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KOREA`s Technology for Expanding Clean Electricity

(2025.04) KOREA ENERGY AGENCY
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1. Key Challenges in the Energy Sector

2. Demonstration of AI Power Operation System Using Digital Twin

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01 Key Challenges in the Energy Sector

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□ Rapid increase in energy demand due to advanced industry investments and electrification demand

○ The increasing demand for energy is expected to accelerate further due to factors such as advanced industry demand, the growth of data centers, and the expansion of electrification as a means for carbon neutrality.

□ Expansion of energy supply and demand volatility

○ The increase in the share of renewable energy generation and fluctuations in temperature, solar radiation, and other factors due to climate change are expected to intensify supply and demand volatility in the future.

□ Increased disaster risks and damages to energy infrastructure

○ Extreme weather events such as heavy rainfall and strong winds are expected to become more intense due to climate change, posing the greatest threat to the stability of energy systems.

→ **The need to integrate AI technology into the energy sector to contribute to the transition to clean electricity is increasing.**

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02 Demonstration of AI Power Operation System Using Digital Twin

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□ **Overview: Establishment of a digital twin that replicates Korea's grid and power generation situation.**

The AI system learns from power operation performance to perform tasks such as generation control, economic dispatch, demand and load forecasting, and evaluates the impacts and effects on the power system.

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03 Establishment of an Integrated Early Warning System for Energy Infrastructure

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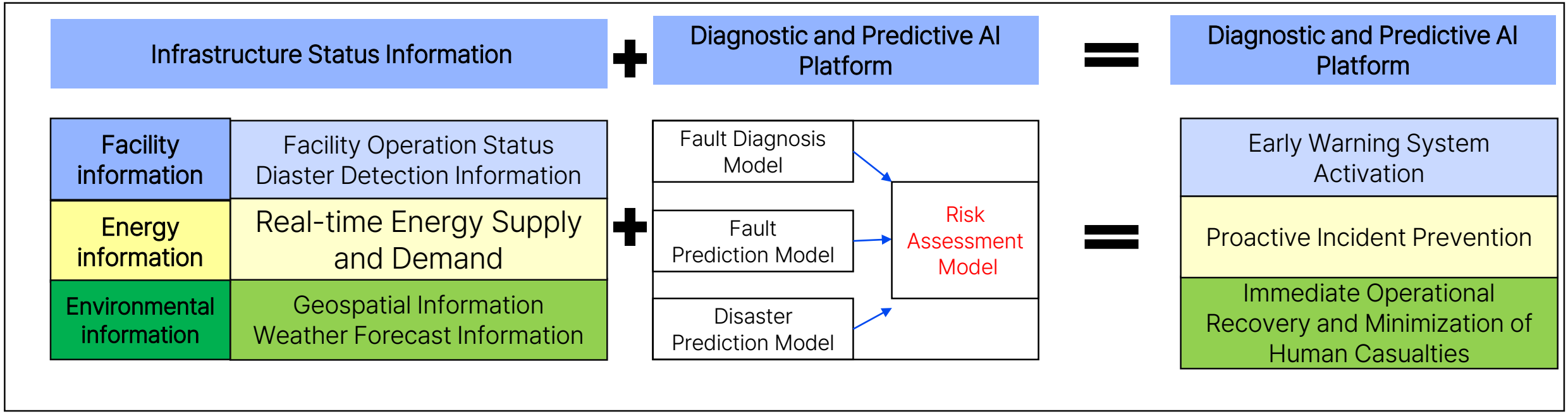
□ **Overview: Establishment of a system that predicts natural disaster damage, equipment malfunctions, and other issues in energy infrastructure using AI technology for early response.**

<Integrated Early Warning System Framework (Example)>



- **Identifying vulnerabilities in energy infrastructure in advance using AI and data analysis technology.**
- **Early detection of potential equipment abnormalities in solar panels, ESS, etc., and performing preventive maintenance.**

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Thank you

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