

Energy Outlook Summary for 2023

Global Agenda for G7 Hiroshima Summit
Energy Security, Environment and Economic Efficiency

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Emerging energy landscapes

- **Instability in the global energy markets**
- **Energy security and the role of government**
- **Challenges for climate change policy**
- **Geopolitical tensions and the importance of Asia**
- **Toward the G7 Hiroshima Summit**
- **Japan's "S+3E" challenges in 2023 and beyond**

Instability in the global energy markets

- **Uncertainty over Ukraine crisis and Russian energy**
- **Concerns over gas/LNG crisis?**
- **Supply disruptions in major global energy supply chain**
- **Challenges for power market stability**
- **Negative impacts of higher energy prices**
- **Slowdown in global economy and China factor**
- **Importance of OPEC plus, US Shale, response measures taken by major suppliers**
- **2023 global energy market continues to be volatile**

Energy security and the role of government

- **EU struggles to phase-out Russian energy dependence**
- **Impacts on developing countries and their strategy**
- **US energy policy after the mid-term election**
- **How things are moving by energy source**
 - **Promotion of nuclear power**
 - **Acceleration of RE and EE**
 - **Stable procurement of fossil fuels and gas/LNG investment**
 - **Speed up for hydrogen and innovation**
- **Government involvement increased**
 - **Energy subsidies**
 - **Investment, long-term commitment, nationalization, etc.**
 - **Government hands needed to deal with externalities**
- **Energy security continued to be highlighted**

Challenges for climate change policy

- **Decarbonization remains strategically important**
- **Emerging short-term backlash to decarbonization**
- **Impact of high energy price on lower income societies**
- **Complications for global climate negotiation**
- **Simultaneous pursuit of energy security & climate policy**
- **Pragmatic approach based on the reality as the key**
- **2023 may turns out to be a crossroad**

Geopolitical tensions and the importance of Asia



- **Ukraine crisis and the worsened divide of the world**
- **West vs China-Russia tension & North-South problem**
- **Uncertainties in the Middle East**
- **China after “zero-corona” policy**
- **Rising importance of India and ASEAN**
- **Integration of energy and economic security?**
- **Global geopolitics and the divide as key issue in 2023**

Toward G7 Hiroshima Summit

- **G7 needs to contribute to global interests/stability**
- **Highlight on Japan's leadership**
- **G7 needs to enhance global energy market stability and global energy security**
 - **Secure needed investment in LNG and others for market stabilization**
 - **Prevent "zero-sum game resource competition"**
 - **Cooperation in nuclear, hydrogen, RE and others**
- **To reflect the voice of Asia and producers**
 - **Role of gas/LNG, multi-step transition, Transition Finance, Avoided emission**
 - **Inclusive approach with producers and consumer-producer dialogue**
- **Japan's role to lead G7 to contribute to global interests**
- **G7 Summit, critical occasion to address global agenda**

Japan's "S+3E" challenges in 2023 and beyond



■ Toward achievement of 2030 energy mix target

- Nuclear re-start, life-time extension and new build/replacement
- LNG and fossil fuel security of supply
- Challenges for maximum introduction of RE and EE
- Promotion of innovation: hydrogen, ammonia, CCS/CCUS, etc.
- Realization of GX (Green Transformation) plan

■ Discussion for the next Strategic Energy Plan

- Strategic consideration needed to enhance energy security under the new situation
- Energy policy with due consideration of "limitation of market mechanism"
- Roadmap needed to realize decarbonization and energy security
- Energy policy needs to address innovation and long-term economic growth

■ Japan stands at a crossroads for energy policy in 2023

Reference Materials

■ Seiya Endo

Energy Trend Topics “This Year’s Power Crunch and Issues Related to the 2030 Energy Mix”

The Institute of Energy Economics, Japan website:

<http://eneken.ieej.or.jp/data/10530.pdf>

■ Akira Yanagisawa

“Observations on the Gasoline Subsidy System and its Effect on Retail Prices”

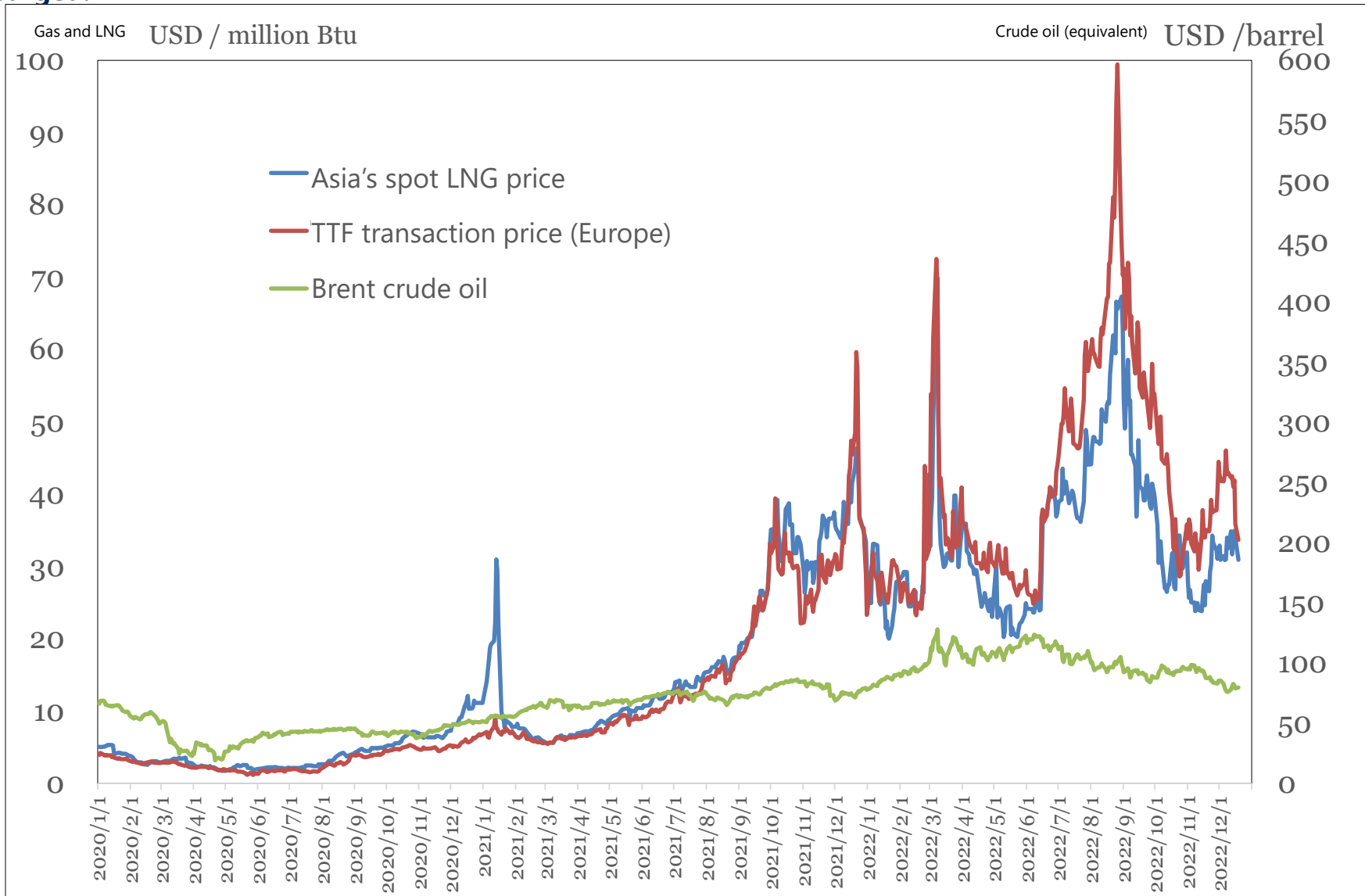
The Institute of Energy Economics, Japan website:

<http://eneken.ieej.or.jp/data/10602.pdf>



Crude oil prices and natural gas/LNG spot prices

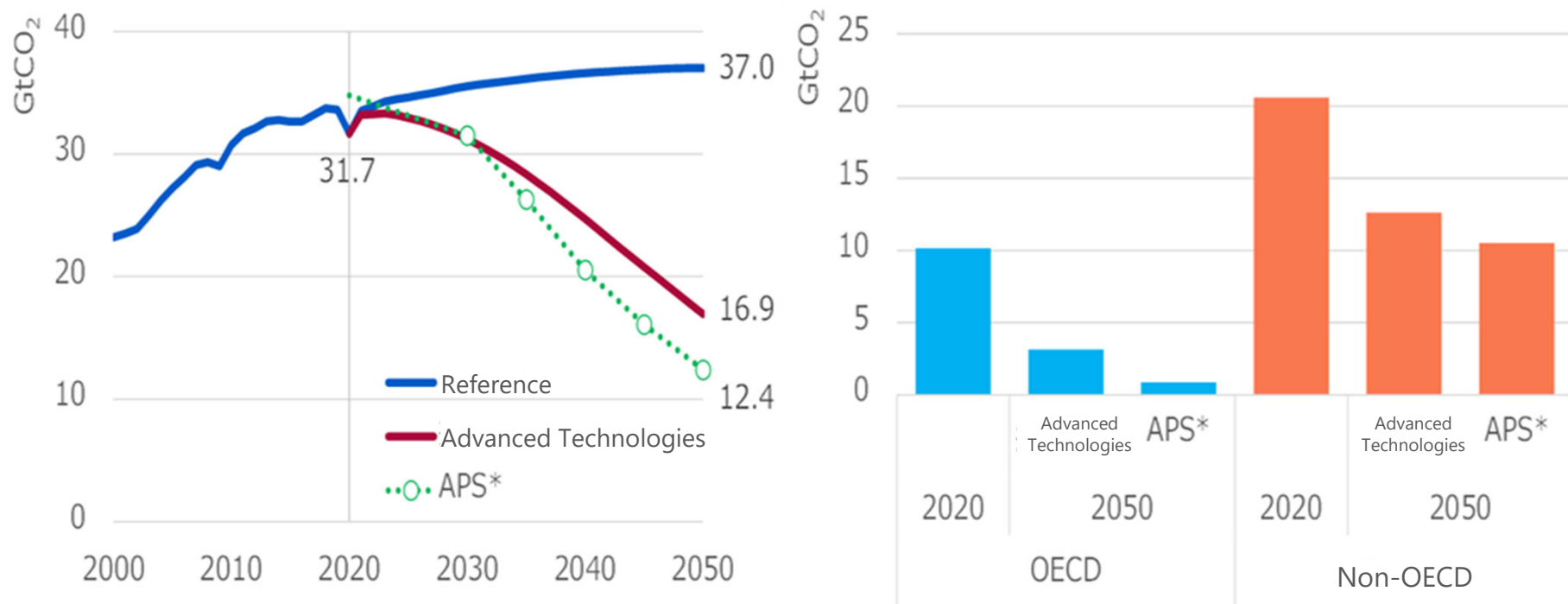
Gas prices in Europe temporarily soared by about \$600 per barrel in crude oil equivalent. Spot prices of LNG in Asia also surged.



Prepared by IEEJ based on a variety of sources

Global CO₂ emission forecast by IEEJ Outlook 2023

- IEEJ Outlook is a forecast-type analysis based on a set of assumptions
- Contrasts with target-driven, backcast-type analyses such as the IEA decarbonization scenarios
- According to the IEEJ's Advanced Technologies Scenario, CO₂ emissions will be reduced by half, but it remains far from zero
- Emission reductions in developing countries are key

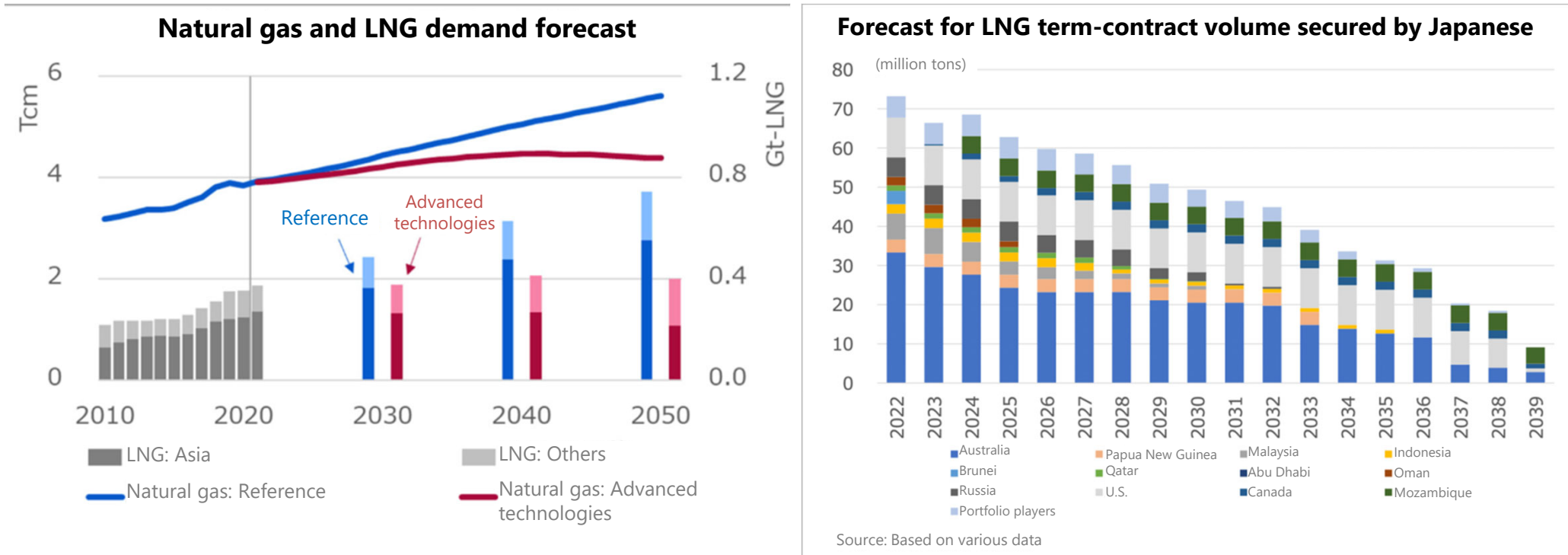


Note: APS stands for Announced Pledge Scenario, which is one of the IEA's scenarios. Figures are based on "IEA World Energy Outlook 2022".

Source: IEEJ Outlook 2023, Institute of Energy Economics, Japan, October 2022.

Global gas and LNG demand and Japan's long-term LNG contracts

- Demand for natural gas and LNG is expected to increase steadily
- Securing sufficient investment to cover demand will be important
- Worldwide there is a trend to focus on long-term contracts, but in Japan long-term contracts are decreasing; this poses an issue for stable procurement in the future

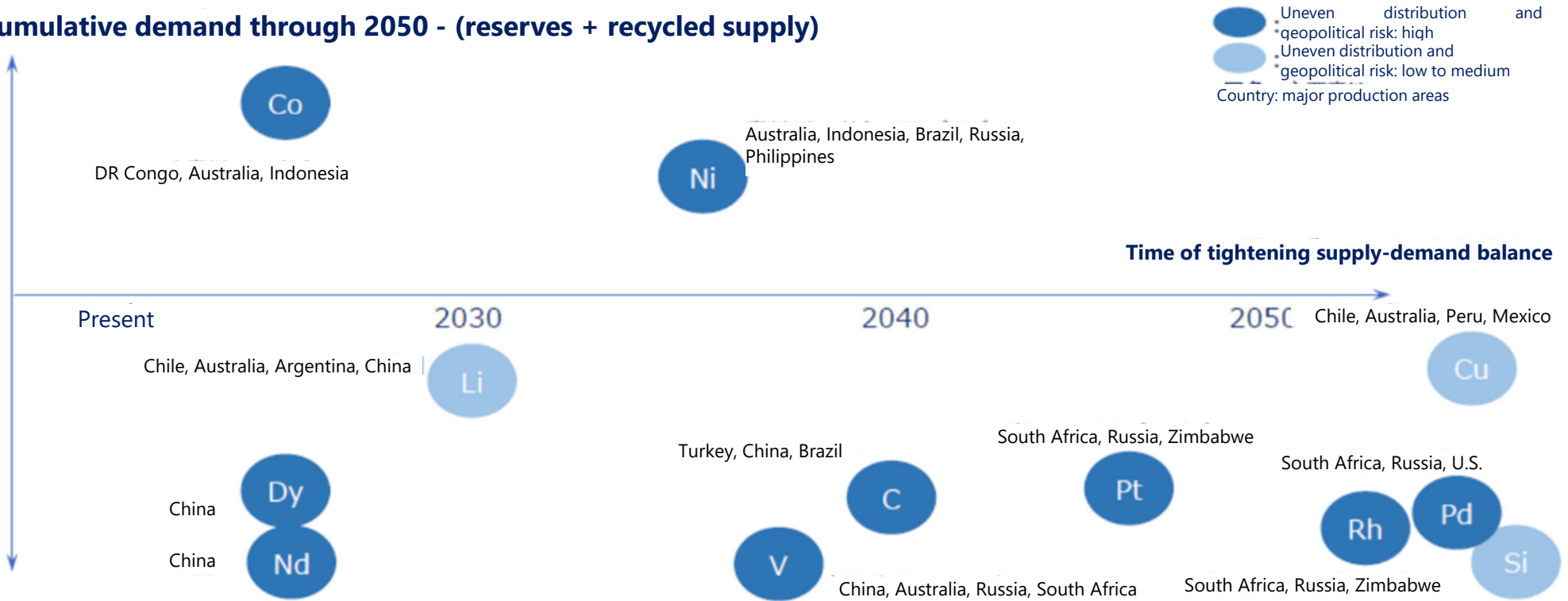


Source: IEEJ Outlook 2023, Institute of Energy Economics, Japan, October 2022.

Critical minerals: supply-demand strains and uneven distribution

- Cobalt, dysprosium, neodymium, etc. experienced a supply-demand strains relatively early, and their distribution is uneven.
- Similar trends will be seen in many minerals over the long term.

Cumulative demand through 2050 - (reserves + recycled supply)

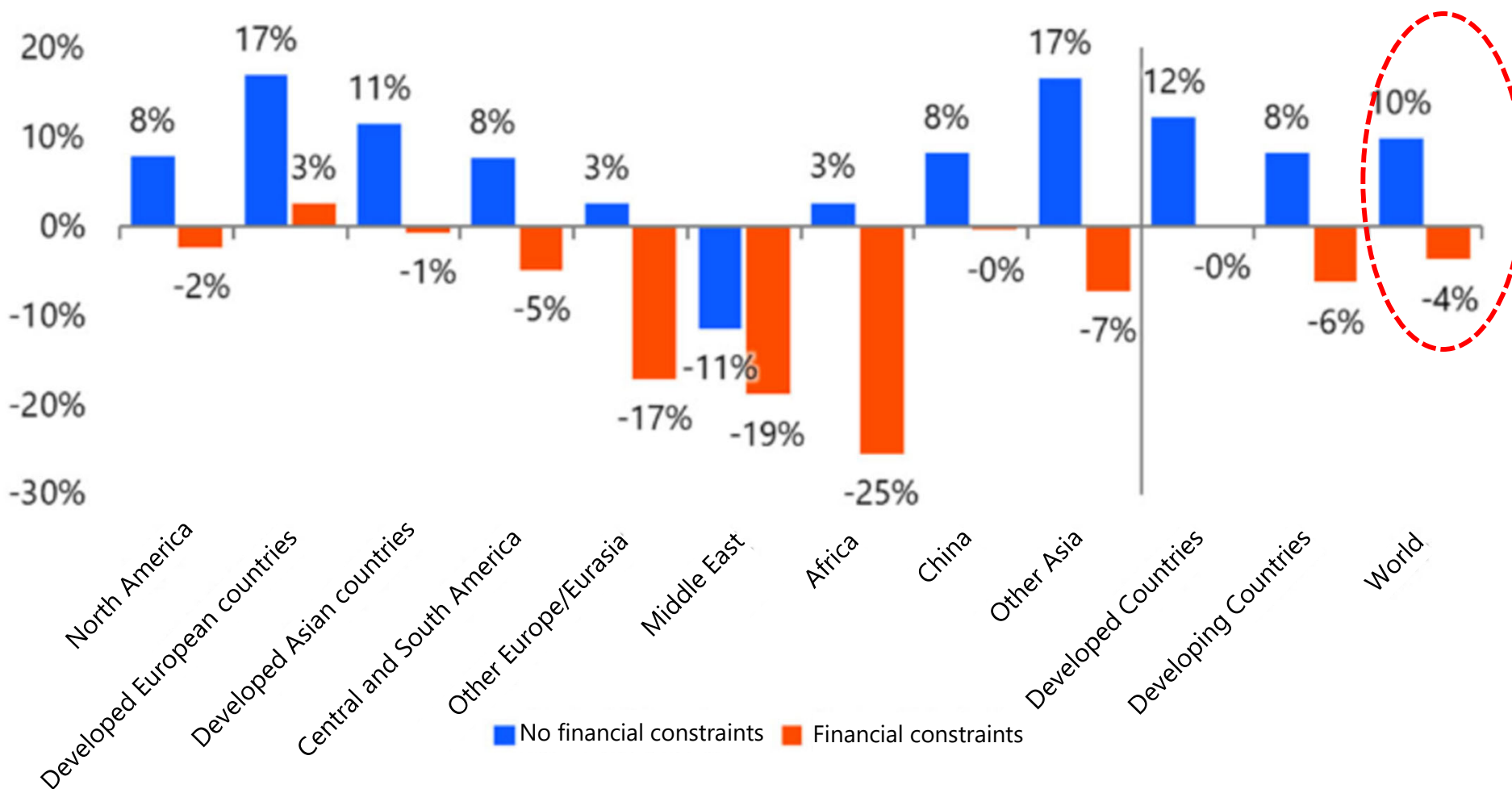


Note: Cu (copper), Li (lithium), Si (silicon), Ni (nickel), Co (cobalt), C (graphite), Pt (platinum), Pd (palladium), Rh (rhodium), Nd (neodymium), Dy (dysprosium), V (vanadium)

Comparison of scenarios for increasing the amount of production through green investment, by region

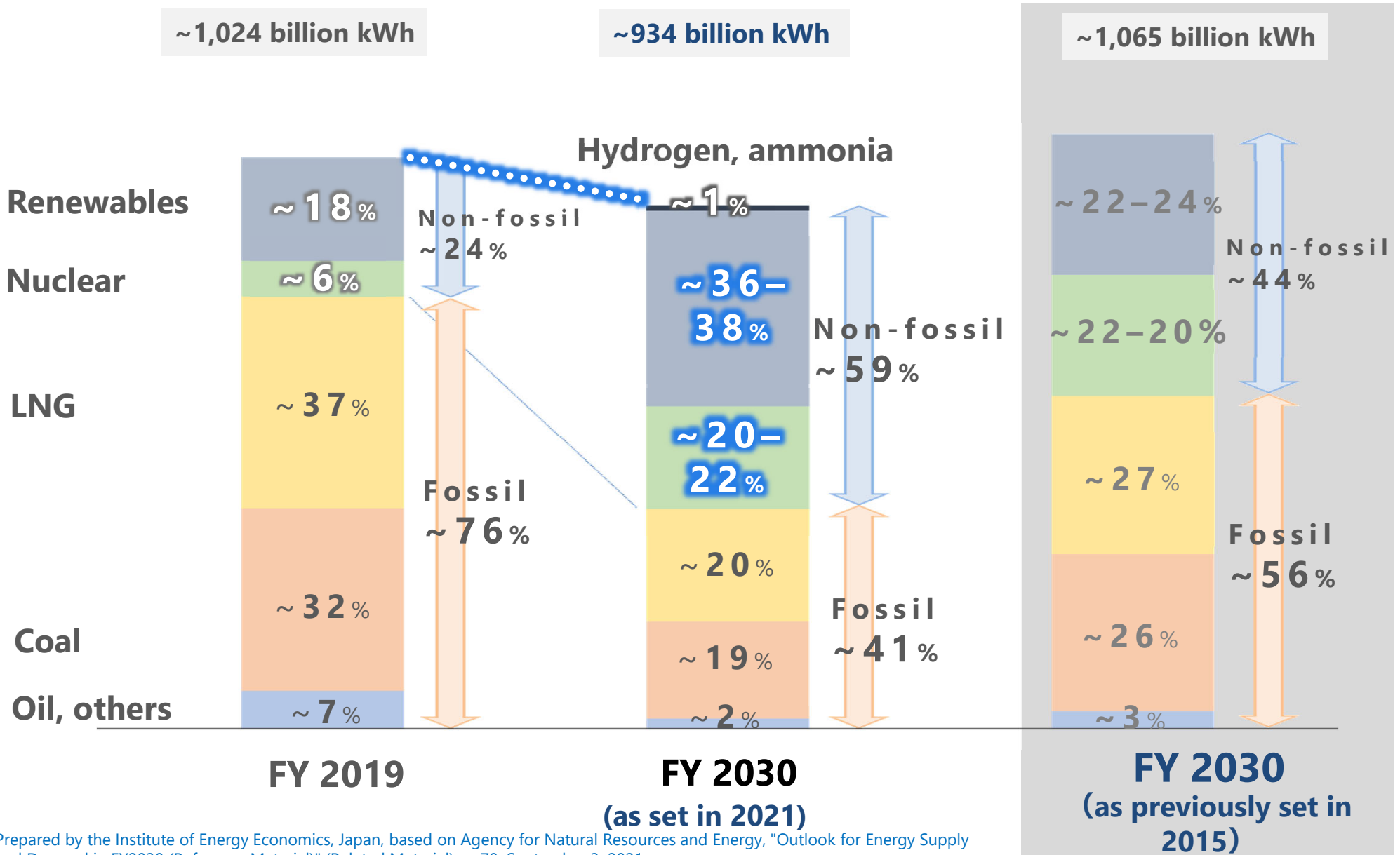
Financial constraints lead to net decreases in production; regional differences also increase

Rate of change in production amount (by region, relative to Reference) [2050]



Source: IEEJ Outlook 2023, Institute of Energy Economics, Japan, October 2022.

Strategic Energy Plan Energy Mix (Comparison with previous and current targets)



Prepared by the Institute of Energy Economics, Japan, based on Agency for Natural Resources and Energy, "Outlook for Energy Supply and Demand in FY2030 (Reference Material)" (Related Material), p. 70. September 3, 2021.

Source: Tatsuya Terazawa, Institute of Energy Economics, Japan. June 2022.

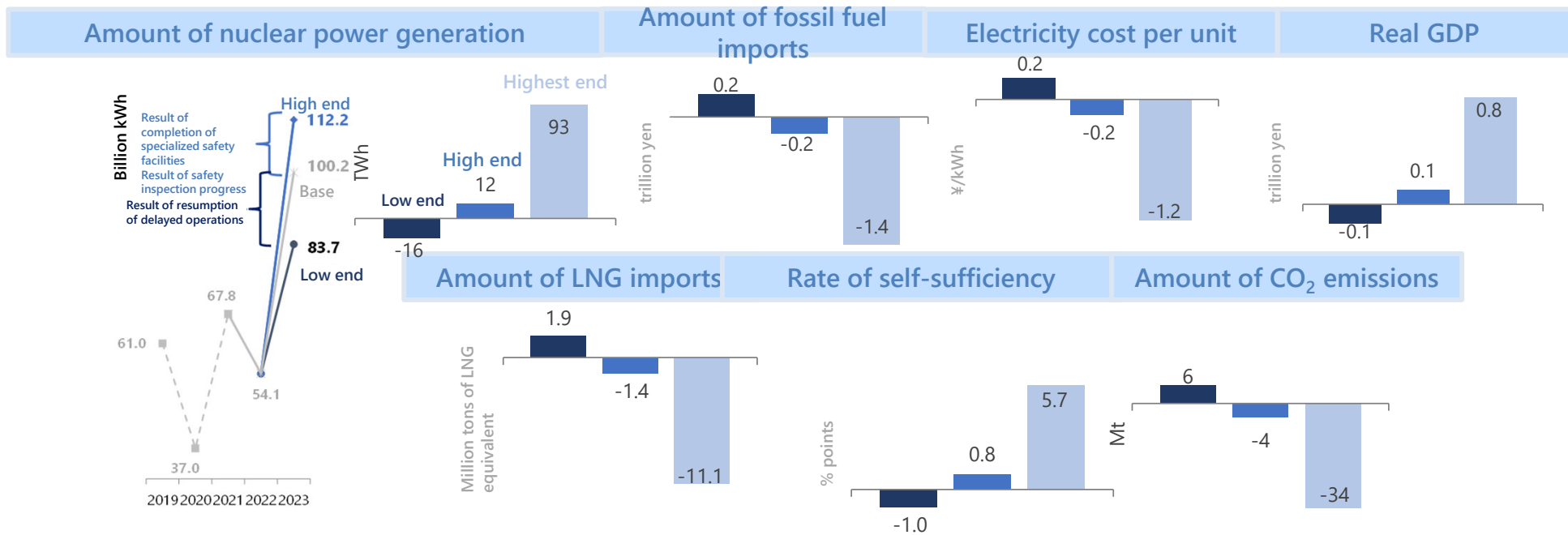


Impact on 3E caused by delays in completion of specialized safety facilities designed to respond to nuclear accidents and restarting of nuclear power plants

Nuclear power will boost the economy through savings in fossil fuel imports and electricity costs. LNG imports will decline and energy security will be enhanced through improved self-sufficiency. CO₂ emissions will also be reduced, contributing to climate change countermeasures.

The government has confirmed its policy of aiming to restart seven additional plants from next summer. In order for Japan to achieve its 3E goals, it's important to facilitate the restarting of operations through appropriate inspections according to the circumstances of each individual plant.

Impact of amount of nuclear power generation (compared to base scenario) [FY 2023]



Note) High end: In this case, the construction of specialized safety facilities, which had been delayed, will be completed in FY 2023. This will result in the restarting of two plants as well as additional plant, which will be restarted following the progress of its inspection.
 Low-end: In this case, three plants that were scheduled to be newly restarted in FY 2023 will not be restarted due to the risk of prolonged inspections, construction work, etc.
 Highest end: In this case, the 27 plants that have applied for the review and inspection for checking conformity to New Regulatory Requirements will operate at 80% facility usage.

Source: Ryo Eto, "Economic and Energy Outlook of Japan for FY2023," Institute of Energy Economics, Japan. December 2022.