# JAPAN NRG WEEKLY

**FEB. 6, 2023**



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Feb. 6, 2023

## NEWS

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- Wind farms are legal in Japan's EEZ offshore area, says state panel while adding other key details for sector
- METI to publish guidelines for supply chain carbon footprint measurements

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- Global lithium titanium oxide battery market to surge to 2031

## ANALYSIS

### SYNTHETIC METHANE CAN HELP WITH STABLE ENERGY SUPPLY, BUT COSTS MUST FALL FURTHER

In November 2022, "e-methane" debuted at the Japan Gas Association with much fanfare. Amid all the excitement, the JGA even provided an "e-methane" logo to certify companies in the recycled carbon value chain, but that move was premature. No company has a timetable to commercialize synthetic methane. To understand its potential and challenges, *Japan NRG* spoke to leading companies in the industry.

### A SMALL SOLUTION FOR A BIG PROBLEM: RESOLVING JAPAN'S GRID CONGESTION

As Japan plans more solar and wind capacity, attention is focusing on grid solutions to help accommodate the intermittency of some renewables. The big-picture vision in a recently released draft of the Power System Master Plan for 2050 calls for as much as ¥7 trillion in investments. There are solutions, however, that could bolster renewables without an entire system rebuild. One utilizes the same thing that generates solar and wind power in the first place: the weather.

## GLOBAL VIEW

A wrap of top energy news from around the world.

## EVENTS SCHEDULE

A selection of events to keep an eye on in 2023.

# JAPAN NRG WEEKLY



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OFTEN USED ACRONYMS

| | | | | |
|---|---|---|---|---|
| METI | The Ministry of Energy, Trade and Industry | | mmbtu | Million British Thermal Units |
| MOE | Ministry of Environment | | mb/d | Million barrels per day |
| ANRE | Agency for Natural Resources and Energy | | mtoe | Million Tons of Oil Equivalent |
| NEDO | New Energy and Industrial Technology Development Organization | | kWh | Kilowatt hours (electricity generation volume) |
| TEPCO | Tokyo Electric Power Company | | FIT | Feed-in Tariff |
| KEPCO | Kansai Electric Power Company | | FIP | Feed-in Premium |
| EPCO | Electric Power Company | | SAF | Sustainable Aviation Fuel |
| JCC | Japan Crude Cocktail | | NPP | Nuclear power plant |
| JKM | Japan Korea Market, the Platt's LNG benchmark | | JOGMEC | Japan Organization for Metals and Energy Security |
| CCUS | Carbon Capture, Utilization and Storage | | | |
| OCCTO | Organization for Cross-regional Coordination of Transmission Operators | | | |
| NRA | Nuclear Regulation Authority | | | |
| GX | Green Transformation | | | |

# NEWS: ENERGY TRANSITION & POLICY

## METI publishes outline of centralized offshore wind survey system

(Japan NRG, Jan. 30)

- METI proposed an outline of the centralized offshore wind survey system, aiming to improve efficiency of project surveys and assessments.
- Some surveys and data collection overlapped among groups planning to participate in the same auction.
- The centralized system covers: 1) identifying project areas and soliciting project auction participations, 2) coordination with regional stakeholders, 3) JOGMEC to conduct wind, weather and seafloor surveys of sites, 4) METI to secure network connection bandwidth, 5) environmental impact assessment and 6) fishery impact surveys.
- CONTEXT: *Until 2022, NEDO did basic weather and seafloor surveys, but now JOGMEC will conduct more elaborate studies tailored to project requirements. The first survey will be made this year at Ganwu-Minami Shiribeshi, Shimasaki, and Hiyama coastal zones in Hokkaido.*

- TAKEAWAY: The MoE also launched an effort to revise the Environmental Assessment Act in a bid to make the reporting process more efficient. MoE, however, has not set timelines for writing the proposed amendments as any changes are certain to spark hot debates.

- SIDE DEVELOPMENT:
  State panel publishes analysis of legal issues for offshore wind in the EEZ
  (Japan NRG, Jan. 31)
  - A group of scholars advising the Cabinet released an analysis of international legal issues regarding offshore wind installations in the EEZ.
  - The panel concluded that installations are structures and facilities, although in the past floating installations have been categorized as vessels. The panel based its analysis on the definitions in the UN Convention on the Law of the Sea (UNCLOS).
  - UNCLOS also mandates the rights of countries to operate installations, but prevents them from blocking the free travel of vessels.
  - The 60th UNCLOS article defines the safety zones around offshore installations, which are limited to an area 500 meters from an installation.
  - The government needs to clarify what items are needed to notify neighboring countries, and what would not require notification under UNCLOS rules, the panel noted.
  - CONTEXT: *The panel, headed by professor Kisugi Shin of Yokohama National University, was formed in October last year, to advise the Cabinet secretariat, MLIT, ANRE, Ministry of Foreign Affairs and the MoE.*
- SIDE DEVELOPMENT:
  Wind farms are legal in the EEZ 370 km offshore, says state panel
  (Nikkei, Jan. 31)
  - An expert state panel for offshore wind farm policy said the building of wind farms in Japan's exclusive economic zone (EEZ) is allowed under international law.

- While Japanese law currently limits wind farms to territorial waters (22 km offshore), the government will consider whether this rule should be amended.
- Japan's EEZ extends 370 km from shore.

## METI to publish guidelines for supply chain carbon footprint measurements

(Japan NRG, Jan. 31)

- In February, METI plans to invite public feedback for its proposed guidelines for measuring carbon footprints throughout supply chains, to complement international standards. The feedback period will run for two weeks.
- The guidelines spell out rules for comparing carbon footprints of competing products and encourage use of primary data.
- The guidelines will be officially released in March.

- TAKEAWAY: Industrial associations are expected to set carbon boundaries of products within their supply chains, which won't be rigidly defined in the new guidelines. The associations have other heavy tasks such as making sure definitions of components and raw materials are uniform throughout the supply chains.

## ANRE modifies 2023-2027 bioethanol plan details following public feedback

(Japan NRG, Feb. 1)

- ANRE has modified figures and wording in the 2023-2027 national green energy goals that were set as required by the Act of Advancement of Energy Supply Structures. The issue was open for public input until Jan 27.
- After re-calculations, life cycle GHG figures of U.S. corn-derived ethanol changed to 36.86g CO2/ MJ from 37.10g/ MJ, and Brazilian sugar cane-derived ethanol to 28.59g/ MJ from 28.56g/ MJ.
- ANRE will keep the annual bioethanol consumption goal at 0.5 million kiloliters crude equivalent since its strategy is to improve energy security by developing local resources.

## Japan requires local governments to allow search for final repository for spent nuclear fuel

(Jiji, Feb. 2)

- The government will revise its basic policy on the final disposal of high-level radioactive waste (nuclear waste) generated from spent fuel from nuclear power plants.
- The government will ask municipal bodies to allow searches by The Nuclear Waste Management Organization of Japan (NUMO) for suitable sites for spent fuel.
- CONTEXT: Currently, such work can only be launched based on a request from a local government. The central government will now give NUMO the agency to pursue the search without waiting on municipalities to volunteer.

- TAKEAWAY: To date, only two local governments – Hokkaido Prefecture's Kamoenai Village and Suttsu Town – have agreed to have their area surveyed for suitability as a waste storage hub. PM Kishida's administration has called for greater utilization of nuclear energy, and so, efforts to solve the nuclear waste disposal issue have also increased.

## METI, MoE study expanding JCM methodology, guidelines to include CCS projects

(Japan NRG, Feb. 3)

- In 2021, METI and MoE launched a study on carbon capture and storage (CCS), aiming to add it to the Joint Crediting Mechanism framework.
- CCS, Enhanced Gas Recovery (EGR) and Enhanced Oil Recovery (EOR) will be included in the expanded JCM guidelines and methodology now under discussion. Carbon capture and utilization (CCU) will not be included.
- Detecting long-term leakage of CO2 is an issue.
- A credit reserve system is proposed where some verified credits are held as reserves, taking into account risks of carbon leakages. If there's leakage, credits are canceled.
- CONTEXT: *METI together with JGC Corporation, J-Power, and other companies have launched CCS and CCUS feasibility studies in Indonesia and Thailand, eyeing them as potential JCM projects. METI hopes these efforts will increase activity in the Asia CCUS Network, a policymaking platform of energy ministries in ASEAN, Australia and the U.S.*

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## MLIT releases Tomakomai GX Hub plan

(Japan NRG, Feb. 1)

- The MLIT released the Tomakomai GX Hub plan. This area in Hokkaido hosts several thermal power plants, an oil refinery and the country's sole CCS project (in pilot phase).
- The goal is to combine the area's potential for green hydrogen supply chains and CCUS.
- The area is estimated to have a total solar capacity of 236 MW, with some wind and biomass power potential. Local renewable capacity could be expanded to 1 GW.
- CONTEXT: *Tomakomai is the nation's base for CCUS technology development. Japan CCS, a geophysical survey firm, has captured 300,000 tons of CO2 from an Idemitsu oil refinery and has stored the gas underground in Tomakomai. Surveys for additional storage areas in the region are underway.*

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## Obayashi Corp allowed to forge carbon credits from green hydrogen project in New Zealand

(Government statement, Feb. 2)

- The MoE recognized Obayashi Corp's green hydrogen production and transport project in New Zealand. This means, the project is eligible for carbon offset credits under the Joint Crediting Mechanism.
- Obayashi will produce green hydrogen using renewable power, and transport the hydrogen. The Japanese government will finance part of the project.

- TAKEAWAY: Obayashi has experience with green hydrogen facility installations thanks to a domestic project that sources its electricity from geothermal power generation. The hydrogen is then transported by land. The construction conglomerate also plans a pilot project that will use green hydrogen to manufacture asphalt.

## ENEOS to commercialize tech for shipping hydrogen via oil tankers by 2025

(Company Statement, Nikkei, Jan.30)

- ENEOS plans to commercialize a technology that can transporting hydrogen at room temperature in oil tankers by FY2025.
- In February, the energy group will start a demonstration facility in Brisbane, Australia that will bind hydrogen with toluene, a chemical, to create a liquid compound known as MCH (methylcyclohexane).
- CONTEXT: *MCH can be shipped more easily since it can use existing vessels. Standalone hydrogen gas has to be cooled to extremely low temperatures for transportation.*
- ENEOS will create its hydrogen (via MCH) using renewable energy, which would classify the hydrogen as "green". The company will deploy a 150-kW solar-powered electrolyzer at the Brisbane facility, testing its performance over eight months.
- During this trial period, ENEOS plans to ship 2-3 tons of hydrogen (via MCH) to Japan. This is enough to fuel 400 to 600 fuel cell vehicles.
- By FY2025, ENEOS plans to scale up the electrolyzer size to 5 MW, which would allow for commercial scale operations. This would also lower the cost of hydrogen production.

- TAKEAWAY: ENEOS is a member of the CO2-free Hydrogen Energy Supply-chain Technology Research Association (HySTRA) organized by NEDO. The pilot project started in 2020 in Australia with brown coal gasification and hydrogen refining, hydrogen liquefaction and storage of liquefied hydrogen (LH2), as well as marine transportation of LH2 from Australia to Japan.

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## IHI introduces first use case for e-methane in Japan as fuel for buses

(Company Statement, Jan. 23)

- Engineering group IHI started supplying e-methane (also known as synthetic methane) to a local government owned community bus operator in Soma City, Fukushima Prefecture.
- The fuel is made using green hydrogen that's derived from solar-generated electricity generated at the Soma IHI Green Energy Center.
- The IHI center has a refueling stand, which used to provide fuel for LNG vehicles.

- TAKEAWAY: See this week's Analysis section for an in-depth look at the e-methane market in Japan.

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## METI to support development of gas turbines that blend in more than 30% of hydrogen

(Denki Shimbun, Feb. 3)

- METI will financially support development of gas turbines with a hydrogen mix ratio of more than 30%.
- Part of the ¥300 billion additionally budgeted in FY2022 for the Green Innovation Fund will be used for this project.
- METI determined that a 30% co-firing ratio, which had been as the original target, wasn't enough to compete on the global market.
- CONTEXT: *The Green Innovation Fund was launched in 2021 with a ¥2 trillion budget. So far, up to ¥1.83 trillion has already been committed to 19 projects over 10 years, with an additional ¥300 billion added to the fund in the second supplementary budget for FY2022.*

- SIDE DEVELOPMENT:
  Kawasaki to enter European hydrogen turbine market
  (Fisco, Feb. 2)
  - Kawasaki Heavy Industries will sell hydrogen turbine services to EU companies.
  - Kawasaki's services involve modifying existing gas-fuelled turbines to run on hydrogen, and thus be a cheaper option than turbine replacement.
  - Kawasaki aims to control 20% of the European hydrogen turbine market by 2030.

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## Toyo Engineering trials green ammonia production in Chile

(Nikkei, Feb. 1)

- Toyo Engineering and Mitsui & Co's proposal to study manufacturing green ammonia under fluctuating power supply conditions won a contract from NEDO. The goal is to evaluate new energy efficient technologies.
- The parties plan to build an experimental plant in northern Chile.
- If the decision is made to start commercial production, the plant will eventually ramp up to 18,000 tons annually.

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## Cosmo Oil adopts biodiesel for tank trucks in Kinki

(Company statement, Jan. 26)

- Cosmo Oil has adopted biodiesel for its 50 tank trucks in the Kinki Area. "Cosmo CF-5" is made from waste oil processed at its refinery. The company expects a CO2 reduction of 159 tons/ year.
- Cosmo Oil is also considering sales to the transportation industry, and will explore establishing a fuel sales plan with the added value of CO2 emission reductions.

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## Suzuki to invest ¥2 trillion for 6 EV models; commercial light truck to launch this year

(Kankyo Business, Feb. 1)

- Suzuki plans to release six new battery EVs, and will begin with a commercial light truck to be launched this year.
- To develop the EV models, Suzuki will invest ¥2 trillion for electrifying facilities with renewable energy, and ¥500 billion for battery development.
- Suzuki aims to achieve carbon neutrality by 2035.

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## Yamagata generates biomass power with sake lees

(Kankyo Business, Jan. 31)

- A winery in Yamagata Pref. started producing sake using electricity generated by biogas from sake lees, which is the leftover bits in sake production. This is the world's first winery to be powered 100% by biogas, and it will reduce CO2 emissions by 67%.
- All electricity is supplied by Nagame-yama biogas power station, Japan's biggest, and operated by Tohoku Ohisama Power. The sake lees are mixed with cow manure to provide power all day.
- The winery plans to establish a more stable circular economy by generating power from manufacturing wastes.

## Idemitsu and Toray to build Japan's first biomass ABS resin supply chain

(Company Statement, Feb. 2)

- Idemitsu Kosan and Toray will work together to produce biomass-based ABS resin, which is a plant-based product. It is a resin used for auto parts and toys.
- Production will start in October.
- SIDE DEVELOPMENT:
  Idemitsu and J-Oil Mills ally to build a biomass business, including in SAF
  (Company Statement, Feb. 1)
  - Idemitsu Kosan and J-Oil Mills signed a MoU to jointly study the establishment of a biomass business. It includes SAF (Sustainable Aviation Fuel) production, plastic recycling, and bio-chemical utilization by securing bio-based materials.
  - The two companies will secure plant raw materials through the sustainable planting of non-edible oil trees, which do not compete with resources for food-based agriculture. The two plan to use oil extraction know-how to build an SAF manufacturing and supply chain.
- SIDE DEVELOPMENT:
  Nippon Paper-led group seeks to manufacture SAF from wood
  (Asia Nikkei, Feb. 3)
  - A group of companies led by Nippon Paper want to make bioethanol from wood for sustainable aviation fuel (SAF) in Japan. Investment costs are expected to be in the tens of billions of yen. Output will start in 2027. The target is for 10,000 kl of fuel a year.
  - Sumitomo Corp, the Green Earth Institute, and others are part of the group. The firms plan to register a JV in 2024.

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## Daito Trust Construction accelerates rooftop solar for rental apartments

(Kankyo Business, Feb. 2)

- Daito Trust secured ¥9 billion from the Bank of Yokohama through a green syndicated loan, to install more solar PV equipment at its rental houses and apartments.
- Daito Trust uses the electricity for their rental properties, offices, and construction sites to reduce CO2 emission. The excess electricity will be sold to electric companies.
- The green syndicated loan is provided by Shizuoka Bank, Gunma Bank, Chiba Bank, Iyo Bank, 77-Bank, Chugoku Bank, Bank of Nagoya, and Hiroshima Bank.
- CONTEXT: *Daito Trust joined RE100, which aims to switch electricity consumption to 100% renewable sources by 2040. Daito aims to equip 25,000 of its rental properties with solar PVs, which will generate annual 333 GWh of clean power. This scheme was approved by the "J-Credit system."*

# NEWS: POWER MARKETS

## FIT for rooftop solar on business buildings will trade 20-30% higher

(Nikkei, Feb. 2)

- METI will introduce a new feed-in-tariff (FIT) system from FY2024 to buy electricity from rooftop solar panels on office buildings, factories, and warehouses for 20-30% more than solar power installed on land.
- The new price plan applies to commercial-use solar PV plants with output of over 10 kW. The current price is ¥9.5~10/ kW up to 250 kW; the new price will be around ¥12/ kW, considering the higher cost of construction.
- METI's goal is to encourage industrial firms to install more solar panels on rooftops.

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## Major utilities face losses of over ¥1 trillion; worst result since 2013

(Kyodo, Feb. 2)

- All of Japan's 10 major power companies, with the exception of Chubu Electric, expect a loss in the quarter representing the first three months of 2023.
- The result is attributed to high LNG and coal prices, and a weak yen.
- Total losses amongst the nine utilities are projected to exceed ¥1 trillion: the worst result since the same period in 2013.
- SIDE DEVELOPMENT:
  TEPCO loses ¥651 billion in Oct-December quarter
  (Company Statement, Feb. 1)
  - TEPCO reported a consolidated loss of ¥651 billion in the three months to December. This is despite the company posting a ¥123 billion gain on the sale of subsidiaries and affiliates' stock and a ¥63 billion gain on sales of fixed assets.
  - TEPCO reported a profit of ¥9.9 billion in the same period 2021.

- TAKEAWAY: TEPCO's heavy exposure to fossil fuels led to the largest loss of any utility for the last three months of a calendar year. It is bigger than the loss after the 2011 Great East Japan Earthquake in 2011 (¥623 billion yen). The company has one operational nuclear plant but cannot restart it due to low public trust towards the utility since the Fukushima accident.

- SIDE DEVELOPMENT:
  Chubu financials see dramatic turnaround; projects a profit of ¥50 billion
  (Tokai TV, Jan. 30)
  - Chubu revised its earnings forecast for the first three months of 2023, and now projects a profit of ¥50 billion.
  - While the utility forecast a ¥130 billion loss back in October, a stronger yen and falling oil and gas prices helped the company improve its finances.

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## FTC: unauthorized access to EPCOs customer data potentially breaches antitrust law

(TBS, Feb. 1)

- Japan's Fair Trade Commission's secretary general Kobayashi Wataru said EPCOs' unauthorized access to customer data of other market entrants possibly violates the Electricity Business Act and the Anti-Monopoly Act.
- The Electricity and Gas Market Surveillance Commission (EGC) is investigating Tohoku, Chubu, Kansai, Chugoku, Shikoku and Kyushu electric power companies. The FTC has no plan to launch a separate probe, Kobayashi said.
- Kobayashi said that while JFTC has not launched any investigation of the major power companies, also known as EPCOs, the possibility of future probes has not been ruled out.

- TAKEAWAY: In December 2022, Chubu, Chugoku and Kyushu electric power companies were hit by the FTC with a fine of ¥100 billion in total for cartel-related business practices. It remains unclear how and when the EPCOs can improve compliance.

  In theory, JFTC has the capacity to launch a separate probe. EGC may escalate the case to JFTC. The power operators, whose customer data were exposed, could file complaints to the JFTC.

  - SIDE DEVELOPMENT:
    KEPCO breaches worse than thought; over 40,000 electricity subscribers accessed illegally
    (Yomiuri Shimbun, Jan. 30)
    - KEPCO now says staff illegally accessed records of over 40,000 electricity subscribers between April and December last year, nearly 3 times greater than initially thought.
    - KEPCO also revealed that 1,000 staff were involved.
    - Similar breaches were also revealed at Tohoku Electric, Chubu Electric, Chugoku Electric, Shikoku Electric, and Kyushu Electric.

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## Kansai Electric announces unplanned shutdown of Takahama NPP unit 4

(Denki Shimbun, Feb. 2)

- Kansai Electric's Unit 4 of Takahama NPP (PWR, 870 MW) was automatically stopped on Jan 30. Kansai Electric is trying to identify the cause; the restart day remains unclear.
- The NRA said that "there seems to be a high possibility of an abnormality in the control rod system". Other possibilities include falling control rods.

- TAKEAWAY: Stoppage will result in an estimated ¥9.5 billion monthly loss. In addition to Takahama's Unit 4, Kansai Electric has four more reactors in operation at the moment.

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## ANRE to allow power retailers more flexibility over long-term contracts

(Japan NRG, Jan. 31)

- ANRE plans to allow power retailers, which source supply from power operators on long-term contracts, to resell the contract to other retailers.
- CONTEXT: *Retailers say that uncertainty in future consumer demand has discouraged them from signing long-term purchase contracts; meanwhile power operators need 10–20-year supply contracts to secure financing.*

- TAKEAWAY: Tokyo Commodity Exchange's head of power markets, Yamashita Masahiro, told ANRE that market tools to forecast prices 10-20 years ahead are instrumental for power supply stability. However,

liquidity of power futures contracts remains low as wholesale power prices hold above retail prices. And there are not many power traders in the Japanese market at this moment.

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## High-voltage contracts of new power firms fell below 200,000

(Denki Shimbun, Feb. 2)

- According to the Electricity and Gas Market Surveillance Commission (EGC), the number of high-voltage contracts held by new power players fell below 200,000 in October 2022, the biggest drop in five years.
- CONTEXT: *Many new power companies are slimming down their customer base to avoid going further into the red as they are losing money on certain contracts. As a result, many customers are returning to the EPCOs.*

- TAKEAWAY: For years, new electric power companies were aggressively acquiring new customers. Now, they're more cautious about new customers. Customers with low load factors, in particular, were first to exit when faced with large price hikes. Independent power retailers focus on managing peak demand so that procurement volume always exceeds sales volume. The aim was to minimize spot market procurement even during high demand periods.

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## Sojitz plans 109 MW onshore wind power plant

(New Energy Business News, Feb 2)

- Sojitz released an environmental assessment brief for the 'Otaru Yoichi Wind Power Plant in Hokkaido'. The project aims to develop a 109.2 MW onshore wind power generation plant in a state-owned forest located between Otaru City and Yoichi Town with aim of starting operation in spring 2029.
- The project site is approximately 859.3 hectares in size and would house 26 turbines. Construction will begin in September 2024.

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## Tohoku Electric's power plant sets Guinness Record for power generation efficiency

(Denki Shimbun, Jan. 31)

- Tohoku Electric's unit 1 of Joetsu Thermal Power Plant made the Guinness Book of Records as the world's most efficient combined-cycle power generation facility.
- The Joetsu Thermal Power Plant began commercial operation last December.
- It achieved a power generation efficiency of 63.62%, surpassing the 63.08% of Chubu Electric's Nishi Nagoya Thermal Power Station No. 7-1 (JERA's facility).
- Joetsu's record was achieved in collaboration with Tohoku Electric and MHI.

- TAKEAWAY: The previous record by Nishi Nagoya was in part due to the work of Toshiba. While pursuing efficiency gains, Japanese power operators and engineering firms are expected to move to low carbon energy solutions.

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## Kyushu Electric completes Severe Accident Measures at Unit 4 of Genkai NPP

(Denki Shimbun, Feb. 3)

- Kyushu Electric completed installation of Severe Accident Measures Equipment for Unit 4 of Genkai NPP (PWR, 1.18 GW).
- All four reactors at the Genkai station have completed this upgrade and can now operate unhindered.

- TAKEAWAY: Construction of Severe Accident Measures Equipment was required at all NPPs after the Fukushima accident. These include a system to pour water into the reactor containment area in case of an accident; a filtered containment venting system; additional power supply facilities and communication equipment. EPCOs aren't allowed to operate NPPs without Severe Accident Measures equipment.

  Kyushu Electric has now finished the required upgrades at both of its NPPs.

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## Fears of soil contamination from Chinese solar panels

(Gekkan Spa, Jan. 29)

- In Yamaguchi, residents are worried that cheap Chinese-made solar panels will pollute local farmland.
- Soil surveys found arsenic and lead, which residents blame on solar farms.
- Residents also cite the risk of electrocution in the event of a flood.

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## Mitsui & Co invests in Brazilian energy trader Stima Energia

(Nikkan Kogyo Shimbun, Feb. 2)

- Mitsui & Co plans to acquire a 36% stake in Brazilian energy trader Stima Energia for an undisclosed sum.
- Stima was established in 2017, and wants to improve supply and demand management, as well as hedge risk.
- The Brazilian energy market is dominated by renewables.

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## Hitachi Energy sold its Russia business to local management

(Denki Shimbun, Feb. 1)

- Hitachi Energy completed the sale of its Russian subsidiary to the local management.
- Hitachi Energy has been involved in the power transmission and distribution business in Russia since 1988.
- The subsidiary employs 300 people and has factories and sales offices.

# NEWS: OIL, GAS & MINING

## Toho Gas expects record profit in the first quarter of 2023; a 150% increase YoY

(Nikkei, Jan. 31)

- Toho Gas projects a consolidated profit of ¥236 billion for the first three months of 2023: a 150% increase YoY.
- TG procures almost all of its LNG on long-term contracts, and has benefited from higher energy prices, as well as its Australian energy development initiatives.
- As fears of LNG shortages eased, Toho sold surplus LNG, further boosting profits.

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## LNG stocks of 10 power grids stood at 2.53m tons, down from 2.7m tons a week earlier

(Government data, Feb. 2)

- LNG stocks of 10 power grids stood at 2.53 million tons as of Jan 29, down from 2.7 million tons a week earlier. ANRE first reported the Jan 22 stocks as 2.57 million tons, but revised the number.
- The end-January stocks in 2022 were 1.8 million tons. The five-year average for this time of year is 1.67 million tons.

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## INPEX exits from all tight oil business in Texas, U.S.

(Company Statement, Feb. 1)

- INPEX has terminated its tight oil business in Texas and sold the remaining assets to a unit of Repsol.
- The company said it wants to make its oil and gas business "cleaner."

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## Global lithium titanium oxide battery market set to reach $13.9 bn by 2031

(PR Newswire, Jan. 30)

- The lithium titanium oxide battery market is expected to reach $13.9 billion by the end of 2031 (was at $1.33bn in 2022).
- SIDE DEVELOPMENT:
  Iron phosphate batteries to become mainstream in EVs; Toshiba targets aqueous batteries
  (Nikkei, Jan. 31)
  - The revival of lithium-ion batteries is in the limelight against a backdrop of soaring material prices caused by rising EV battery demand.
  - Toshiba is aiming to develop aqueous batteries to reduce costs by 20-30% compared to lithium iron phosphate batteries for large energy storage facilities. Toshiba sees aqueous units in practical use by 2030.

ANALYSIS

BY MAYUMI WATANABE

## Japan Hopes to Develop Synthetic Methane Into Staple Energy Supply

In November 2022, "e-methane" debuted at the Japan Gas Association (JGA) with much fanfare. This nearly carbon-neutral methane is synthetic; it is produced from captured CO2 and green hydrogen or other non-fossil energy sources.

For its production, any type of CO2 can be used as feedstock, so long as it does not contain sulfur or other impurities that cause catalysts to degrade. This in turn, however, raises questions such as from where the carbon is coming and what is the emission threshold for green hydrogen.

Amid all the excitement at the November event, the JGA even provided an "e-methane" logo to certify companies in the recycled carbon value chain. The move was probably premature. At the moment, no company has a specific timetable to commercialize e-methane.

To better understand the potential offered by e-methane and the challenges that its development faces, *Japan NRG* spoke to leading companies in the industry.

### Cheap renewable energy is crucial

As a first step, the production of synthetic methane involves the capture of CO2, such as from industrial sites, and the generation of hydrogen by separating its molecules from water by electrolysis. Then, there's methanation, which is when carbon, hydrogen and catalysts react to produce methane.

When methane is consumed, it releases CO2, but in theory this is offset since the synthetic fuel was originally made from captured CO2. The net result on the CO2 in the atmosphere is said to be near zero.

Methanation is a century-old technology that has evolved rapidly in recent years. The Japanese government began to fund its own research in 2017, hoping to possibly replace LNG-derived city gas with synthetic methane.

The methanation process requires little energy as the molecules involved release heat during chemical reactions. There's almost no byproduct from the chemical reactions, except for carbon and hydrogen that failed to react. Initially, catalysts made from ruthenium and alumina were common, but in recent years nickel, ruthenium and other elements are used, improving performance.

Since the catalysts can be recycled, and existing city gas infrastructure can be used to deliver the methane to consumers, it potentially offers a neat solution. The major setback has been the large amount of electricity required for the electrolysis process, which accounts for over 90% of power used to create e-methane.

In general, around 20 MWh of power is needed to produce one ton of e-methane. In order to make e-methane carbon neutral, electrolysis needs to be powered by a significant source of cheap renewables, which Japan currently has limited access to.

### The business players

In Japan, INPEX, Hitachi Zosen, IHI and Tokyo Gas are the forerunners competing to be the first to commercialize e-methane. In 2024-2025, INPEX plans pilot production at its Nagaoka plant, using the Sabatier methanation method. The pilot involves the transport of synthetic methane through an INPEX gas pipeline and a possible sale of the fuel. The company's Nagaoka facility will have a 400 nm3/ hour capacity and possibly be Japan's largest.

Presently, Hitachi Zosen's 125 nm3/ hour plant is the country's largest methanation plant. The company said it has entered into an agreement with China's Yulin Chemical to test a 500 nm3/ hour plant in the Shaanxi province of China. The Hitachi-Yulin plant, if completed, will likely be the world's largest.

Tokyo Gas installed a 12.5 nm3/ hour methanation plant at its Yokohama R&D facility last year. It will start field tests with Yokohama City this year using biogas that contains carbon and possibly sulfur as feedstock.

| | Present installations | 2025-2030 goals |
|---|---|---|
| INPEX | To construct a 400 nm3/ hour Nagaoka plant by 2025 | 10,000 nm3/ hour |
| Hitachi Zosen | 125 nm3/ hour installation at an incineration plant | 5,000 nm3/ hour |
| Tokyo Gas | 12.5 nm3/ hour at Yokohama R&D center | 300-500 nm3/ hour |
| IHI | 12.5 nm3/ hour at Soma IHI Green Energy Center | over several 100 nm3/ hour |

The companies have no commercialization plans yet, but they're reaching out to partners overseas to conduct feasibility studies.

**Overseas feasibility studies involving Japanese firms**

| | | |
|---|---|---|
| INPEX | AGL Energy | Australia |
| Osaka Gas | ATCO | Australia |
| | City Energy, City OG Energy Services | Singapore |
| Tokyo Gas, Osaka Gas, Toho Gas, Mitsubishi Corp. | Cameron LNG | U.S. |
| TBD | TBD | Peru, Middle East |

### Overseas expansion to find cheap renewables

The list of projects will grow longer as Japanese utilities look to South America and the Middle East, where renewable power generation sources are cheaper than in the home market.

However, the Japan Gas Association (JGA) is eyeing another possibility.

"The concept of carbon recycling is not found in the ISO, GHG protocol or IPCC guidelines, so we want to spread the idea," said Kohara Mitsuhiro, JGA's international certification and standardization general manager.
Spreading the idea of carbon recycling is a priority, and narrowing down its definition, conducting life cycle assessment of the entire value chain, and developing robust verification and reporting technologies will follow.

While e-methane aims to show that it is a clean energy source, it does not accept all CO2-free energy inputs. For example, using nuclear power to make hydrogen is not allowed under JGA definitions. Similarly, the use of batteries is also off the table because they are a secondary energy source, unless the batteries are storing nature-derived energy.

Green hydrogen threshold figures are wide-ranging, from 1.4 kg of CO2/ ton to 3 kg/ ton in the EU and the U.S. The JGA is monitoring regulatory developments overseas, notably in the EU, which has seen a surge of interest in synthetic methane.

The JGA is also designing plans to count and offset carbon. If e-methane is produced overseas, the carbon offset credits should be transferable to Japan. The JGA plans to use frameworks under the Paris Agreement such as the Joint Crediting Mechanism, the scope of which the government plans to expand to include projects funded entirely by the private sector. (See *Japan NRG Weekly's* January 10 issue for an interview with MoE's JCM point man).

## Challenges to commercialization

The effort to spread the e-methane concept won't bear fruit unless costs are brought down to levels acceptable to the market. The JGA sees the cost at ¥120/ nm3 by 2030, and aims to cut it to ¥40-50/ nm3 by 2050. One possible solution is minimizing energy losses throughout the methanation processes, said Ogasawara Kei, methanation technology manager at Tokyo Gas.

Tokyo Gas together with the Japan Aerospace Exploration Agency (JAXA) is developing hybrid electrolysis-methanation equipment where heat released in the methanation process can be used for electrolysis.

"There's a 50% loss of renewable energy during the methanation process, but our goal is to improve the energy utilization rate to 80%," said Ogasawara, adding that to make e-methane cheaper the life-cycle of catalysts needs to be longer; and initial capital investments and running costs of the production plants will have to be trimmed, while scaling up their capacities.

Meanwhile, Osaka Gas is developing solid oxide electrolysis cells (SOEC) methanation technology that could possibly reduce costs while scaling up production.

**Beyond Sabatier: new methanation tech in development**

| | | |
|---|---|---|
| *Hybrid Sabatier* | Combining electrolysis and methanation processes | Tokyo Gas/JAXA |
| *PEMCO2 reductions* | Low temperature reduction | Tokyo Gas/Osaka University |
| *Bio methanation/reactor* | Search for bacteria triggering fast reactions | Tokyo Gas, Osaka Gas |
| *Solid oxide electrolysis cells* | Combining electrolysis and methanation processes | Osaka Gas/Toshiba Energy Systems |
| *Methanation in cement and steel manufacturing* | Carbon recycling | Taiheiyo Cement/IHI/JFE Steel |

Currently, electrolysis and 12.5 nm3/ hour methanation equipment cost several ¥100 million each, and are mostly produced by Hitachi Zosen and IHI, and with a handful of manufacturers overseas. However, it's hoped that competition will drive more market entries, higher efficiencies and lower costs.

## Goals in place

For now, the future path of the e-methane value chain remains uncertain. The only clear timetable is the government's 2030 goal to make e-methane account for a mere 1% of Japan's city gas supplies.

Major hurdles need to be overcome, including establishing carbon recycling methodologies that can be included in the JCM and other programs. The JGA hopes the framework to develop global e-methane standards will be ready when the technologies are fully developed.


Source: Japan Gas Association

# ANALYSIS

BY CHISAKI WATANABE

## A Small Solution for a Big Problem: Resolving Japan's Grid Congestion

As Japan plans more solar and wind capacity, attention is focusing on grid solutions to help accommodate the intermittency of some renewables supply. The big-picture vision in the recently released draft of the Power System Master Plan for 2050 Japan calls for as much as ¥7 trillion in investments to decarbonize the system.

There are solutions, however, that could bolster the use of renewables without an entire system rebuild or the installation of new, bigger transmission lines. One solution relies on the same thing that generates renewable power in the first place: the weather.

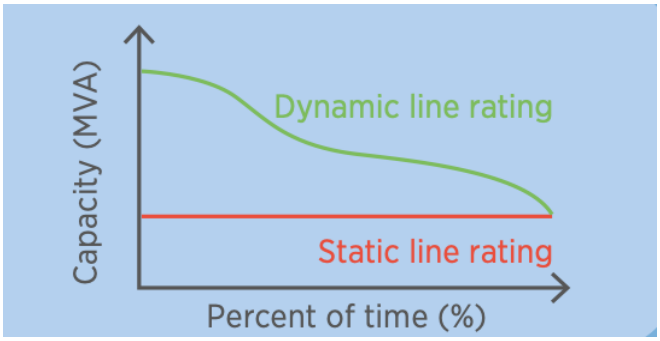
A technology called dynamic line-rating (DLR) can improve the capacity to transmit electricity of an existing transmission line by adjusting throughput based on outside temperature and other conditions. By adding sensors to cables, a grid operator can determine how much electricity volume the lines can safely carry without overheating.

More use of variable energy sources causes fluctuations in electricity transmission flows and peaks that are more pronounced than in conventional energy systems. Tech such as DLR can provide a low-cost solution that could add a few percentage points to efficiency without waiting years for big-budget public works to revamp the system.

### How it works

The volume of electricity that a power line can transmit safely depends on ambient conditions. In Japan, the ampacity (i.e. the maximum current carrying capacity) is calculated using a model climate condition that assumes an air temperature of 40°C with wind speed at 0.5 m/s and solar radiation at 1,000W/ m².

In other words, the volume of electricity that a power line can carry is based on summer weather conditions. For the majority of the year, the weather is milder.




Source: IRENA

DLR systems have been available since the 1990s, with France and Belgium leading efforts to explore the technology, according to the International Renewable Energy Agency (IRENA). But only with the rapid deployment of solar and wind in recent years has spurred pilot projects for this innovation.

In addition to checking air temperature, European researchers focus on wind speed, and the temperature and sagging of a power line. Estimates on how much DLR can increase the maximum capacity of power lines vary. The European Network of Transmission System Operators for Electricity (ENTSOE) says it can achieve an increase of between 40% and 100% compared to static line-rating. It also says that in Europe typical ampacity gains of 10 to 15% can be expected over 90% of the time, although results depend on the methodology.

As for cost, according to a 2017 study by American Electric Power (AEP), an Ohio-based utility, a simulation of a hypothetical DLR deployment on three sections of a 22-mile transmission line found that the installation and implementation cost would be about $500,000 with a commercially available DLR system.

This could achieve a net congestion savings of more than $4 million, indicating a payback period of two months. In comparison, an upgrade of the same transmission line would cost between $22 million and $176 million, according to a report by the U.S. Department of Energy.

Some of the best practice applications of DLR technology include the interconnection between Belgium and France, according to ENTSOE. Commercially available sensors were used to measure real-time sag directly on power lines, leading to the development of a forecast module that reached almost 60 hours ahead.

Using DLR, up to 200% of rated capacity became available under certain conditions between 2008 and 2020. In Spain, using low cost sensors on existing lines to measure sag, researchers found that transmission capacity increased 15% to 30% during a 3-month experiment in 2017.

### Situation in Japan

In March 2021, METI said that DLR technology can be effective in reducing the frequency of curtailment – a situation in which power generators are asked to reduce or shut down operations to maintain grid stability. The ministry saw this as having a strong impact especially on local grids. DLR was also mentioned in the Sixth Basic Energy Plan, released later that year.

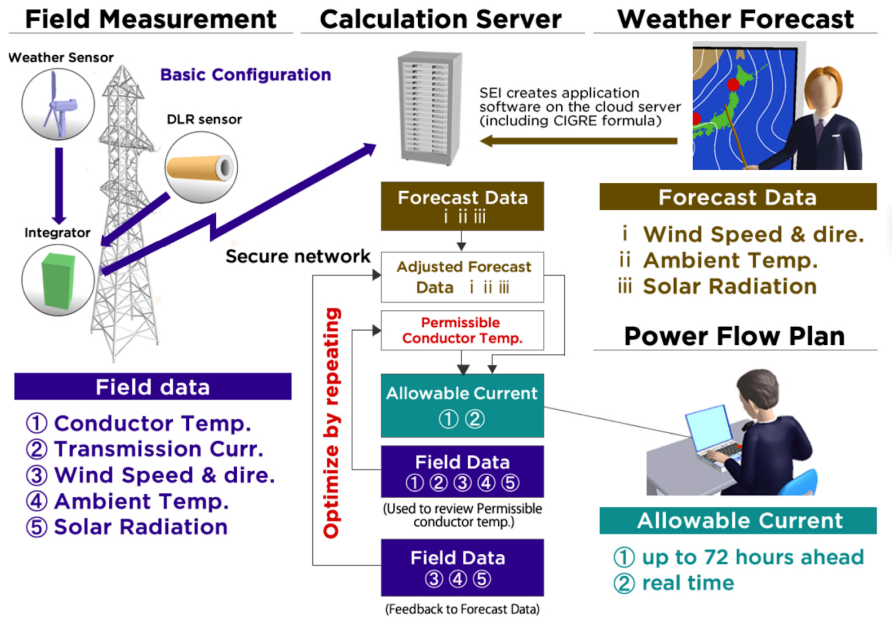
Some of Japan's largest utilities are studying the tech's potential. Chugoku Electric, which covers southwestern Japan, completed a one-year pilot with Fujitsu in Sept 2022 using the utility's three transmission lines in Shimane, Yamaguchi and Hiroshima.

Devices were installed at substations to measure vibration of optical ground wires (OPGW) for computers to acquire vibration data in milliseconds at intervals of several meters over a length of 70 kilometers. An OPGW is a type of cable placed in the topmost position of the transmission line to protect the cable from lightning strikes and provide a communications path.

The data was then used to estimate wind conditions and temperatures of the transmission line to compare with the actual measurement data, and the companies said the two data sets were generally in accordance.

Hokkaido Electricity started a pilot in November 2022 using a DLR system developed by Sumitomo Electric Industries to measure electric current and the temperature of a

transmission line combined with an existing system introduced in 2014 for the monitoring of power flow. The companies will study how much more electricity can be transmitted and how often curtailment can be reduced. The pilot, which runs through October, is being conducted in the Wakkanai area in Hokkaido with DLR and weather sensors installed at three locations.




Source: Sumitomo Electric Industries

## Compatibility with wind power

In its five-year business plan in December, Tohoku Electric said it's studying how to manage the capacity of transmission lines using the DLR technology for more extensive management of grid congestion to expand renewable energy.

Marubeni, a trading company, is also betting on DLR. The company signed a distribution agreement in September 2021 with LineVision, a U.S. provider of the real-time monitoring and analytics for grid maintenance and operation, and began a pilot on transmission lines owned by its subsidiary, Mibugawa Electric Power.

Last October, Marubeni completed a series C funding in LineVision and signed a MoU for a strategic partnership to expand LineVision's business in Japan and other countries. LineVision's non-contact sensor can be installed without directly touching transmission lines, allowing it to be installed quickly and safely.

DLR has another advantage – its compatibility with wind power. An increase in electric current in a transmission line increases the chance of overheating and damaging the line as it gets hotter, according to the Idaho National Laboratory. But an increase in wind speed blowing at a right angle to a high-voltage line can cool the line and safely increase the amount of current it can carry by 10% to 40%.

DLR is among many options for alleviating grid congestion such as energy storage and demand response. As Japan gears up to expand its offshore wind capacity, which creates the need for grid expansions and upgrades, DLR is expected to play a key role in helping to keep the system balanced and at optimal efficiency.

# GLOBAL VIEW

BY JOHN VAROLI

*Below are some of last week's most important international energy developments monitored by the* Japan NRG *team because of their potential to impact energy supply and demand, as well as prices. We see the following as relevant to Japanese and international energy investors.*

### Commodities

High interest rates and prices, as well as changing trade patterns, have made the global flow of raw materials more costly to finance. The industry will have to come up with an extra $300 to $500 billion in financing to maintain current trade levels, says a report by McKinsey.

### EU/ Wind power

This year will be difficult for the wind industry, as high costs and slow approvals for new projects will drag on profits. For example, Danish wind turbine maker Vestas said that the slow EU planning system and supply chain inflation is depressing profits.

### Hydrogen power

ExxonMobil plans to invest $7 billion in hydrogen, carbon capture and biofuels through 2027. Its Texas facility is expected to produce 1 bcf of blue hydrogen daily. Exxon plans to bury 98% of the CO2 emitted, about 7 million metric tons annually.

### Libya/ Natural gas

The National Oil Corporation and Italy's Eni agreed to develop gas production for Libya's domestic market and for export to the EU. The $8 billion "Structures A&E" is the country's first major project in two decades, and consists of two offshore gas fields and a CCS facility.

### Norway/ Oil and Gas

In 2022, a record-breaking 24 oil and gas projects were approved, reports Rystad Energy. This means a total pipeline of 35 projects were approved in the last 2.5 years, with investment totalling $43 billion. About 25 bcm of additional Norwegian gas will be online by 2028.

### Oil profits

Shell reported a record $39.9 billion profit in 2022, double last year's total and the highest in its 115-year history. ExxonMobil had a $56 billion profit in 2022, its largest ever. Chevron had a $36 billion profit. The White House condemned Big Oil's profits as "outrageous".

### Oil rigs

In 2022, offshore rig activity rose in several key regions. Global marketed jack-up utilization increased from 87% in January to 91% in December. The Middle East garnered all the jack-up attention, with over 60 new contracts from Saudi Aramco and ADNOC Offshore.

### Oil and gas exploration

Consulting firm Wood Mackenzie said worldwide fossil-fuel exploration in 2022 hit the highest levels in over a decade, and the discoveries include many "higher-quality hydrocarbons" that will require less new infrastructure and expenditures.

**Philippines/ LNG**

The Department of Energy approved a $67 million LNG import terminal, the country's seventh such facility. The Philippines needs LNG imports to fuel its gas-fired power plants that have a combined capacity of more than 3 GW.

**Saudi Arabia/ Hydrogen power**

The government will invest up to $267 billion on "cleaner energy", with the goal of becoming the world's leading exporter of clean hydrogen. The funds will go to build production, transport lines and distribution networks to facilitate the export of clean hydrogen.

**Türkiye/ LNG**

Türkiye signed an agreement with Oman to buy 1.4 bcm of LNG annually for 10 years. Türkiye and Bulgaria also signed an agreement to transport up to 1.5 bcm of natural gas a year for a 13-year period.

# 2023 EVENTS CALENDAR

*A selection of domestic and international events we believe will have an impact on Japanese energy*

| | |
|---|---|
| **January** | ○ METI Minister Yasutoshi Nishimura met with US DOE Secretary Jennifer M. Granholm in Washington D.C<br>○ PM Kishida met with IEA Executive Director Fatih Birol in Paris<br>○ Kishida-Biden summit meeting (January 13)<br>○ Last day to solicit public comments about GX (January 22)<br>○ Indonesia takes over as chair of the ASEAN for 2023<br>○ JCCP (Japan Cooperation Center for Petroleum and Sustainable Energy) Symposium (January 26)<br>○ Japan's parliament convenes (late January)<br>○ Lunar New Year (January 21-27)<br>○ Ammonia as Fuel World Summit (January 30-February 2)<br>○ Toyota group launches trial runs of FC truck transport system<br>○ IMO carbon regulation enters into force for all ships<br>○ China expected to announce the volume of rare earth production permitted by the government for the first months of 2023 |
| **February** | ○ Japan Energy Summit (February 28-March 2)<br>○ FIT solar auction (February 20-March 3)<br>○ IEA Global Methane Tracker 2023 release (TBD)<br>○ GX roadmap to be approved in a Cabinet meeting (February) |
| **March** | ○ REvision 2023 Symposium by Renewable Energy Institute (March 8)<br>○ Japan Atomic Industrial Forum Seminar (March 13)<br>○ World Smart Energy Week (March 15-17)<br>○ Small solar, wind operators subject to tighter technical rules due to Electricity Business Act amendments (March 20)<br>○ FIT on-shore wind auction (March 6-17)<br>○ IPCC to release sixth assessment report<br>○ End of 2022/2023 Japanese fiscal year<br>○ China hosts National People's Congress to appoint top government officials |
| **April** | ○ Enforcement of Acts to Promote Non-Fossil Energy and Sophisticated Supply Structure enters Phase II (April 1)<br>○ Amendments to Energy Conservation Act take effect (April 1)<br>○ Process for non-firm renewable connection to local transmission lines starts (April 1)<br>○ Rare earth mining will require state licensing (April 1)<br>○ Canadian Sigma Lithium to start commercial production at its Brazilian mine, one of the five largest lithium projects in the world<br>○ GX League becomes fully operational<br>○ Eurus, Cosmo and Looop to bring online Japan's largest onshore wind farm<br>○ Japan holds local elections for governors, mayors and legislatures |

| | |
|---|---|
| **May** | ○ May Golden Week holidays (May 3-5)<br>○ General election in Thailand (May 7)<br>○ World Hydrogen Summit (May 9-11)<br>○ G7 Hiroshima Summit (May 19-21) |
| **June** | ○ 35th OPEC and non-OPEC ministerial meeting (June 4)<br>○ IEA annual global conference on energy efficiency (June 6-8)<br>○ General and presidential election in Turkey (June 18)<br>○ Lithium Supply and Battery Raw Materials 2023 (June 20-22)<br>○ Happo Noshiro, Murakami-Tainai, Oga-Katagami-Akita and Saikai-Eshima wind project auctions close (June 30)<br>○ JERA, Shikoku Electric start running new coal power plants |
| **July** | ○ LNG 2023 World Conference (July 10-14) |
| **August** | ○ China expected to announce the volume quota allowances of rare earth production for the balance of 2023 |
| **September** | ○ G20 New Delhi Summit (September 9-10)<br>○ 2023 UN SDG Summit (September 19-20) |
| **October** | ○ IEA World Energy Outlook 2023 Release<br>○ BP Energy Outlook 2023 Release<br>○ Connecting Green Hydrogen Japan 2023<br>○ Japan Wind Energy 2023 summit |
| **November** | ○ COP 28 (November 30-December 12)<br>○ U.S. hosts the APEC summit in San Francisco |
| **December** | ○ ASEAN-Japan summit to mark 50 years of cooperation<br>○ Last market trading day (December 30) |

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