

Trends in Energy and the Role of Coal

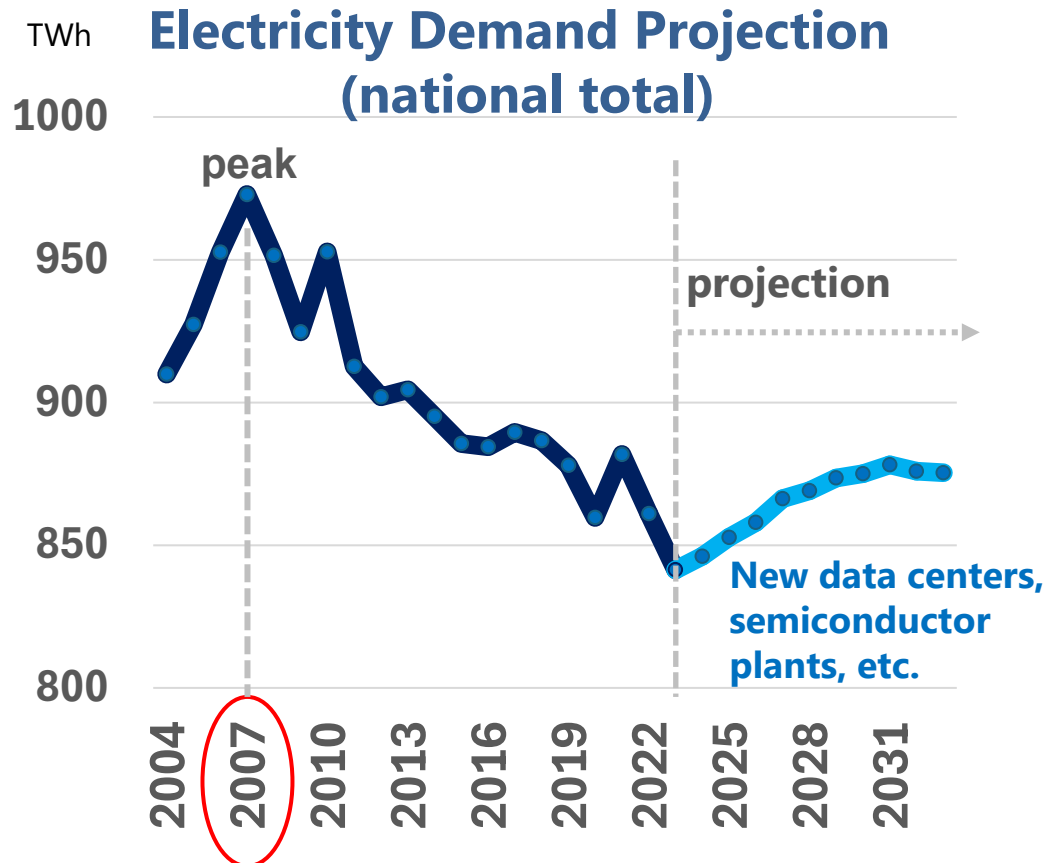
September 2, 2024

Tatsuya Terazawa

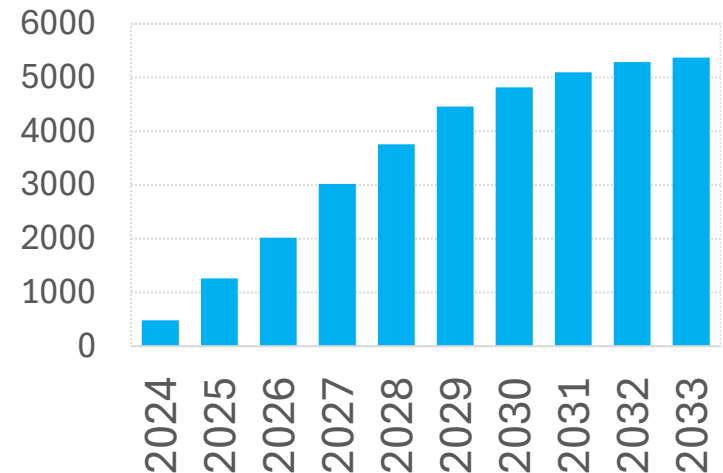
Chairman and CEO, The Institute of Energy Economics, Japan (IEEJ)

Increase in electricity demand

- Electricity demand in Japan expected to grow after 15 years of decline



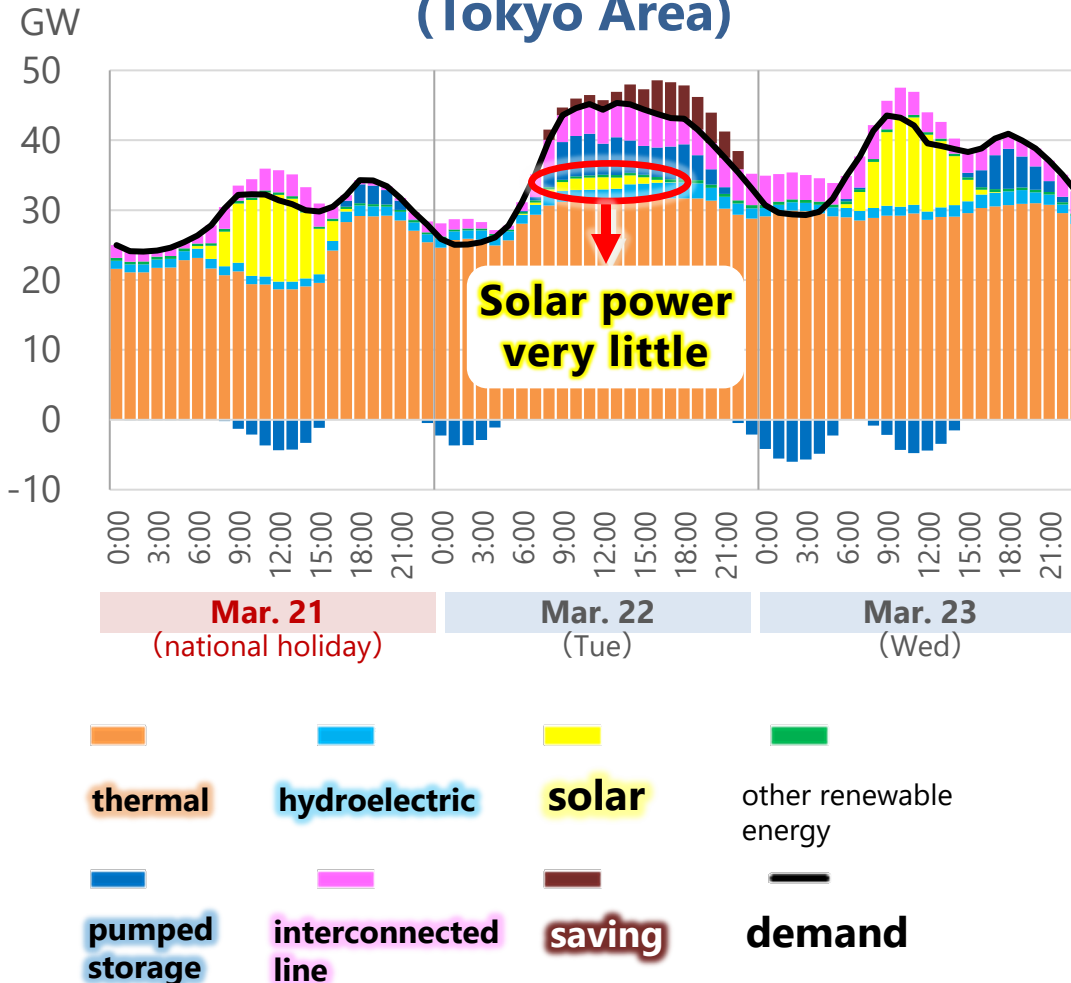
Demand for new data centers and semiconductor plants (MW)



Source: OCCTO

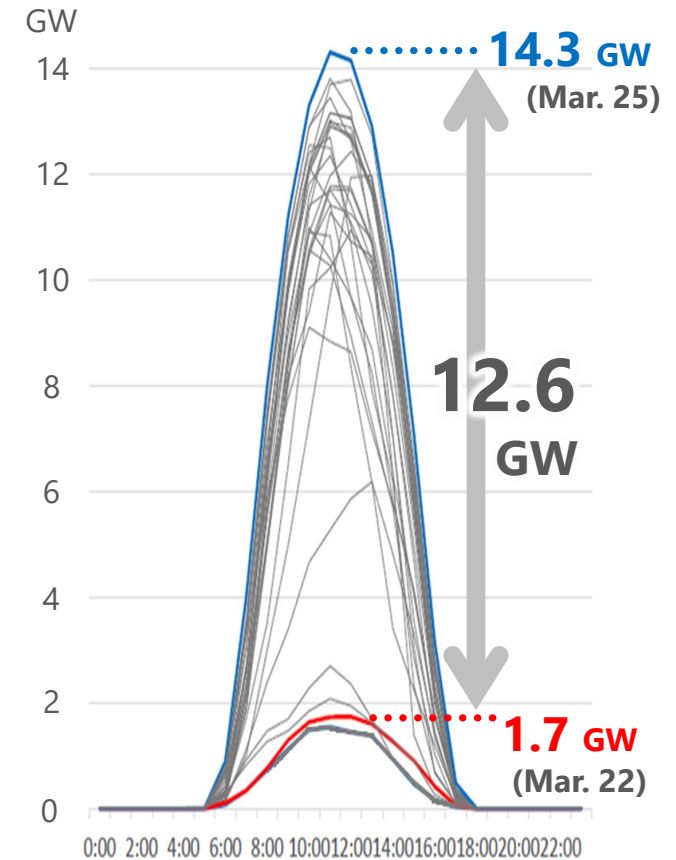
Responding to Intermittency (March 22, 2022 : Tokyo Area)

Electricity Supply and Demand (Tokyo Area)



Source: Tepco Power Grid, METI and Cabinet Office

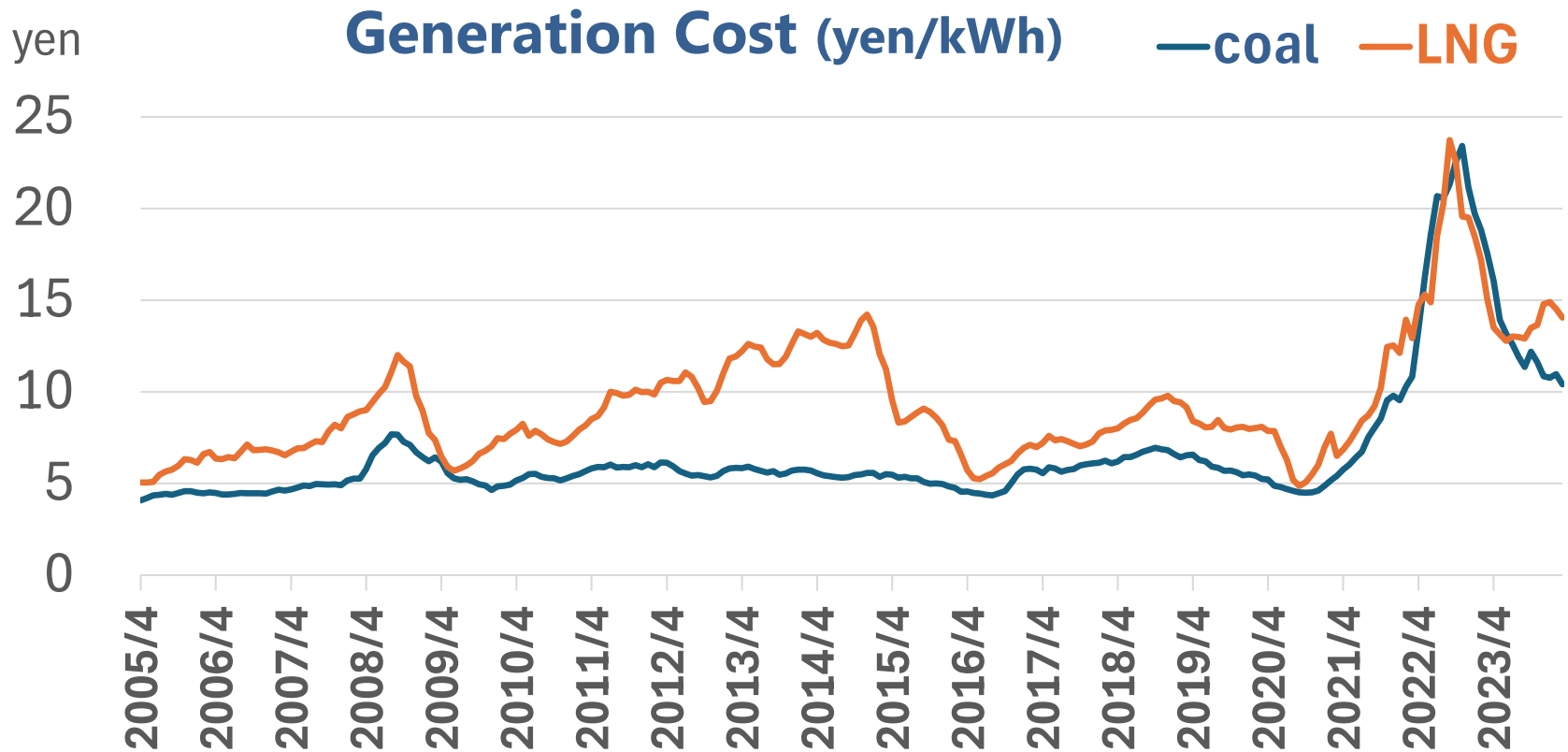
Solar output on each day of March 2022



Source: Agency for Natural Resources and Energy, METI

Need to control cost increase

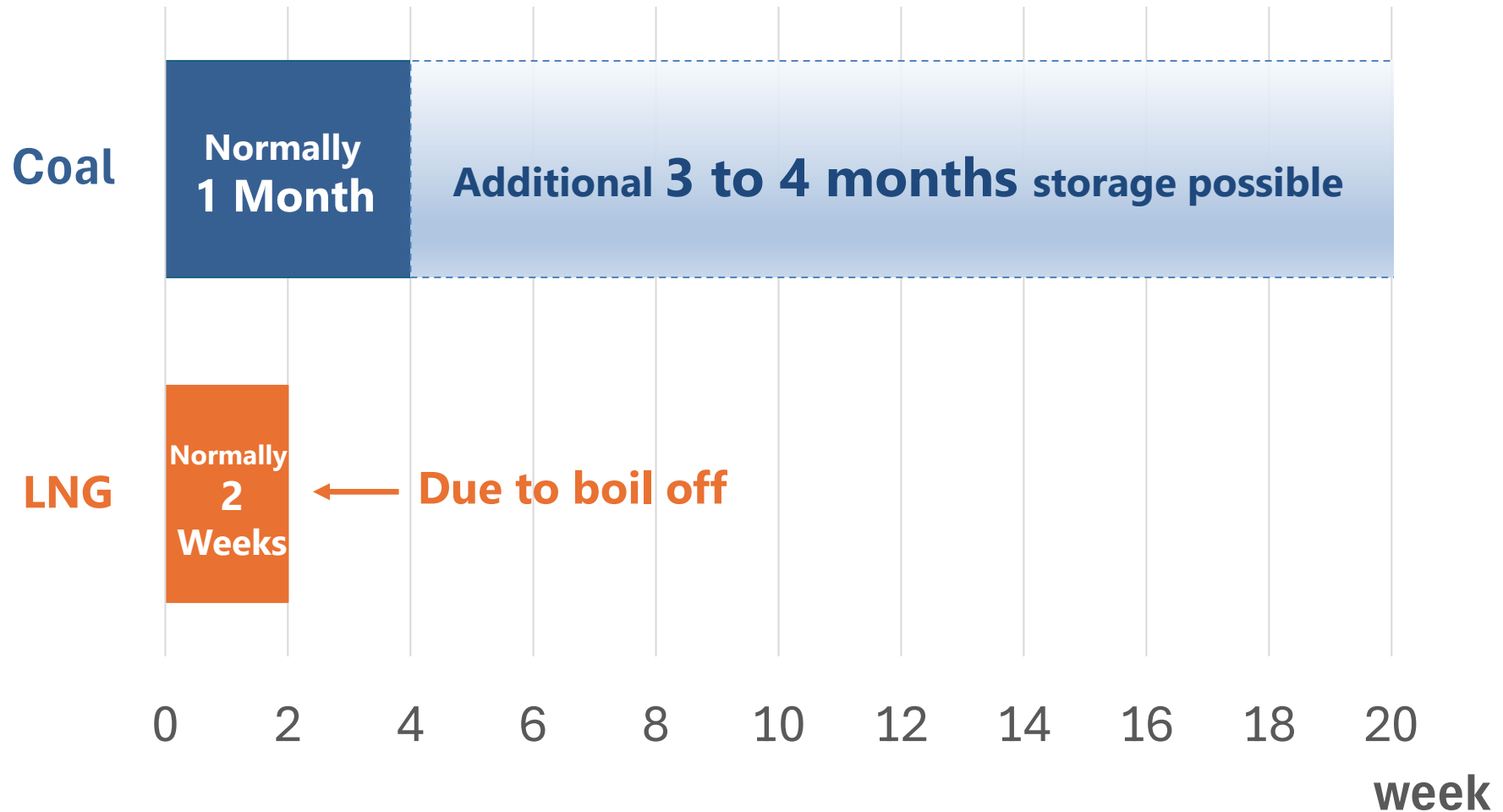
- Coal remains an economically superior resource compared to others.



Source: Calculated by IEEJ based on trade statistics

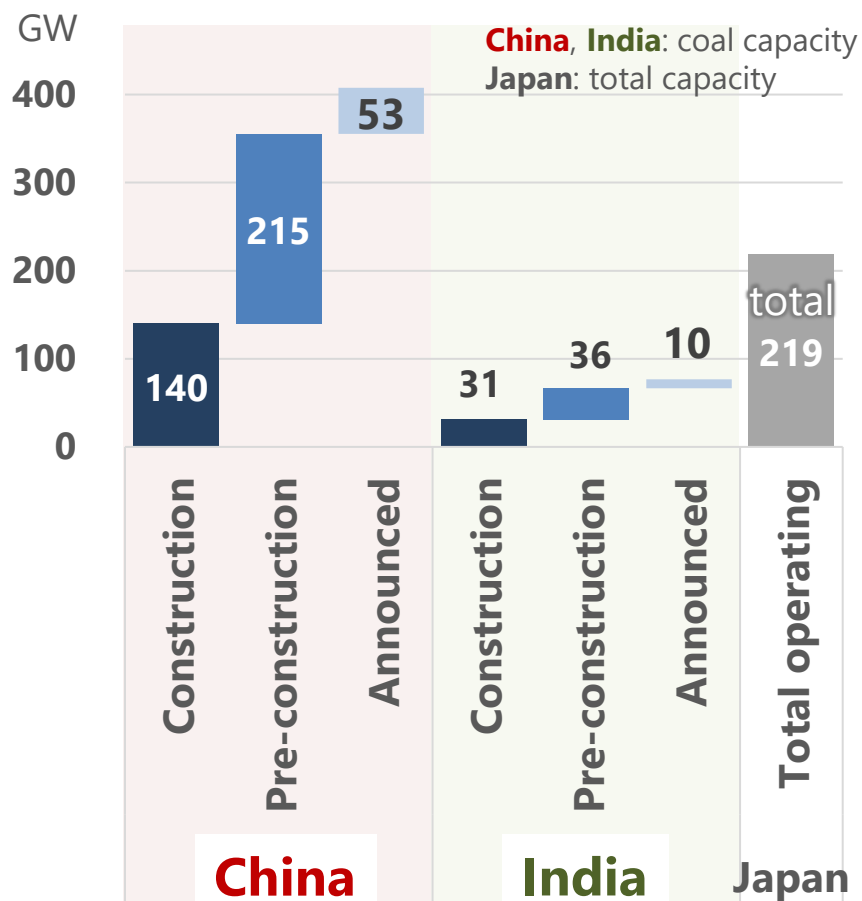
For Energy Security

- Coal is relatively easy to store over the long term.



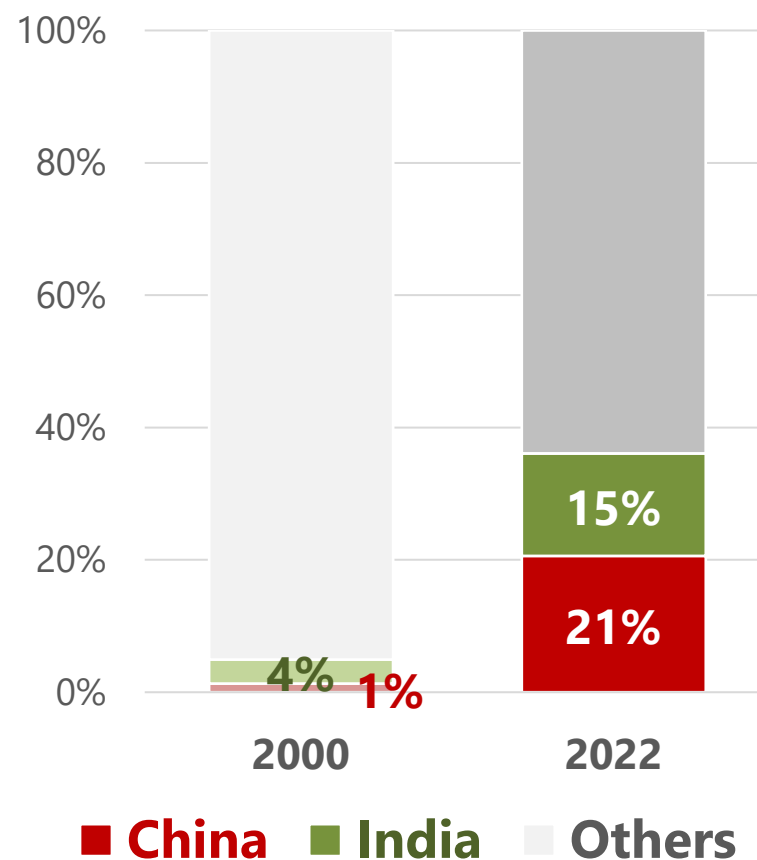
Need to secure stable coal supply during energy transitions

Coal power plant buildup in China and India



Source: Global Energy Monitor

Share of China and India in world's coal imports



Source: IEA

Direction of coal power generation reduction

■ Excerpts from Apulia G7 Leaders' Communiqué (G7 Italia 2024 : June 13-15, 2024)

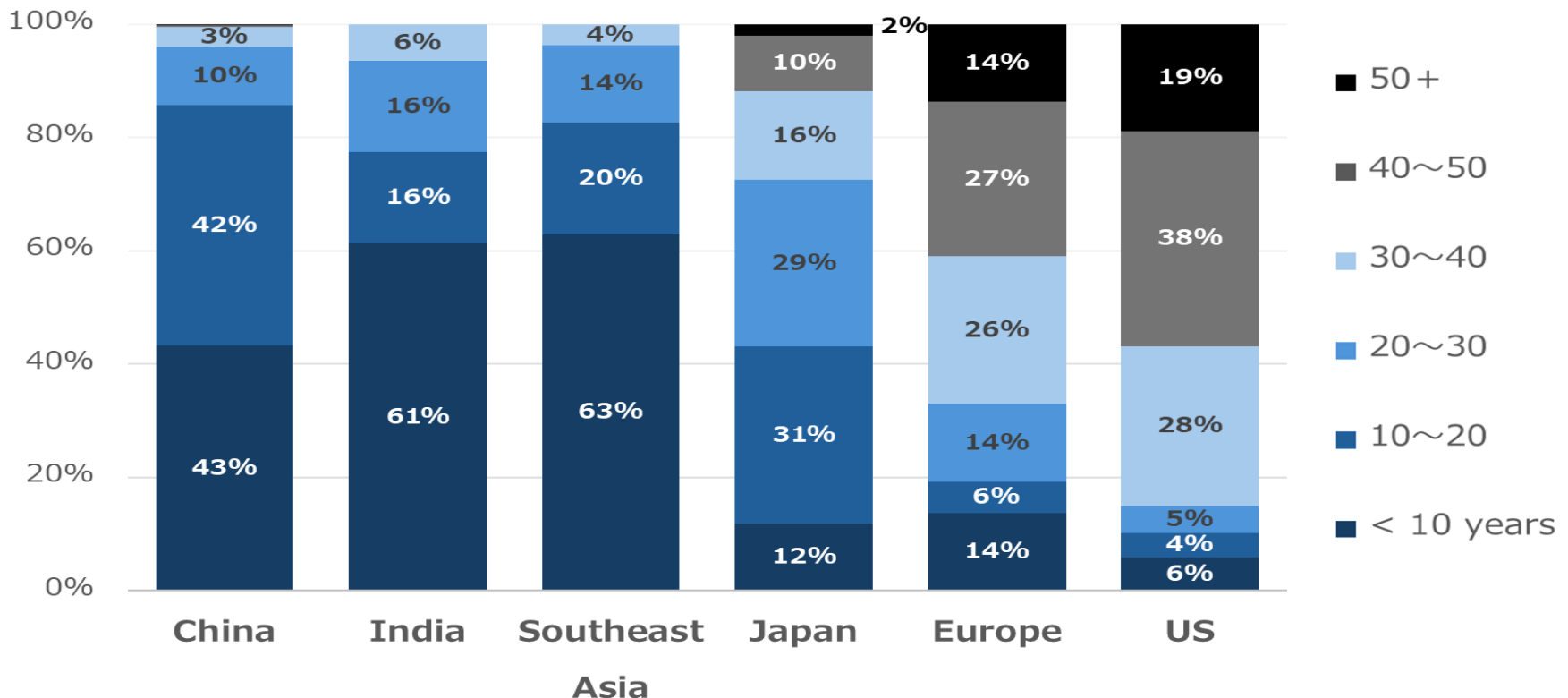
Energy, Climate and Environment (excerpt)

We reaffirm our commitment to achieve a fully or predominantly decarbonized power sector by 2035 and to phase out existing unabated coal power generation in our energy systems during the first half of 2030s, or **in a timeline consistent with keeping a limit of 1.5°C temperature rise within reach, in line with countries' net-zero pathways.**

Young fleet of coal power plants in Asia

- Asia's electricity demand will keep growing, and the average vintage of **its coal power fleet is still young.**

SHARES OF COAL-FIRED POWER CAPACITY BY AGE (AS OF 2020)



*In Japan, a total of 3.5 MW of coal-fired power plants have been put into operation by major power companies since 2021.

Source: IEA, Global coal-fired power capacity by plant age; METI for Japanese figures,

Significance of co-firing in Asia

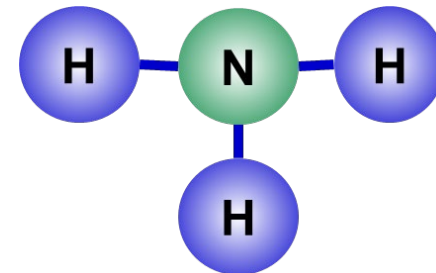
- **Co-firing provides a quick, effective, and realistic decarbonization solution.**
- Carbon intensity can be lowered to an equivalent level to gas-fired power generation if the co-firing ratio is raised to 50%.

Fluidized-bed boiler



Biomass

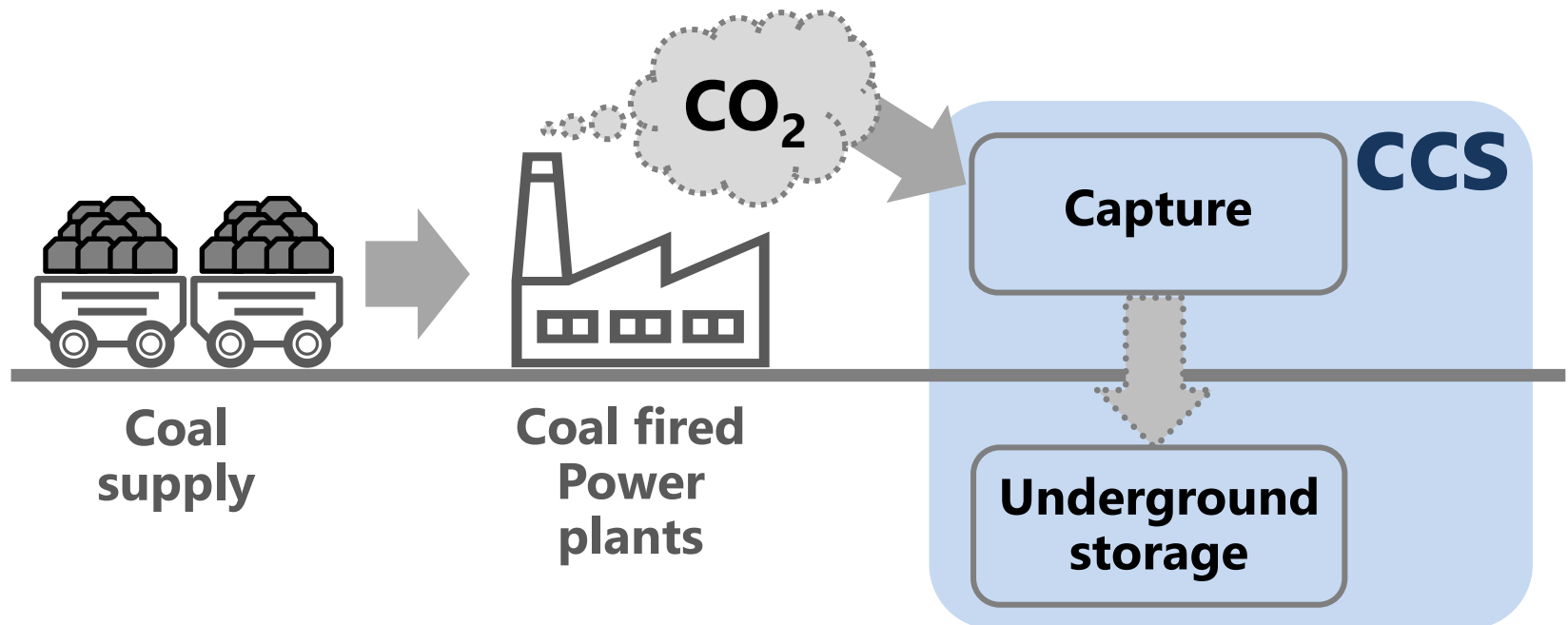
Pulverized boiler



Ammonia

CCS for coal fired power generation

- **Advantage:** CCS for coal fired power generation may be efficient because of its high CO₂ density in the emitted gas.
- **Challenge:** CCS for coal fired power generation requires large volume of CO₂ capture and storage.

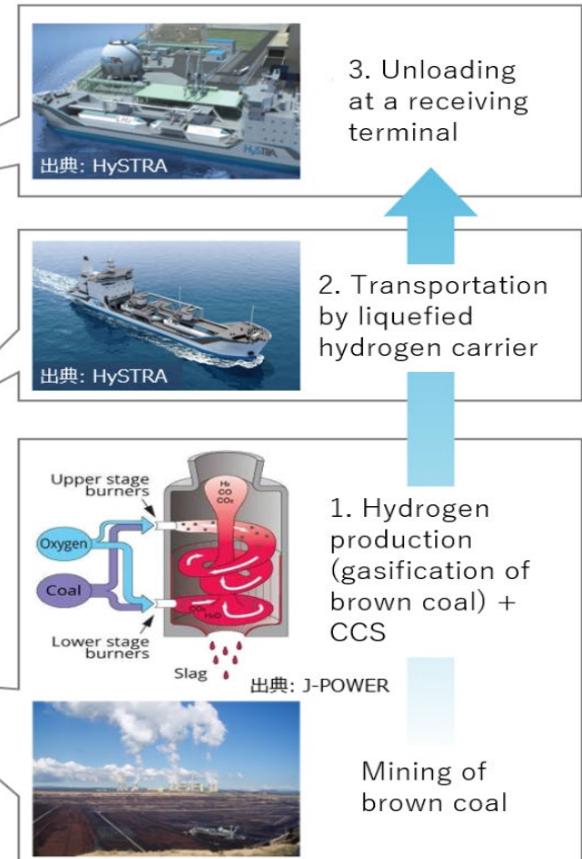


Blue Hydrogen from Coal

- **Advantage:** Low-cost feedstock (Brown coal)
Diversification of feedstocks.
- **Challenge:** Cost due to larger volume of CCS.

Blue hydrogen project from Australia to Japan

Australia-Japan "Brown Coal to Hydrogen" Supply Chain



Summary

■ Coal can play valuable roles to address energy challenges especially in Asia

- Power demand growth
- Increased intermittency
- Need to control cost increase
- Enhance energy security

■ Actions to realize the roles of coal

- Ensure stable supply during the transition
- Decarbonize power generation through co-firing & CCS
- Production of blue hydrogen from coal