METI
Ministry of Economy, Trade and Industry

Japan's Support for Energy Transitions in Asia

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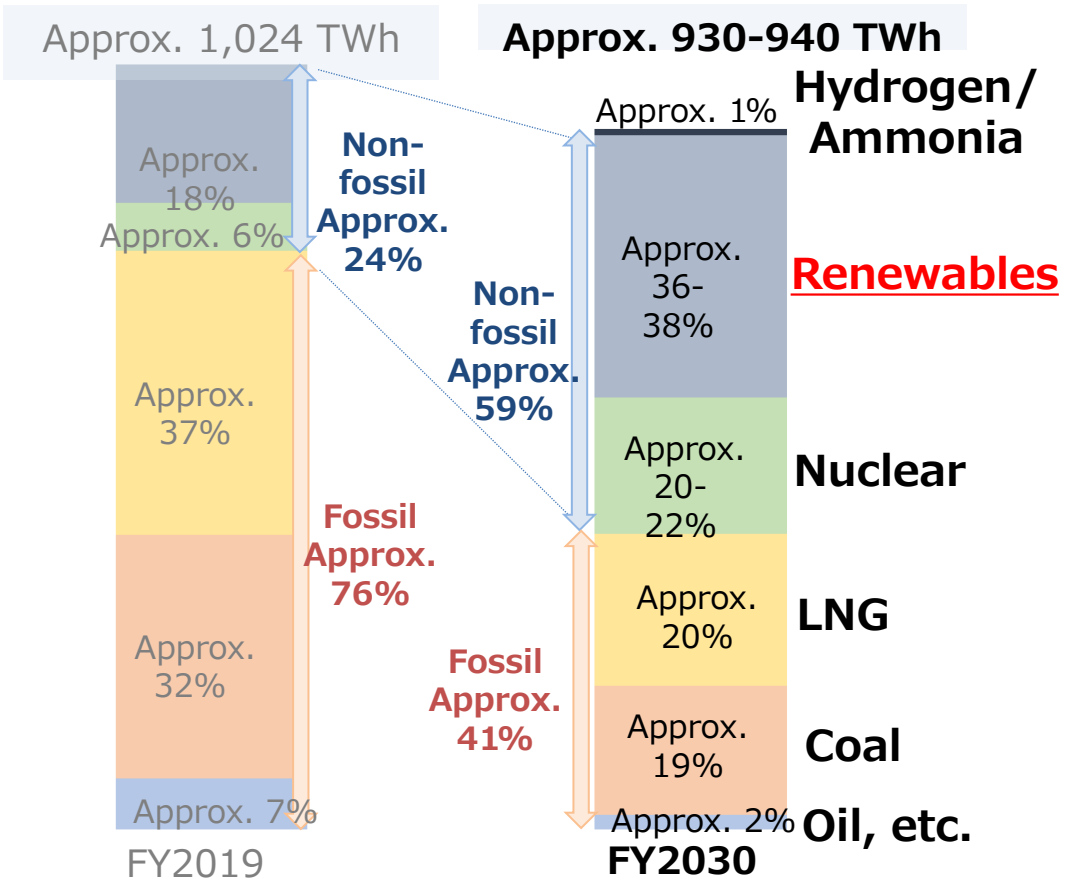
The 6th Strategic Energy Plan -Policy responses for 2030-

- Features of 2030 Electricity Mix: Maximizing deployment of renewables and energy conservation efforts.
- Accelerate restart of reactors, with safety as top priority and prerequisites.
- Start introducing zero emission thermal technologies at commercial level.

Power generation mix



- **Maximum introduction of renewables as primary power sources**.
- **Further pursuit of thorough energy efficiency**
- **Restart of nuclear power plants with safety as a top priority**.
- On the major premise of **ensuring energy security**, **thermal power** in the electricity mix **will be lowered as much as possible.**
- **Innovation** in the thermal power by means of **hydrogen /ammonia - fired power generation and CCUS/Carbon Recycling** will be pursued.

Renewables Need Sizable, Preferably Flat and Dry Land Areas

Nuclear power plant
1 GW class
(about 0.6km^2)

Solar power
The area of the Yamanote Line
(about 58km^2)

Wind power generation
3.4 times that of solar power
(about 214km^2)

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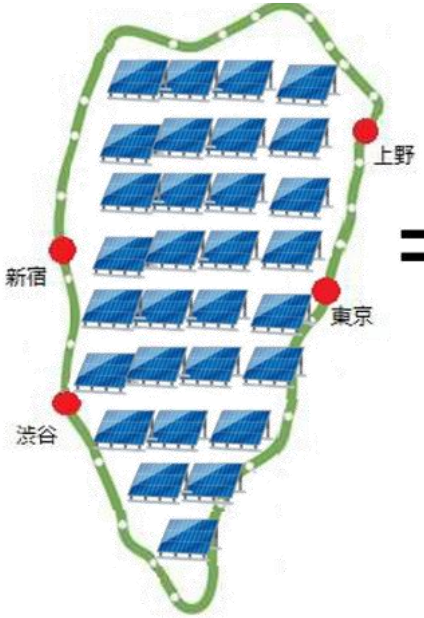

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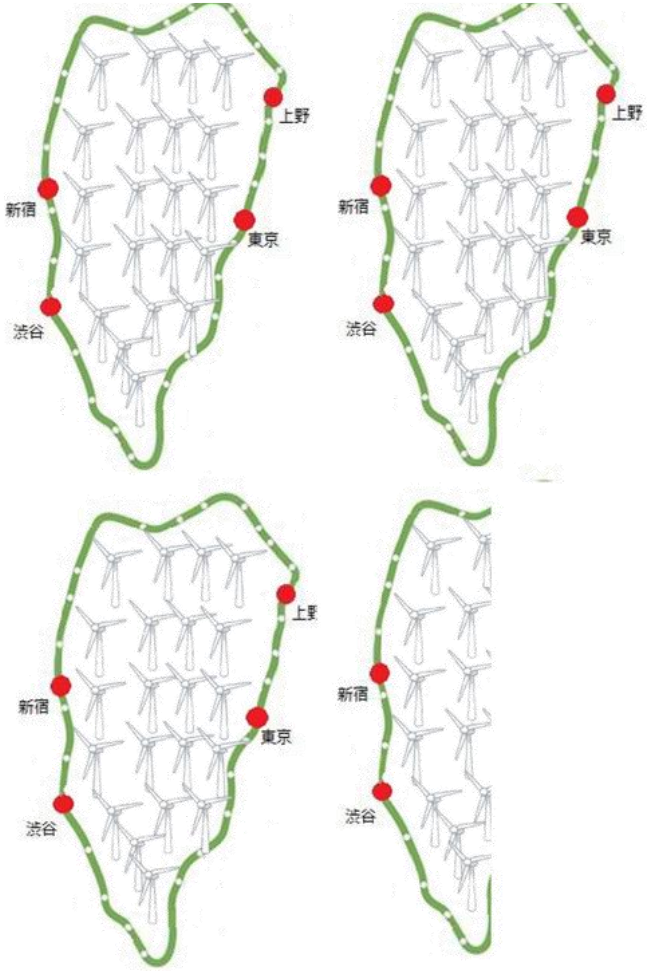
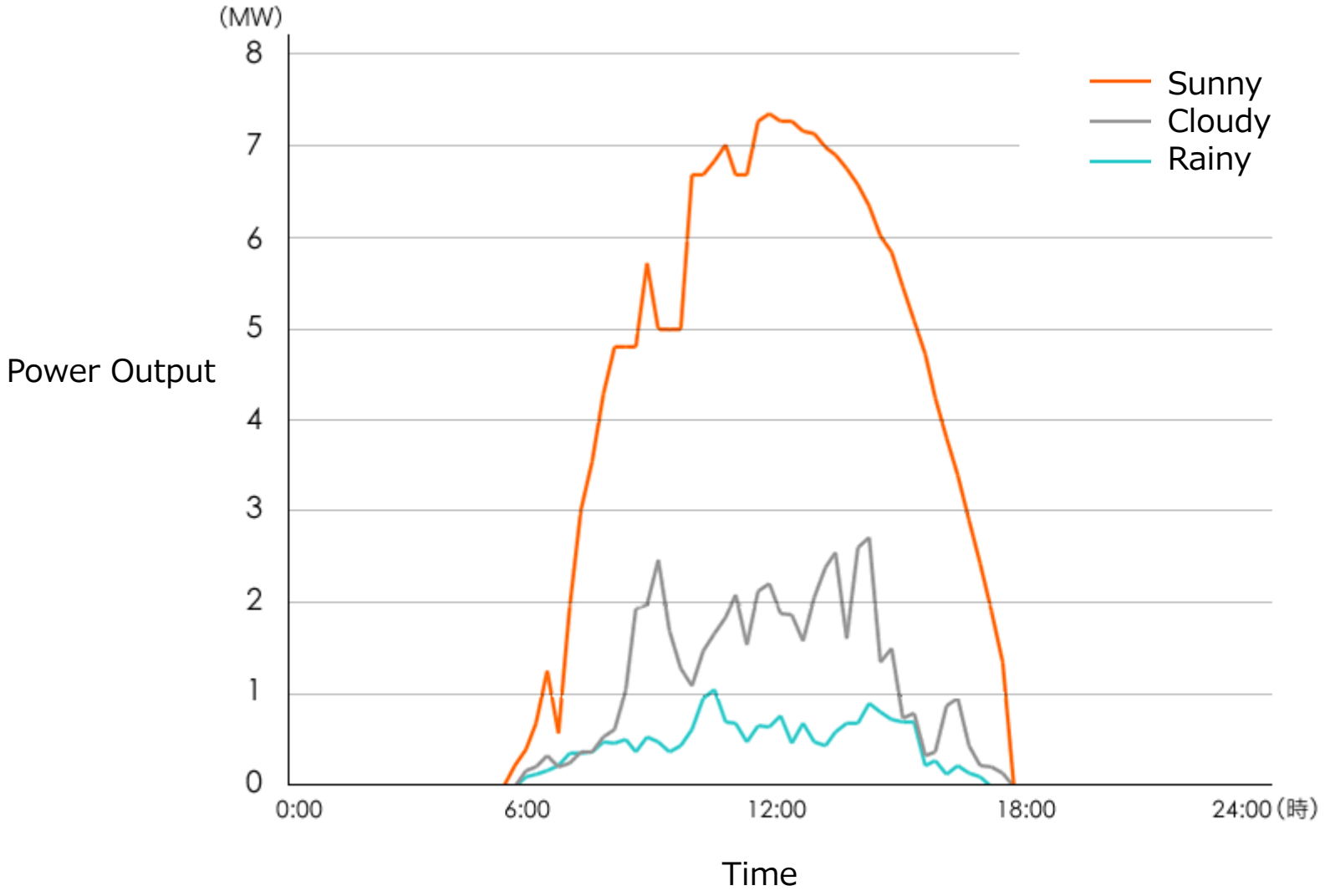


*Note that solar and wind power generation does not generate electricity when there is no wind in cloudy weather.

Key challenges for renewables expansion

① Intermittency	➢ Solar and wind are intermittent in nature and need adjustable electricity sources to keep balance between demand and supply of electricity. Currently, thermal power plants and pumped-storages are the major backup sources. ➢ **Lack of adjustable electricity sources will prevent expansion of renewables, while power companies are increasingly reluctant to keep idle thermal PPs.** ➢ Decarbonation of thermal power plants (hydrogen, batteries, Thermal with CCUS/Carbon Recycle, biomass, demand response, etc.) needs to be pursued.
② Securing Grid Capacity	➢ **Long distance between areas with renewable potential (e.g. Hokkaido) and electricity demand areas (e.g. Tokyo) increases the transmission costs.** ➢ Examining measures to enhance grid connections with relevant cost-benefit analysis is important.
③ Securing Grid Stability (Inertia)	➢ **Intermittent renewables do not provide inertia, which makes grid system vulnerable to accidents of power plants and increases blackout risks.** ➢ Developing technologies to provide artificial inertia and their smooth deployment is important.
④ Geographical and social constraints	➢ **Japan has limited land and sea areas compared to its electricity demands.** Farmlands and fishery areas are important for Japan's economy and societies. ➢ **Coordination with various stakeholders is essential to expand renewable energy deployment.**
⑤ Cost acceptance	➢ Large investment is needed to expand renewables, as the availability of land areas becomes constraints. ➢ **How to digest increasing costs and risks associated with the expansion of renewables is a big challenge for Japan.**

PV doesn’t produce electricity on a rainy day

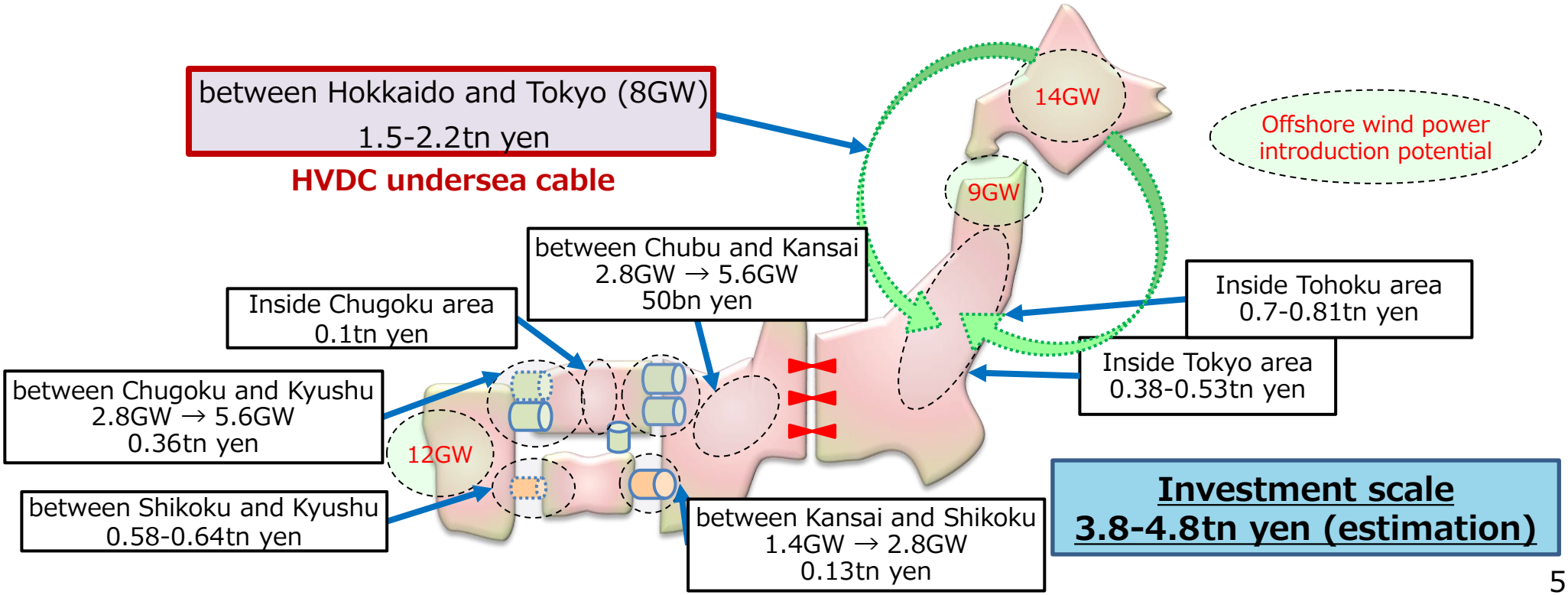


a Solar Taketoyo, Operated byChubu Electric Power Co.

Upgrading grids and their connection is under planning

- **The core grid systems** such as core-regional interconnection lines, etc. will be **upgraded by the master plan in "push-type approach"**
- **Japanese "Connect & Manage" (non-firm access will be extended to local grid networks.**; **The rules for use of power grids** will be reviewed so that renewable energy can use the grid transmission systems preferentially over coal-fired power, etc.)

Outline of the first draft of the Master-plan



Different Approaches towards Carbon Neutrality

- All countries need to accelerate their efforts to aim for Carbon Neutrality.
- Although the goal (=CN) is the same, there are various transition pathways, and a country must find realistic and well-tailored pathways in accordance with its situations.
- Combination of early CFP retirement and accelerated deployment of renewables could be costly for many Asian countries.
- Asia needs to examine various pathways, be open to all technologies and energy sources, create innovations and cooperate and engage each other to pursue CN.

Situations in Europe

- Rich in renewable resources
- Wide and well-connected grid networks
- CFPs are old and disposable
- Abundant cheap gas supply by pipeline
- Nuclear is available
- Flat electricity demand

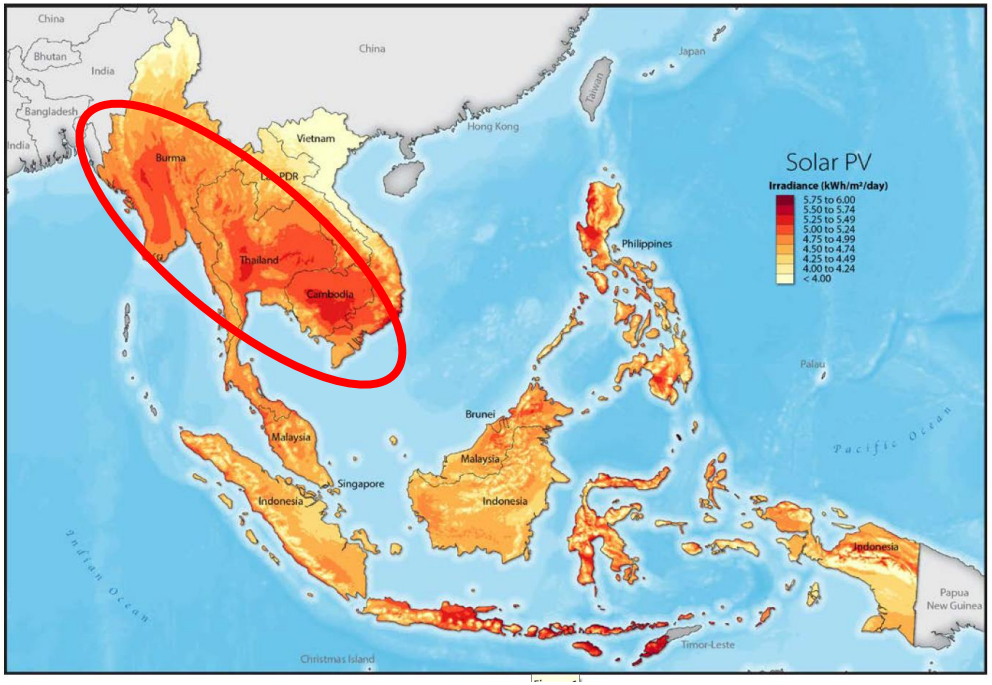
Situations in Asia

- Limitation in commercially-viable renewables
- Small grid size with limited interconnection
- CFPs are mostly new and not yet depreciated
- Depleting gas reserves
- Nuclear is not available for many countries
- Rapidly growing electricity demand

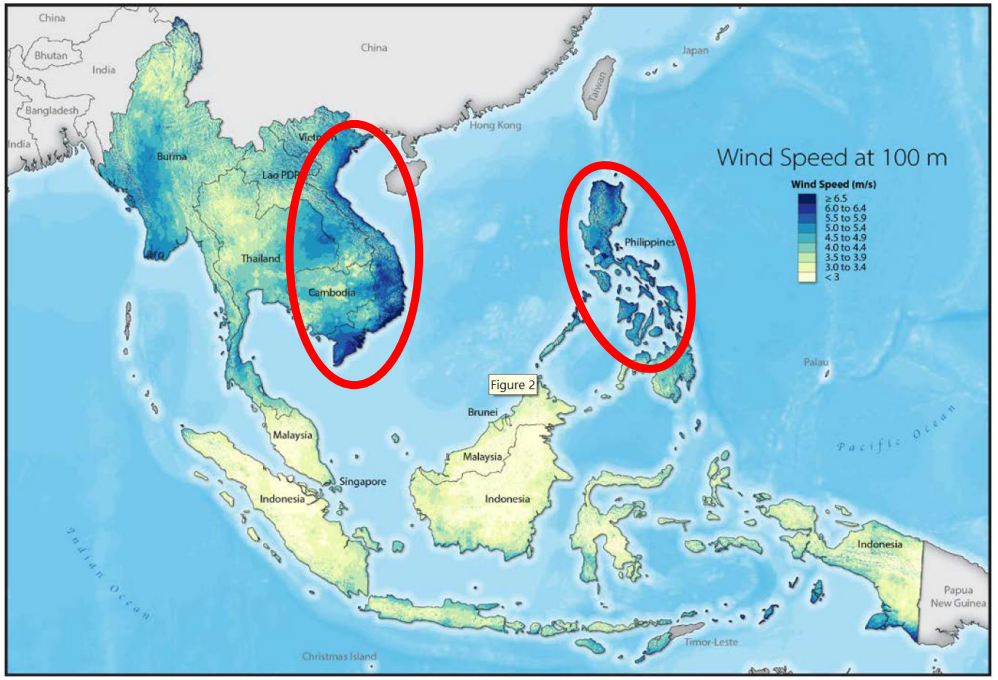
Renewables are ubiquitous but commercially viable ones are not

- Flat arid land areas are suitable for mega-solar projects.
- Wind is weak and unstable near the equator.
- Grid upgrading is needed before deploying intermittent renewables at scale.
- Backups are expensive, whether batteries or gas fired power plants.

<Solar resource potentials in ASEAN>



<Wind resource potentials in ASEAN>



Source: Lee Nathan et al.(2020), EXPLORING RENEWABLE ENERGY OPPORTUNITIES IN SELECT SOUTHEAST ASIAN COUNTRIES

Prospect of Indonesia's Power Demand (～2035)

Total supply in 2035:613TWh, if power demand continuously grow at 5% annually.

RE & LNG:249TWh
→ +185TWh from 2019
→ **+132TWh from 2030**

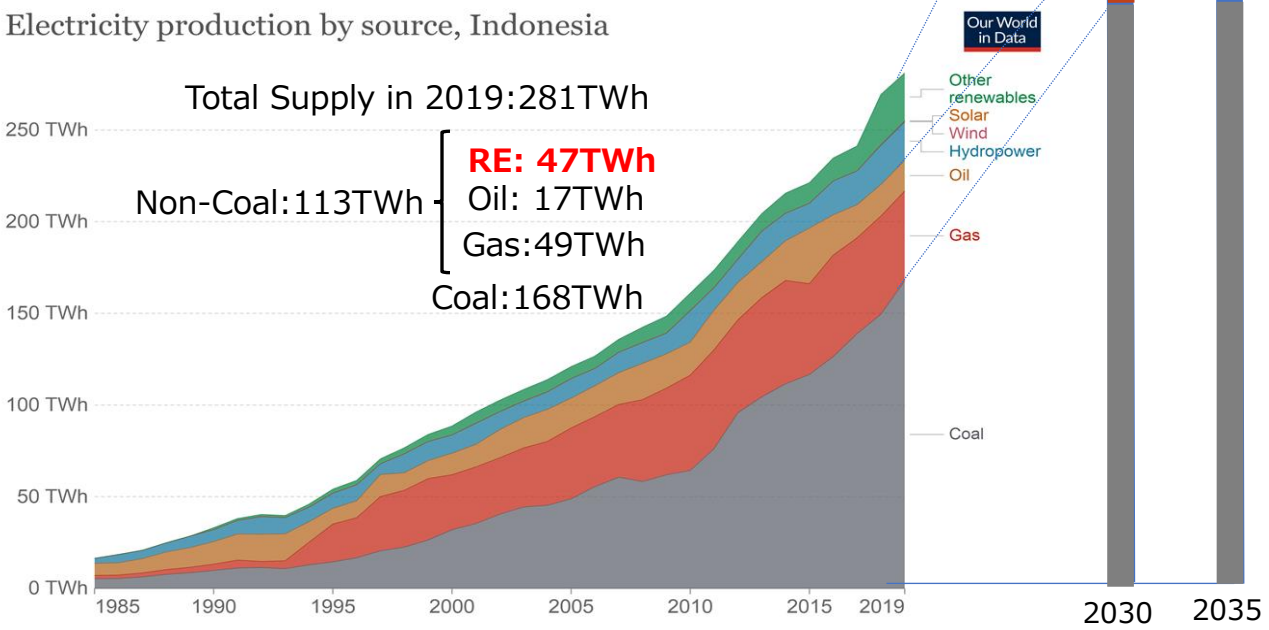
Total supply in 2030:481TWh, if power demand continuously grow at 5% annually.

RE & LNG in 2030:117TWh
→ **+70TWh from 2019**

Gas:49TWh, same as 2019

Coal & Gas:364TWh
→ +147TWh from 2019

Coal: 315TWh, if all currently planned CFP (48GW in total) and existing CFP are operated with 75% capacity utilization ratio.



Source: Our World in Data based on BP Statistical Review of World Energy, Ember Global Electricity Review (2022) & Ember European Electricity Review (2022)

Asia Energy Transition Initiative (AETI)

- "**Asia Energy Transition Initiative (AETI)**" includes a variety of support for the realisation of various and pragmatic energy transitions in Asia.

1. Support for formulating energy transition roadmaps

- Economic Research Institute for ASEAN and East Asia (ERIA) and the Institute of Energy Economics Japan (IEEJ)'s support

2. Presentation and promotion of the concept of Asia Transition Finance

- Asia Transition Finance Study Group (ATFSG)

3. US$10 billion financial support for various projects

- (e.g.) Renewable Energy, Energy Efficiency, LNG, CCUS etc.

4. Technology development and deployment, utilizing the achievement of "Green Innovation Fund"

- (e.g.) Offshore wind, Fuel-ammonia, Hydrogen etc.

5. Human resource development, knowledge sharing and rule-making on decarbonisation technologies

- Capacity building of decarbonisation technologies for 1,000 people in Asian countries
- Asia CCUS network

Prime Minister Fumio Kishida announced Japan aims for Asia Zero Emissions Community

Policy Speech by PM to the 208th Session of the Diet, Jan. 17, 2022 (Exertion)

- One more important point is that Japan will make use of its technologies, systems and know-how in hydrogen and ammonia and other areas to contribute to the decarbonization of the world, especially Asia, and lead the world in technical standards and international infrastructure development, together with the countries of Asia.
- We aim to join forces with like-minded countries in Asia in creating something that can be called the "Asia Zero Emissions Community."

Speech by PM at "Davos Agenda", Jan. 18, 2022 (Exertion)

- I am also aware that many Asian countries have energy structures that are similar to Japan. Just as the European Union started as the European Coal and Steel Community during the Cold War, Japan envisions an "Asia Zero Emissions Community" in Asia where both geopolitical and geo-economic challenges are intensifying. This community would become a platform to advance efforts such as international joint investment on development of zero-emission technologies and hydrogen infrastructure, joint financing, standardization of related technologies, and establishment of an Asian emissions trading market.

Where the $10 billion Financial Support

- Clean technologies, both existing and created by by the 2 trillion-yen Green Innovation Fund could support Indonesia to overcome the challenges to pursue CN in 2060.

Renewable energy/ Energy efficiency

- O&M technologies related to grid stability (Supply-side).
- Grid enhancement / grid management technology including storage batteries.
- Energy efficiency in industrial /transportation sector, and buildings.

Storage battery for grid stability

DX in transportation sector

LNG

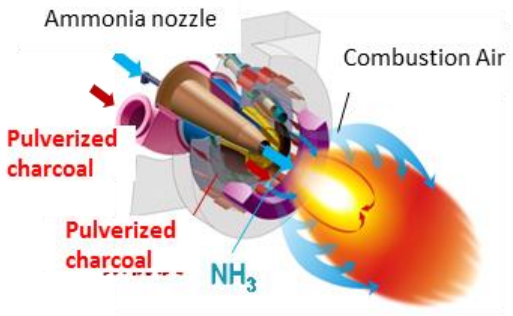
- Upgrading gas fire power plants and introducing LNG.

Gas turbine

LNG Ship (ref.) KHI

Hydrogen/Ammonia/ Biomass

- Co-firing or full-combustion of ammonia/hydrogen/biomass.



CCUS

- CCS/CCU (Carbon recycling)