

Special Keynote

AI, Energy, Defense



More Materials Needed



More Efforts Required

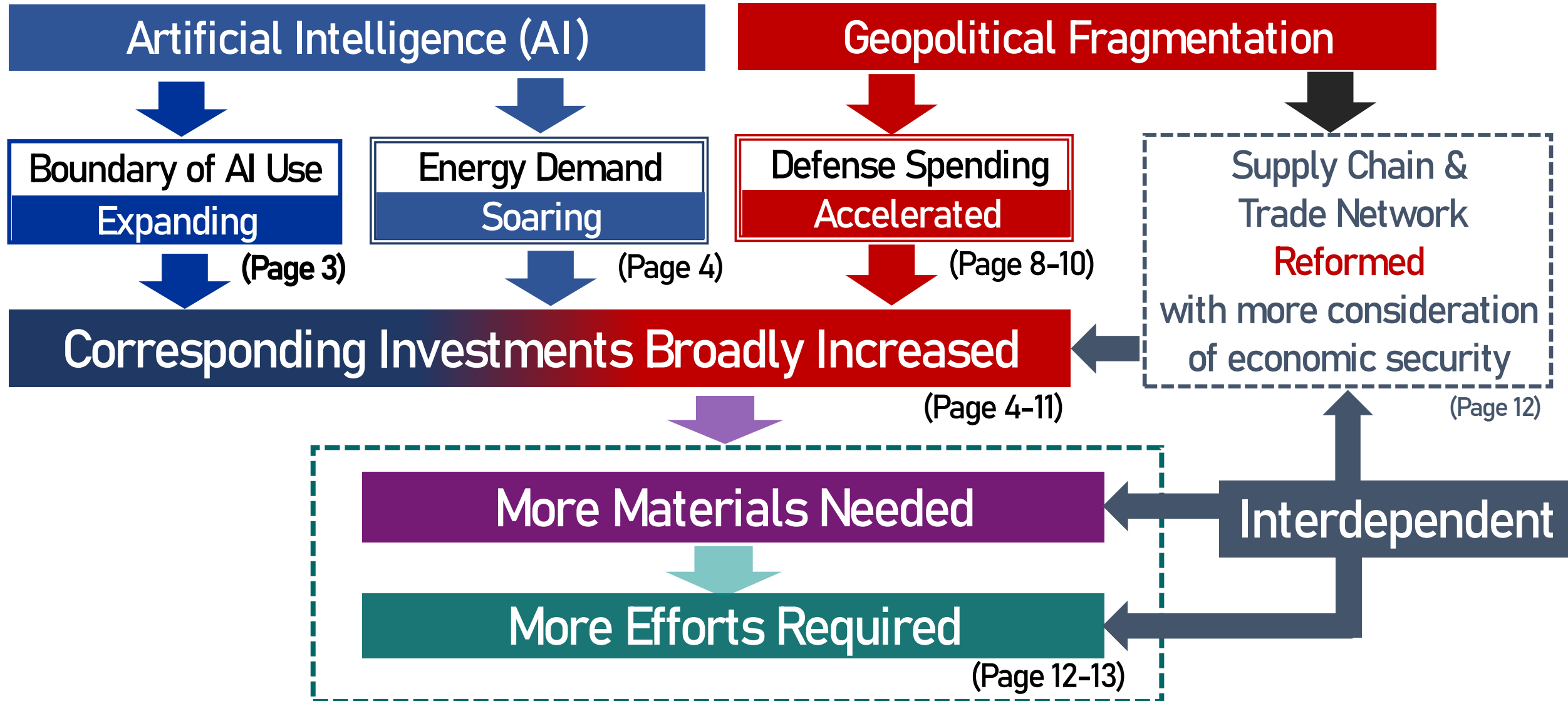


4th September 2026

Shunichi MIYANAGA

Mitsubishi Heavy Industries, Ltd (MHI)

OUTLINE



1. Standing at the Entrance of the AI Age

It is Difficult to Predict at this stage

- : How far the AI technology will reach
- : To what extent its technological development can be controlled

However, we are convinced of the Facts

- : “Winner takes all” type competition among Big-Tech, major powers and other advanced countries is fiercely underway
 - ➡ Large-scale investments in Data Center (DC) and Production Facilities of various Semiconductors
 - ➡ R&D for further advancements of not just LLM-AI but a broad range of physical AI

2-1. Soaring Energy Demand Caused by AI

Increasing Use of AI and Data Accumulation

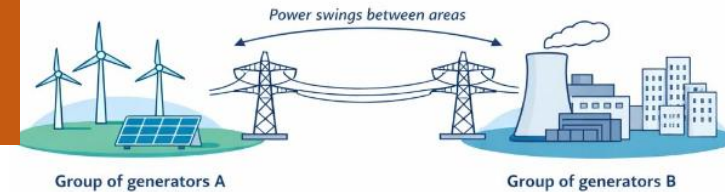
Operation of AI platform (especially DC) Needs More and More Electricity

Pursuit of More Efficient Semiconductors

Chip Production is a Major Consumer of Electricity (e.g. Circuit Miniaturization by EUV-ray)

Soaring Energy Demand
Drives Investments

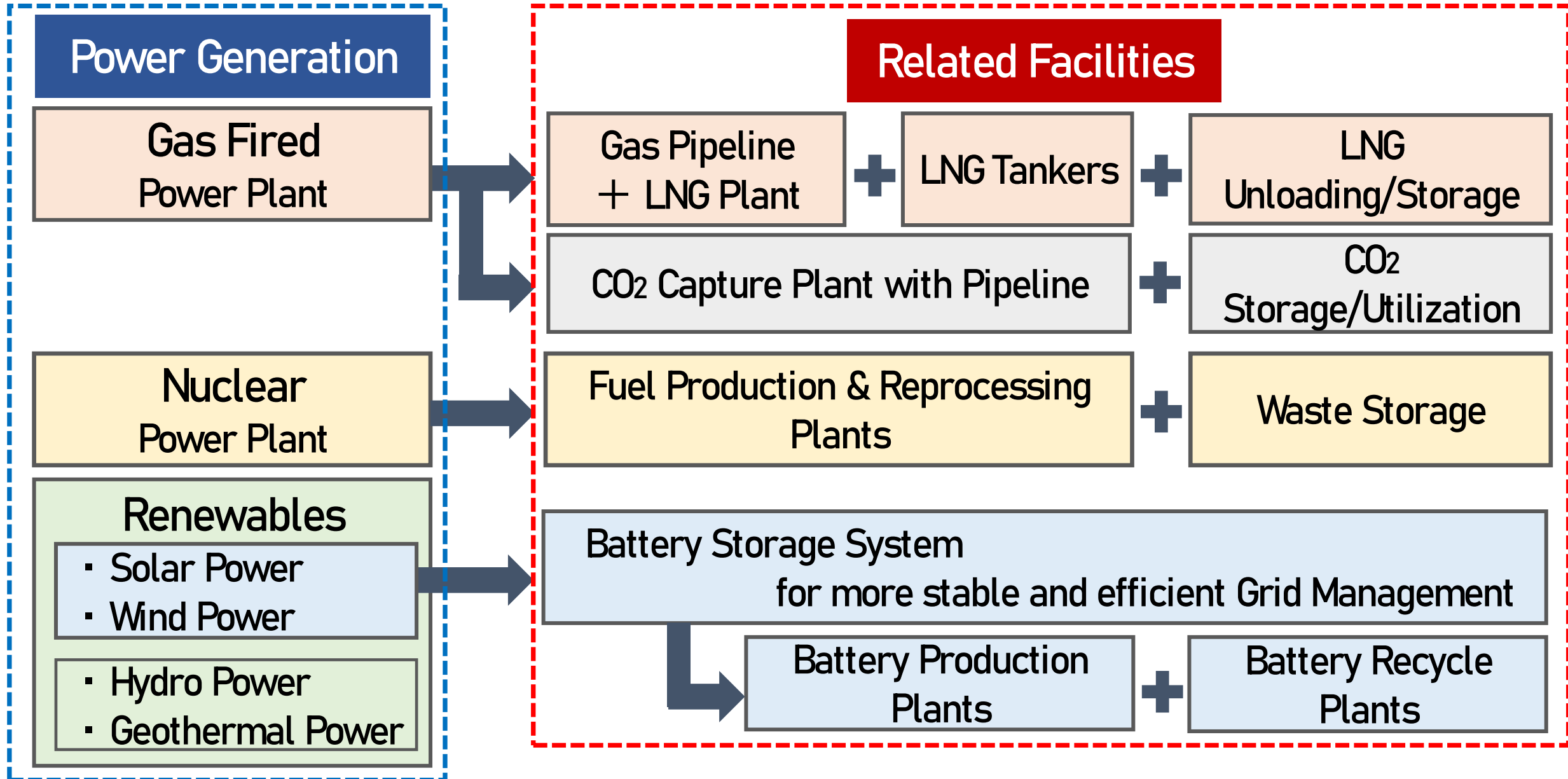
Inter-area oscillation and damping in a power grid



Power Generation and
related Facilities & Equipment

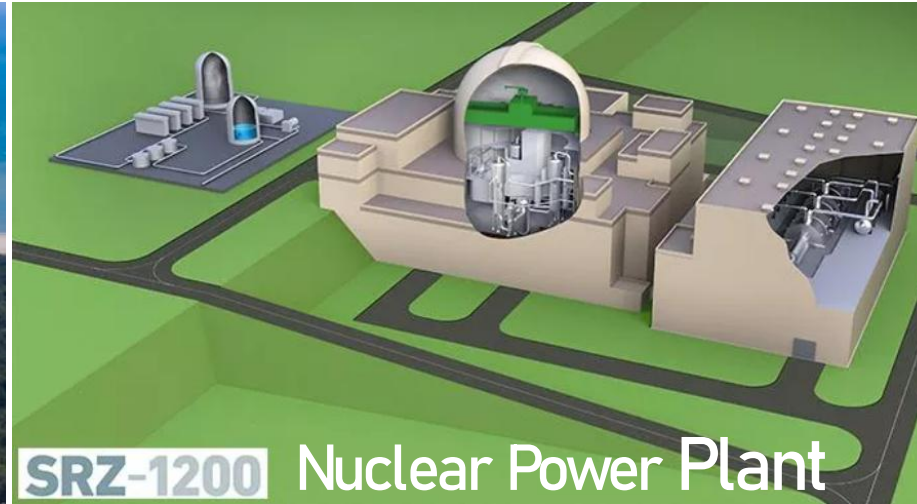
Transmission & Distribution Network

2-2. Capital Investments to Meet the Soaring Energy Demand



2-3. Power Generation Plants

Gas Fired Power Plant
(2,800 MW GTCC / Tunghsiao, Taiwan)



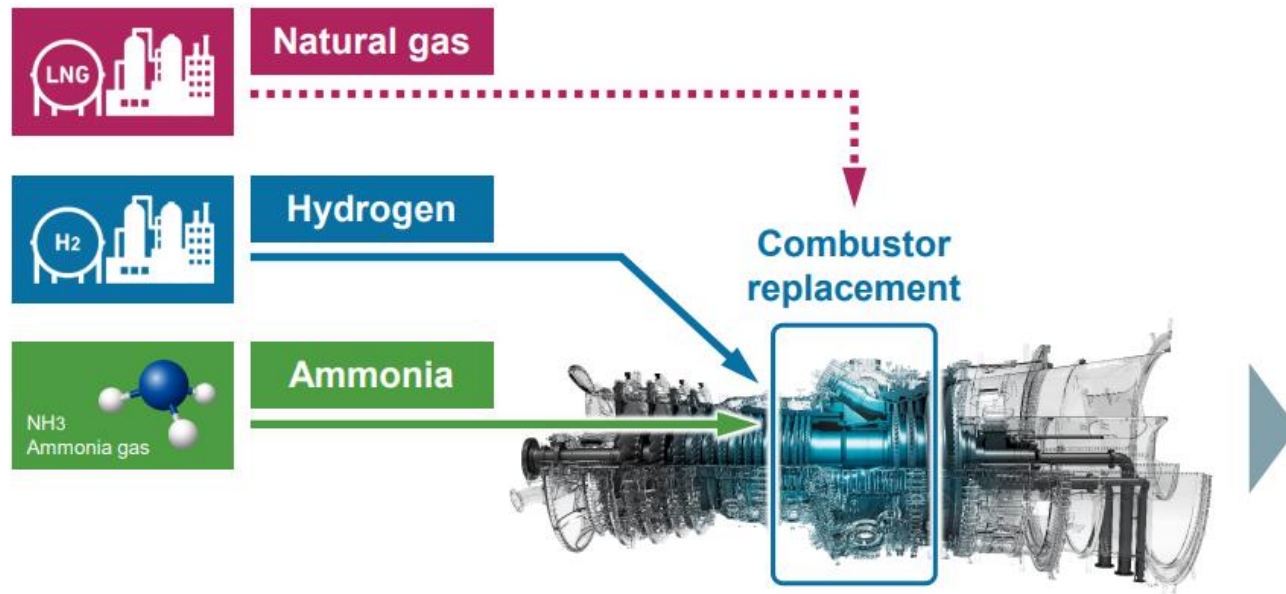
Solar Power Plant
(North Carolina, USA)



Wind Power Plant
(Colorado, USA)



Geothermal Power Plant
(under drilling in Utah, USA)



Combustor Types

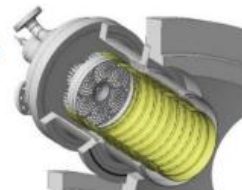
Type 1



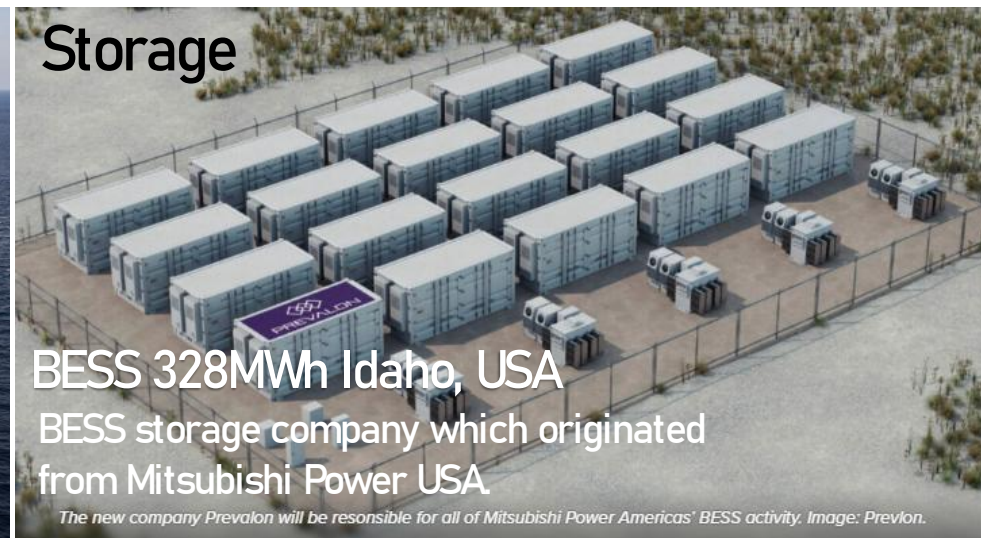
Type 2



Type 3



2-4. Energy Value-chain Investments

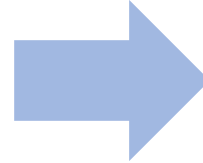


3-1. Defense Reinforcement

Geopolitical Fragmentation



Recent Major Conflicts

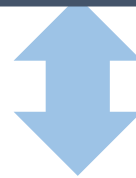


Intensified Concern on
National & Economic Security



Rapid Reinforcement of **Own Defense Capability** in both Conventional systems and new domains enabled by emerging technologies* and Asymmetric battle concepts*.

* P9 : Emerging Defense Technologies



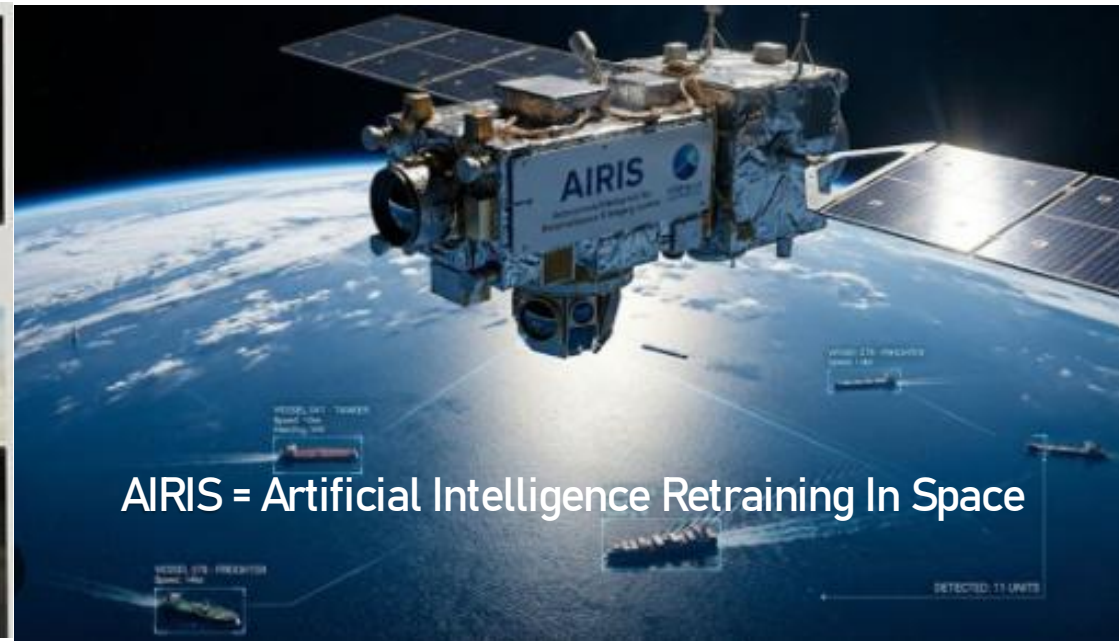
Financial and Technical Hurdles due to

: Limited Production Capacity (Few Defense Contractors)

➡ Main Causes : Volatile Demand, Costs for High-level Technology Competition & Confidential Duty

: Increase in Cost for Capital Investments and Production

3-2. Emerging Defense Technologies



Result of
Ship Detection
by AIRIS

3-3. Defense Reinforcement Deriving Investments

Expansion of Production Capacity

- Conventional Arms (Land, Sea & Air)
- Variety of Satellites (Surveillance from space, etc.)



Development with Dual-use Concept

- Unmanned Arms (Land, Sea & Air)
- Advanced Laser Arms, etc.

Other Necessary Reinforcement

- Logistic Systems
- Ammunition Production
- Resilient Infrastructure
 - Warehouses, Training fields, etc.

- Need to overcome
the Financial and Technical Hurdles
(See page 8)
- Limited Industrial and Financial Capacity in many countries



- International Cooperation (Alliance) to share the Cost Burden
- Budget Increase with Long-Term Commitment to make business viable
- Start-Up with Leader Company's Coordination for Emerging Technologies

4. Other Investments We Need

Besides the aforementioned Investments related to AI, Energy & Defense



We also need to continue or extend Investments for

- : Economic Growth of **Developing Countries**



Industrialization suited to geographic/geological characteristics

- : **Reconstruction** of Societies & Industries destroyed by the conflicts

- : **Decarbonizing** Action to cover more increased GH Gas Emission than that we have expected by now.

5-1. More Efforts Required (1/2)

Until we reach an equilibrium, we may face several waves :
Investments call for Materials ↔ Materials call for Investments

- Comparing potential supply capacities between Organic and **Nonorganic Materials**, the latter needs greater attention.

$$\left(\begin{array}{l} \text{Critical Minerals} \\ (\text{Cu, Ni, Rare Earth, . . .}) \end{array} \right) + \left(\begin{array}{l} \text{Base Metals} \\ (\text{Fe, Al, Cement, Glass, . . .}) \end{array} \right)$$

- However, there are such **Difficulties/Hurdles** as
 - Decreasing number of deposits that we can commercially develop
 - Bottleneck of Processing, especially Smelting-Refining
 - Geopolitical Fragmentation :
 - ➡ Protectionism hindering international collaborations
 - ➡ Less optimized Supply Chain compared to era of Globalization

5-2. More Efforts Required (2/2)

Efforts at Present

1. Enhancement of our wise-use movement
 - “Use Longer”, “Use Less” and “Recycle more”
2. Extension of the ongoing start-up challenges
3. Promotion of more international cooperation, through sharing reliable and neutral data & information with mutual trust



Efforts/Hopes for the Future

1. Applying AI technology to enable industries to operate with significantly lower energy and raw materials consumption
2. Advanced social and business structures to expand the wise-use of materials
3. Technological breakthroughs:
 - Invention of alternatives for very rare or critical materials
 - Exploration and mining technologies for deeper deposits

We should be

- Neither Pessimistic Nor Optimistic, Just Constructive !
- Keeping on our Efforts for the coming Generations !

Thank you.