8 Nuclear Science and Engineering Research

Promoting Basic R&D on Nuclear Energy and Creation of Innovative Technology to Meet Social Needs

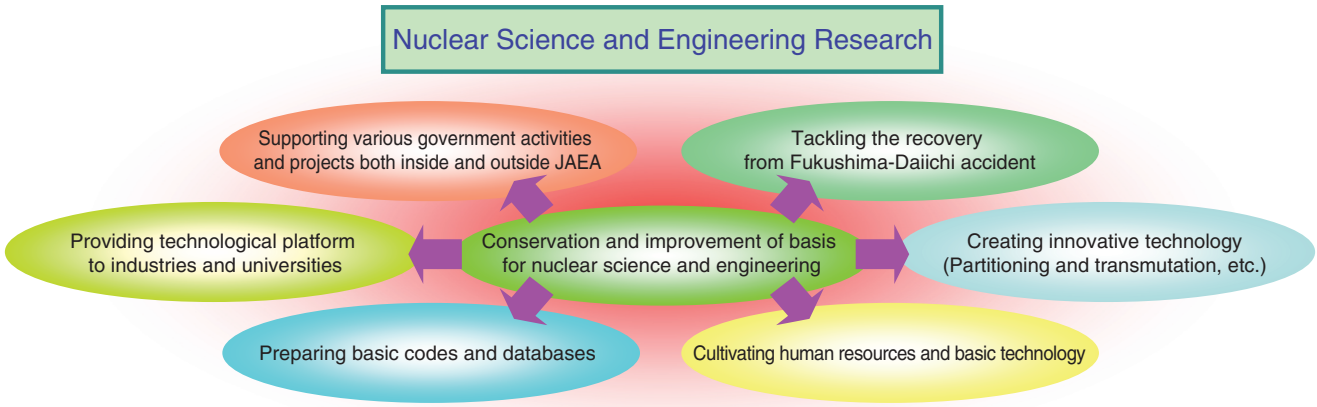

Fig.8-1 Roles of nuclear science and engineering research
We play various roles in the conservation and improvement of the basis for nuclear science and engineering.

Nuclear science and engineering research aims to promote various activities, as shown in Fig.8-1, including recovery from the accident at the Tokyo Electric Power Company, Incorporated Fukushima Daiichi Nuclear Power Station (1F). To this end, research is being conducted in the areas of nuclear data and reactor engineering, fuels and materials engineering, nuclear chemistry, and environment and radiation science. Joint research with industry and academia is also being promoted via the Nuclear Engineering Research Collaboration Center.

In the area of nuclear data and reactor engineering, the Japanese Evaluated Nuclear Data Library (JENDL) is being edited, and nuclear data are being measured to improve it. Calculation methods for nuclear reactor design (Topic 8-1), transmutation technologies to reduce the amount of long-lived radioactive waste (Fig.8-2), and so on are also being studied. Regarding the accident at 1F, the decay heat in the reactor cores was evaluated (Chapter 1, Topic 1-17).

In the area of fuels and materials engineering, research on the nuclear fuels and materials used in nuclear reactors and fuel cycle facilities is being promoted (Fig.8-3, Topic 8-3). Regarding the accident at 1F, the properties of the fuel debris and materials immersed in sea water are being investigated.

In the area of nuclear chemistry, research is being promoted on basic data for reprocessing, separation of long-lived nuclides from nuclear wastes, and detection of extremely small amounts of nuclear materials (Topics 8-4, 8-5, 8-6, 8-7). These technologies are also being applied to the recovery from the accident at 1F.

In the area of environmental and radiation science, studies of the behavior of radionuclides in the environment and the development of a database for radiation protection are being promoted (Topics 8-2, 8-8, 8-9). The behaviors of ^{137}Cs released by the accident at 1F in the marine sediment and forest topsoil are being studied in order to predict the long-term environmental consequences (Chapter 1, Topics 1-1, 1-8).

In collaboration with industry, a production technique for medical radio-isotopes using an accelerator-driven neutron source has been being developed. A new corrosion-resistant material is also being developed.

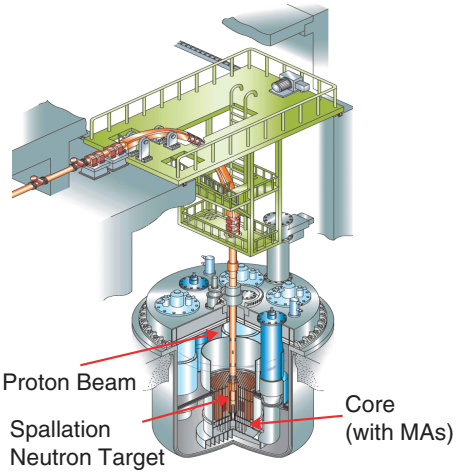

Fig.8-2 Accelerator-driven system (ADS) to transmute minor actinides (MAs)
An 800 MWt ADS can be operated with a 1.5 GeV, 30 MW proton beam at maximum power. Through operation of one ADS, the amount of long-lived MA nuclides discharged from 10 units of a 1 GWe light water reactor can be transmuted into short-lived or stable ones.

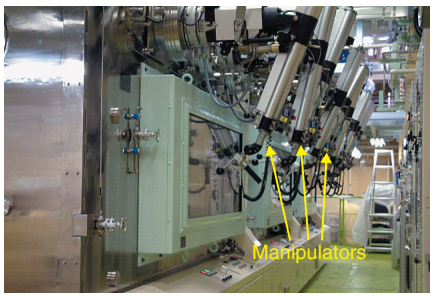

Fig.8-3 TRU High-Temperature Chemistry (TRU-HITEC) module installed at NUCEF
Various thermochemical data are being measured for highly radioactive trans-uranic (TRU) elements in an inert gas atmosphere.