Coal's Strategic Role in the Energy Transition

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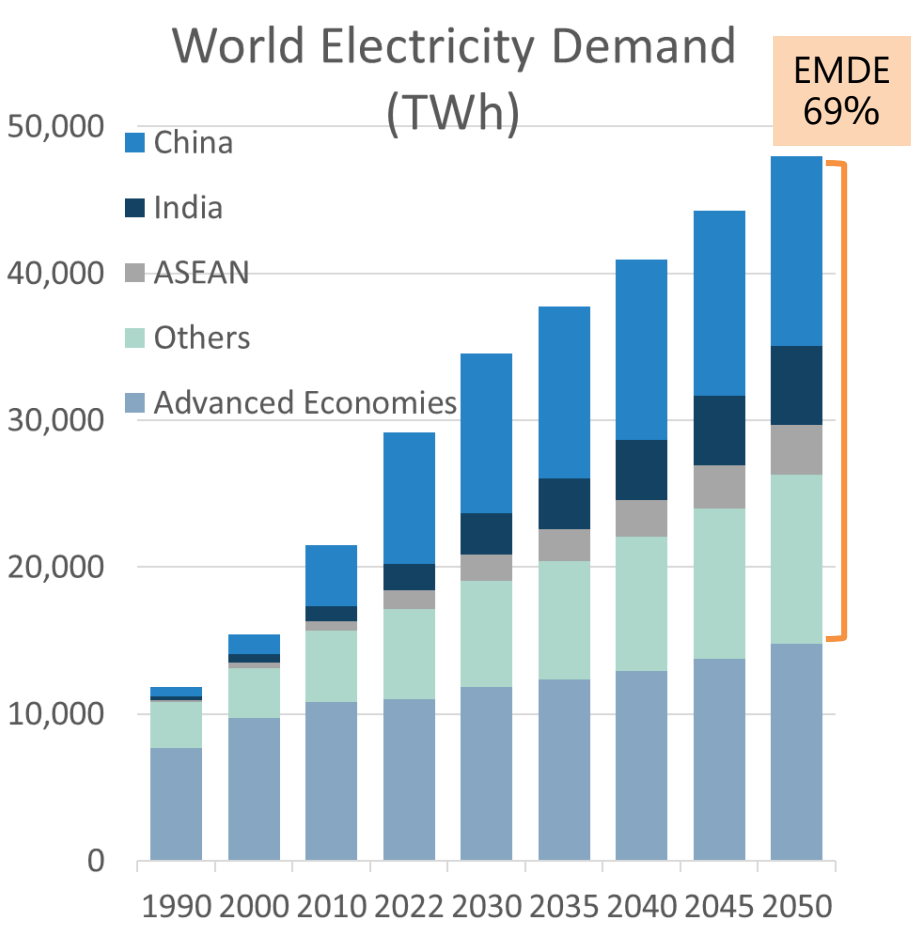
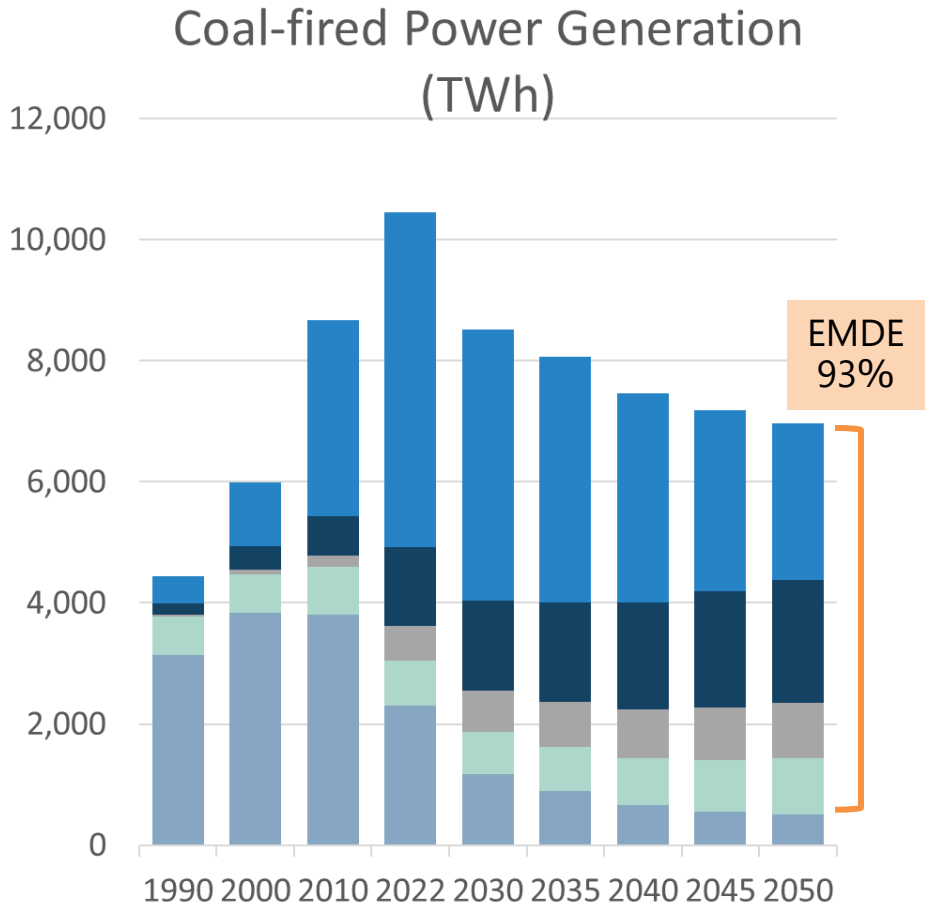
World: Growing Electricity Demand in Asia

- **Electricity demand continues to increase, particularly in Emerging Markets & Developing Economies (EMDE).**



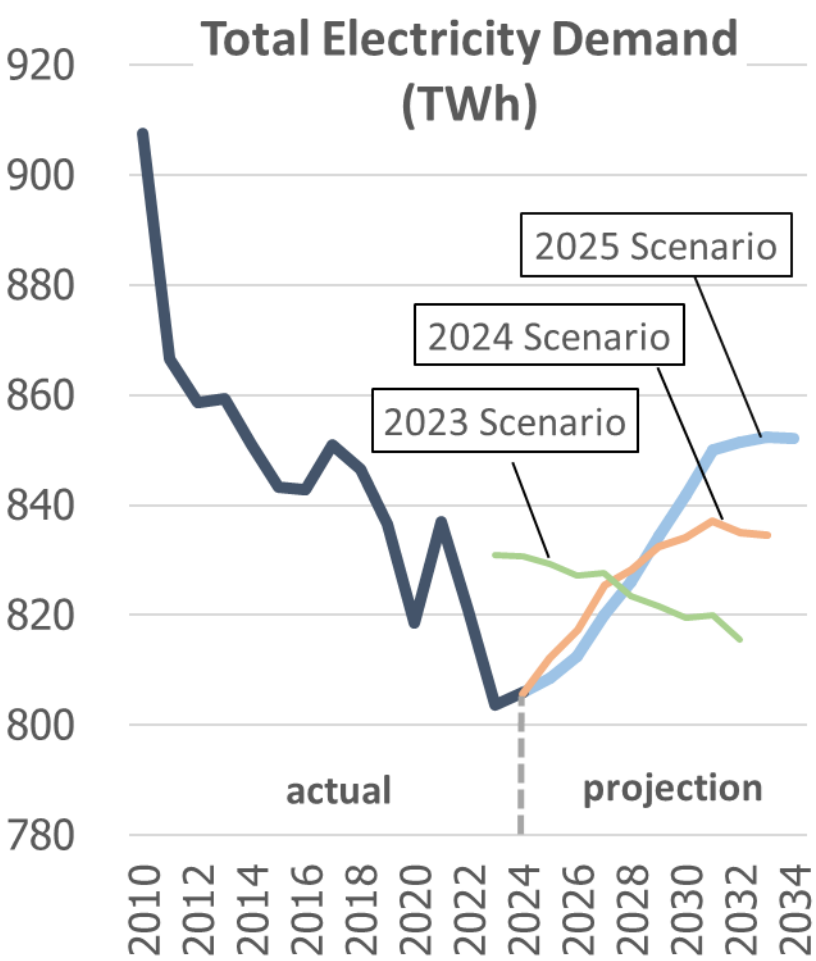
Source: IEEJ



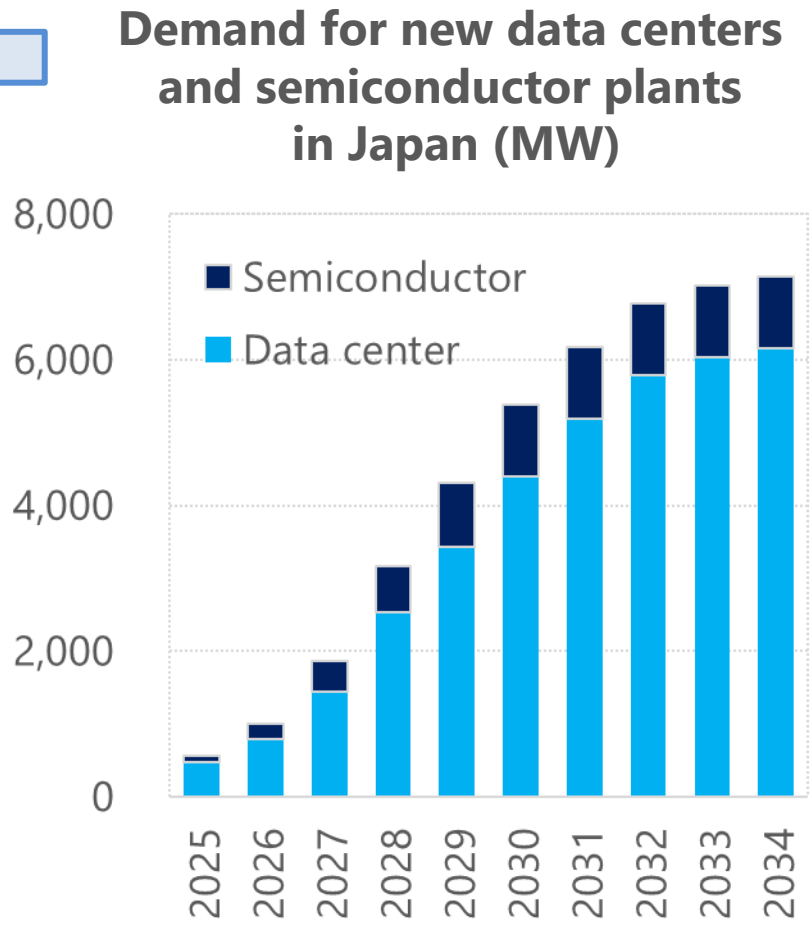
Source: IEEJ

Japan: Increase in Electricity Demand

■ **Electricity demand in Japan is expected to grow after 15 years of decline**



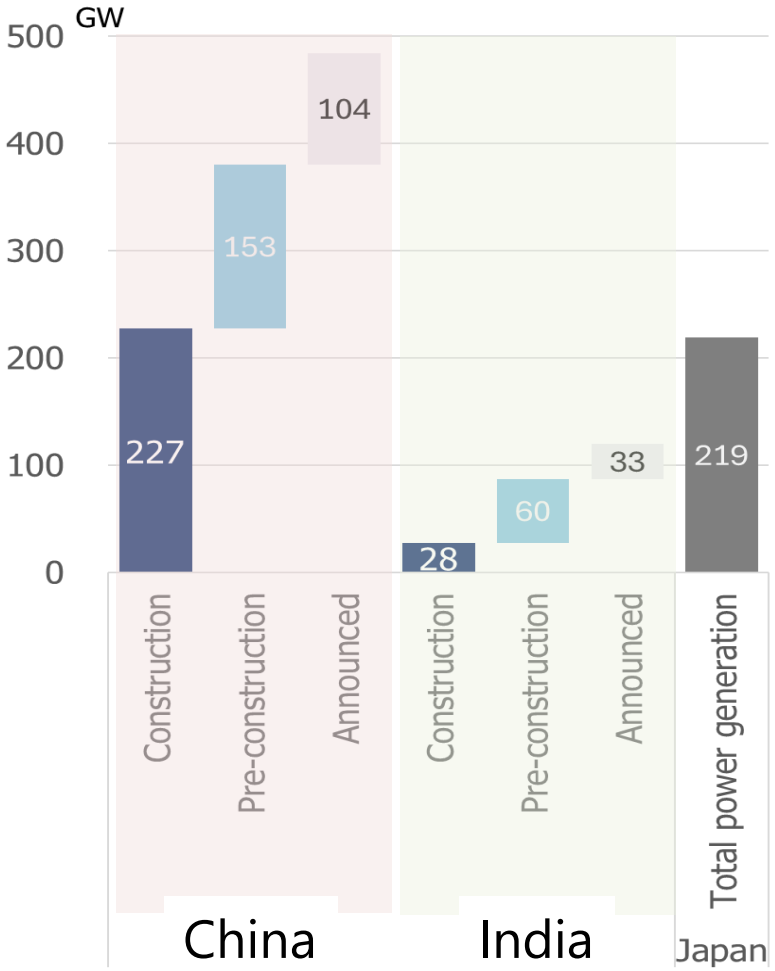
Source: OCCTO



Source: OCCTO

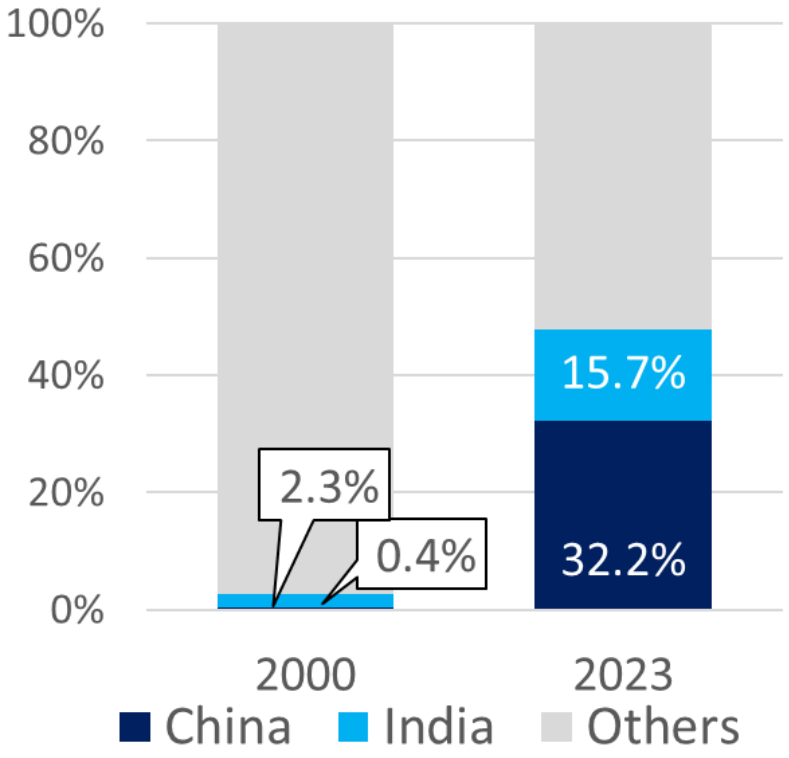
China & India: Need to secure stable coal supply during the Energy Transition

■ Coal power plant buildup in China and India



Source: Global Energy Monitor

■ China and India import half of the world's thermal coal trade



Source: IEA

USA: The Trump administration transformed the policy - Beautiful Clean Coal

Energy Dominance Strategy

Positioning fossil fuels as a strategic key to strengthening industrial competitiveness

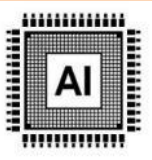
Beautiful Clean Coal

U.S. Executive Order #14261 aims to revive and strengthen the coal industry by promoting coal production and usage through deregulation, financial support and prioritizing federal land for coal mining.

Deregulation

- ✓ Repealing or relaxing emissions regulations
- ✓ Extending the lifespan and improving the capacity factor of existing coal-fired plants

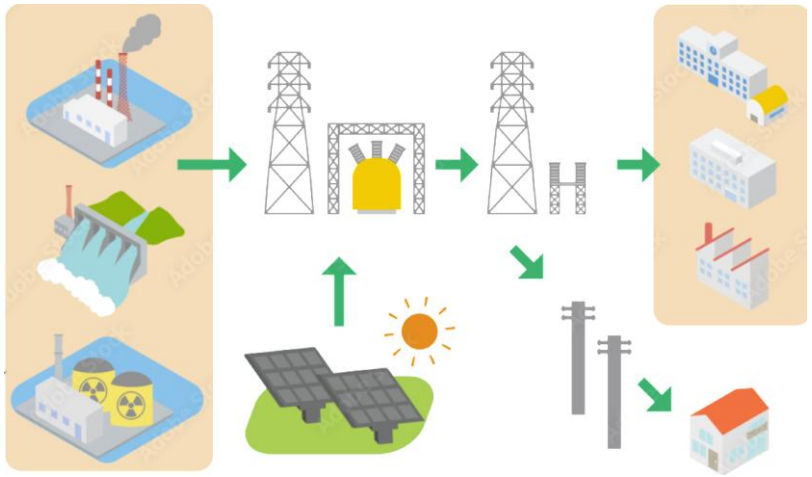
For Increased AI/DC Demand



- ✓ Ensuring a stable power supply for future large-scale electricity demand (AI/data centers)
- ✓ Valuing its dispatchable function to address intermittency of Renewable Energy

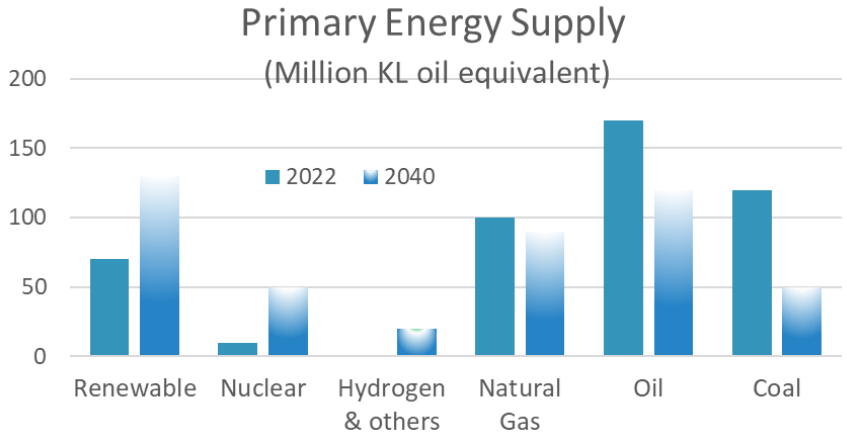
Japan:
7th Strategic Energy Plan - Role of coal

Electricity supply



Coal-fired power station provides backup and supply-demand adjustment functions for “stabilizing renewable energy” as well as “ensuring power supply diversity.”

Hard-to-Abate sectors

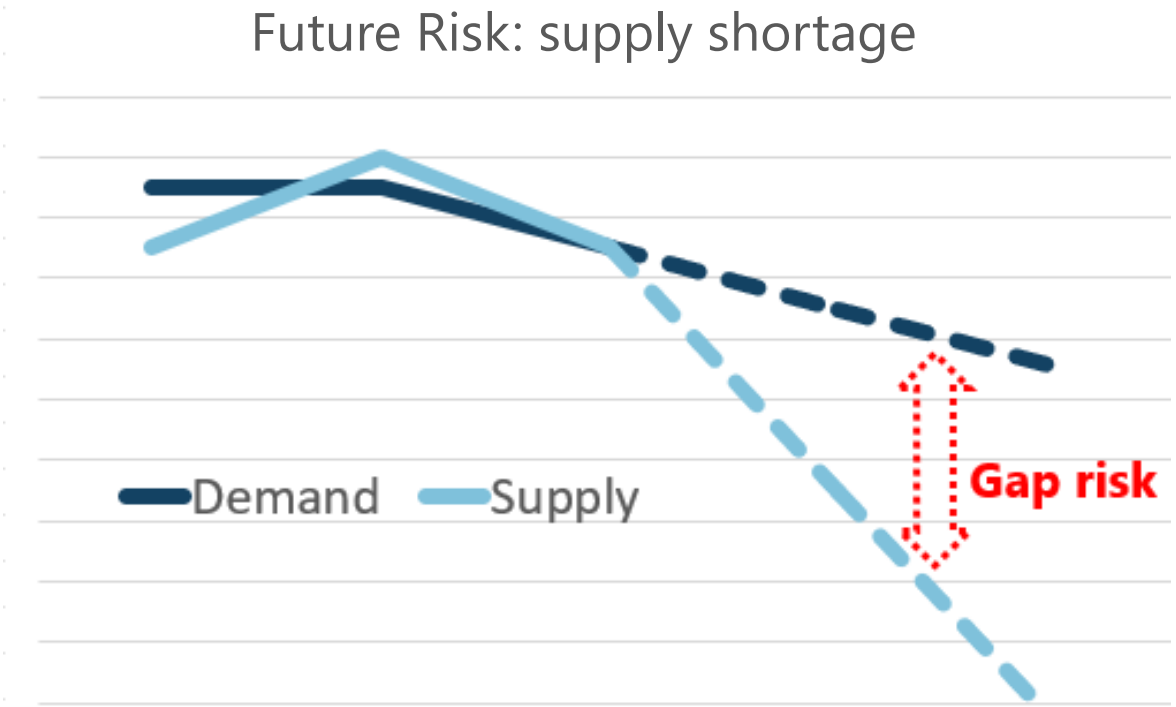


Source: METI

The process heat sector has more technical, cost and system hurdles than electricity sector, and requires a longer transition period to decarbonize.
Coal still has important roles even in 2040, with share around10% of Primary Energy Supply.

How to balance the supply & demand gap: - Coal faces a future of uncertainty

Global progress in environmental measures is expected to reduce coal use over time. However, the complex interplay of decarbonization technologies, commercialization, and economic viability makes accurate forecasting difficult.



- Demand: May decline but not disappear
- Supply: Risk from regulation, policy changes, investment shifts
- Must proactively address and mitigate supply-demand gap risks.

Risk Mitigation Strategy:
-Producer & User collaboration is essential

Producer
(Government & Company)

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Predictability of Policy
- ✓ Clear transition period
- ✓ Ensure sufficient capacity to meet the demand

Promote sustainable mining model
- ✓ Job creation
- ✓ Infrastructure development in the local community

User
(Government & Company)

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Ensuring Procurement
- ✓ Secure off-take guarantees through long term agreement
- ✓ Invest in mine

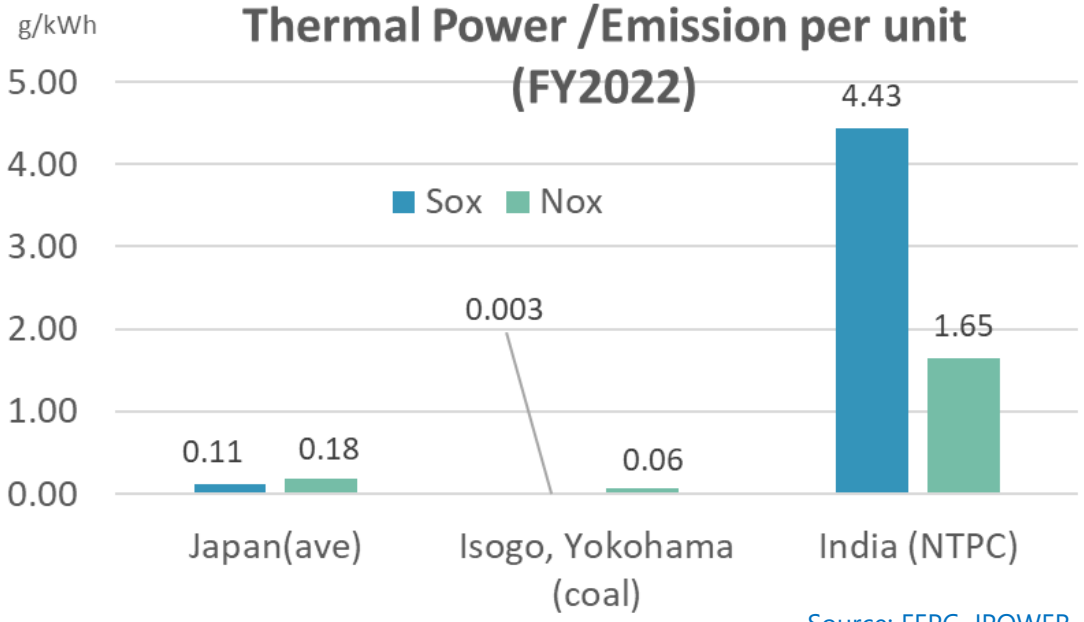
Adequate maintenance of infrastructure
- ✓ Distribution system (coal center)

Emergency supply sharing

World-class environmental management technology for coal power plants

Japan's emissions management

- ✓ In particular, technologies to reduce **SOx, NOx and particulate matter (PM),** which cause photochemical smog and acid rain, have earned a high reputation worldwide.
- ✓ Fuel efficiency improvement technology – Ultra-supercritical pressure unit(USC), Boiler control system, etc.



Source: FEPC, JPOWER, NTPC(India)

Necessary support

- ✓ Develop technology transfer & education program
- ✓ Design of financing scheme

Co-firing:
- Minimize emission during the Transition

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%.

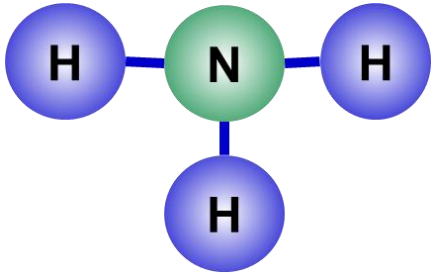
Fluidized-bed boiler

Co-fired

Biomass

Pulverized boiler

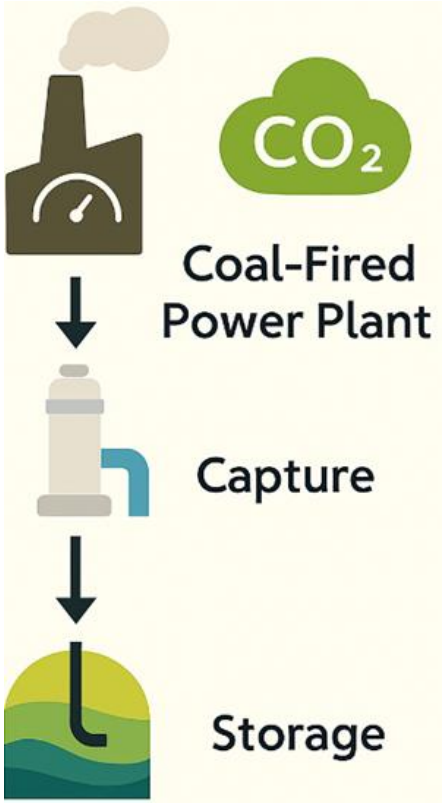
Co-fired



Ammonia

Source: CSIRO

CCS:
-An important role in the decarbonization



Advantage

✓ CCS for coal fired power plant may be efficient because of its high CO_2 density in the emitted gas.

Challenge

✓ CCS for coal fired power plant requires large volume of CO_2 capture and storage.

Summary:
-Rethinking the Role of Coal in the Energy Transition

■ **Coal is not disappearing — Evolving role.**
- ✓ Power demand growth
- ✓ Hard to abate sectors
- ✓ Enhance energy security

■ **We must manage supply/demand gap risks and develop realistic solutions.**

Actions needed: "COAL Producer-User Conference"

<cf. LNG Producer –Consumer Conference since 2012>

- ✓ Strengthen producer-User cooperation
  - Policy discussion - To manage risk of short & mid-to-long term issues facing future trade volume decline

■ **A balanced transition needs both vision and realism.**
- ✓ Sufficient and affordable energy to support growth of EMDE
- ✓ Prevent air pollution (Sox, Nox & PM)
- ✓ Deploy low carbon clean technologies (Co-firing with Biomass /Ammonia, CCS)