Nuclear Technology
− Supporting Foundations for a Stable Supply −

Brief Overview

For nuclear technology to support stable supply in the future, we promoted researches relating to light water aging issues, back-end project support, radiation safety, and next generation nuclear technology.

For ageing research of light water reactors, we contributed to the industry road mapping on various technical problems for ageing and integrally promoted development of survey, assessment, and countermeasure technology for irradiation embrittlement, deterioration due to thermal hydraulics, SCC (stress corrosion cracking). Among them for irradiation embrittlement, an embrittlement prediction method, developed by CRIEPI, of the reactor pressure vessel steel was employed in the electric technical code in Japan Electric Association JEAC4201-2007.

For backend project support researches, we developed high-, low-level radioactive wastes disposal technology and recycled fuel transport and storage technology to support projects by the national government and the power industry smoothly. For low-level radioactive wastes disposal, we reflected our research accomplishments and knowledge into “technical report on the excess depth disposal (draft)” in the Japan Society of Civil Engineers for establishment of private standards.

Achievements by Research Theme

Light water reactor aged deterioration research (Integral project)

● High accuracy prediction of irradiation embrittlement in the light water reactor and its code formation
- Embrittlement prediction method developed by CRIEP based on observation of microstructure monitoring specimen of domestic nuclear reactor pressure vessel steel was employed in JEAC4201-2007, Japan Electric Association technical standards.
- For determination of lower limit reliability curve of master curve fracture toughness test for domestic nuclear reactor pressure vessel steel, we developed a margin determining method corresponding to the number of specimen.

○ Comprehensive measures of thermal flow caused deterioration
- We developed tools quantifying locations possibly generating liquid drop erosion. (Fig.1)

○ Advanced SCC assessment method
- We clarified the effect of material surface hardness distribution and crystal grain boundary to SCC generation in low carbon stainless steel.

○ Aged deterioration measures
- We contributed to establishment of industry load mapping on various technical problems to aged deterioration of light water reactors.

Radiation safety

○ Low dose radiation effect assessment
- We clarified that low dose X rays bystander effect is a different phenomenon from heavier particles than X rays.

○ Rationalized radiation safety ensuring (Fig.2)
- On the basis of the field demonstration tests, we demonstrated practical performance as an alternative contamination inspection method for improved CRIEPI's clearance level measuring equipment (CLALIS).

Backend project supporting research

● High-level radioactive waste disposal
- We developed stress-measuring method relating to survey and assessment technology for geological environmental property and elemental technology including control boring.

● Low-level radioactive waste disposal
- To reflect to private standards, we finalized our research accomplishment and knowledge into “Technical report on margin depth disposal (draft) ”.

● Transpiration and storage of recycled fuel
- We ensured cask-sealing integrity by high speed flying object horizontal impact test and analysis using scaled cask models. (Fig.3)

Next generation nuclear technology

● Metallic fuel cycle
- We established metal fuel production technology satisfying requirements for compositions and densities.
- Practical throughput was demonstrated with an engineering-scale electrorefiner of pyrochemical reprocessing. (Fig.4)

Light water reactor aged deterioration research (Integral project)

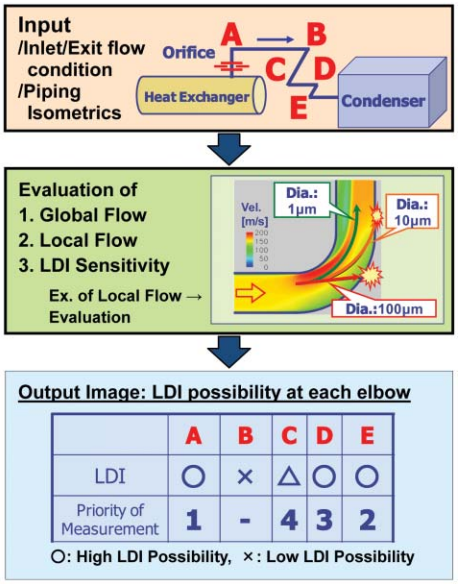

Fig.1 Overview of LDI Prediction System

Radiation Safety

Purpose：To establish a rational radiological protection system through the synergy of biological, environmental and site application technologies

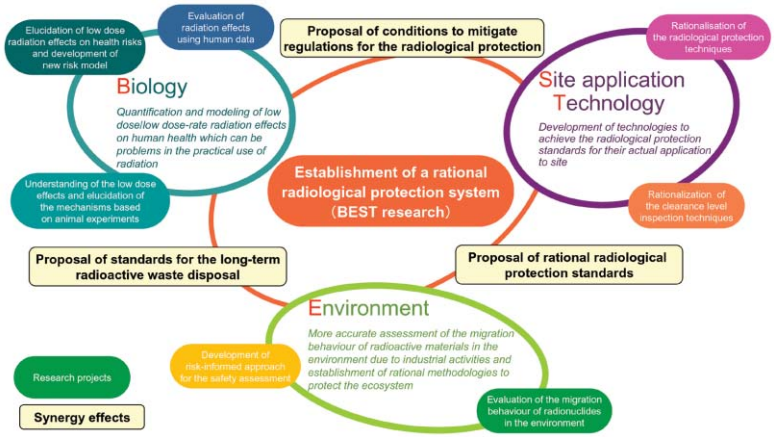

Fig.2 Establishment of a rational radiological protection system

Backend project supporting research

With 57 m/s, the engine of 50 cm in diameter and 316 kg by weight impacted on the body of the 2/5- scale cask model.

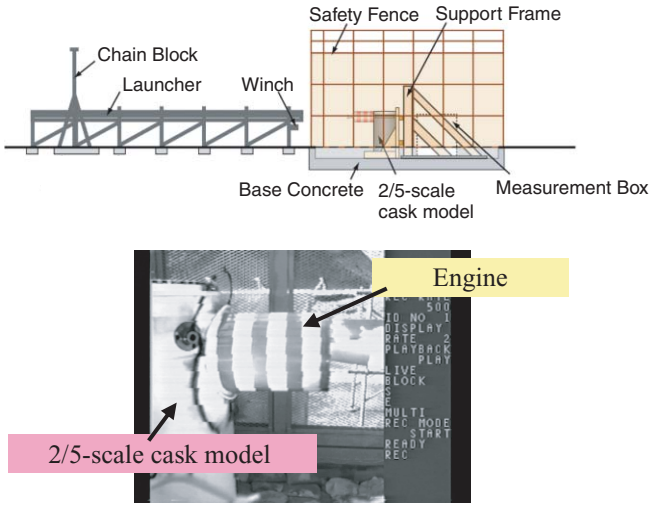

Fig.3 Airplane Engine Impact Test on Metal Cask Body

Next generation nuclear technology

Fig.4 Large-scale Ar atmosphere glove box