Industry trends of Nuclear Energy

- Nuclear Energy can be a potential option to realize the Paris Agreement and initiatives has been taken with a focus on improving safety, reducing both risks and costs.

	Development	Design, manufacturing, and construction	Operation and maintenance	Decommissioning and back-end
Issues	• Transparent and continuous political support • Reducing investment risks related to uncertainty	• Improving safety • Improving economic efficiency • Improving flexibility • Technology transfer	• Reducing operational and maintenance costs • Extending the life of existing reactors and improving safety	• Constructing a nuclear fuel cycle
Industry trends	• Challenging the rate system to reduce investment risks (RAB in UK, ZEC in the US) • Demonstrating next-generation reactors such as SMRs using public funds (CFPP in the US)	• Constructing advanced reactors in emerging countries (China, India, UAE, etc.) • Developing SMR • Developing Generation IV reactors	• Extending the licenses (SLE in the US, 100-year license, Grand Carénage Programme in France, etc.) and improving safety • Reducing O&M costs in response to intensifying competition from other power sources (US)	• Locating the final disposal sites and co-existing with local communities

Areas of innovation to focus on

Technology trends of Nuclear Energy

- The development of SMRs for new facilities is gaining momentum, whereas for existing facilities, digital technology is being used to improve safety and reduce O&M costs.

Development of SMRs

Issues
• Responding to safety concerns regarding Nuclear Energy • Dealing with the excessive cost-overrun of newly Installed Light-water reactors (LWRs) • Integrated operation with rapidly spreading renewable energy
Innovations
• The IAEA* has summarized the 55 reactor types of SMRs being developed worldwide. • All of them are characterized in terms of safety, economic efficiency, and flexibility. ✓ Safety: Passive safety system (e.g. cooling without the pump) ✓ Economic efficiency: Simple design, reducing cost by modularization, and relatively easy to finance due to small-scale ✓ Flexibility: Some designs take advantage of the SMRs to increase operational flexibility. There are also floating reactors that offer flexibility in location • High-temperature technologies, such as high-temperature gas reactors are also envisaged for industrial applications

Safety Improvement and O&M Cost Reduction

Issues
• Improving competitiveness against renewable energy and existing energy sources • Reducing operation costs while improving safety
Innovations
• Upgrading existing plants through the introduction of digital instruments, etc., to improve safety and economy at the same time • Standardizing business processes for asset management and maintenance based on RCM (Reliability Centered Maintenance) using Big data and AI is becoming more advanced • Developing Accident Tolerant Fuel (ATF), which prevents severe accidents even in the event of a severe situation such as the loss of all power sources • Initiatives are also underway to share know-how in the supply chain

Source: IAEA (2018) "Advances in Small Modular Reactor Technology Developments"