JAPAN NRG WEEKLY

FEB. 13, 2023

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Feb. 13, 2023

NEWS

TOP

- GX Basic Policy approved in a Cabinet meeting; nuclear power to make a comeback; offshore wind grid, bond issue also in the plan
- INPEX posts record profit (~$3.3 bn) on high oil and gas prices; weak yen also contributed to the jump in earnings
- Toyota Group is likely to become Japan's top renewables player after its trading arm acquires 85% of SoftBank subsidiary

ENERGY TRANSITION & POLICY

- METI to rewrite roadmap for gas sector decarbonization; a rethink suggests synthetic methane may be falling from favor
- Japan mulls new offset credit system for industrialized nations
- Local officials say they want restart of Ohma NPP construction
- IHI shares details of world's first e-methane powered bus project
- Wind lobby group calls for more talks on offshore tender process
- UK's BP and Chubu Electric to study CCS project at Nagoya Port
- Mitsubishi partners with RWE, Lotte Chemical on fuel ammonia
- Roadmap calls for up to 12 million tons of CCS capacity by 2030

ELECTRICITY MARKETS

- Power companies burned most coal since 2011 as LNG alternative
- Mayor positive about TEPCO restarting nuclear reactor in the fall
- Battery maker NGK and Ricoh join forces to develop VVP business
- Kyushu Electric avoided hiking power price thanks to nuclear units
- Tokyo Gas plans floating wind farm off Fukushima coast
- Data scandal worsens: TEPCO accused of accessing METI system
- JERA to sell stake in one Taiwanese offshore wind project
- Large biomass power plant begins operations in Hokkaido area

OIL, GAS & MINING

- Mitsui and Mitsubishi Corp bullish on new LNG investments
- Japan sets price caps on imports of Russian refined oil products
- Idemitsu sells coal asset in Australia leaving it with one coal mine
- Osaka Gas estimates Freeport LNG outage loss at ~¥150 billion
- Major domestic LPG suppliers in talks to merge operations

ANALYSIS

METI'S PLAN TO DIVERSIFY LOW-CARBON FUELS, AND THE FUTURE OF BIOFUELS

The Green Transformation (GX) energy transition roadmap was approved last week; it calls for development of three carbon recycling technologies: sustainable aviation fuel (SAF), synthetic fuel and synthetic methane. This raises questions. Japan's energy policy seems to support two different roadmaps for fuel decarbonization. On the one hand, GX wants development of new low-carbon fuel tech that recycles CO2; on the other, METI backs stronger biofuels utilization. We review how these might fit together.

CUTTING BACK ON CRUDE: JAPAN SHOOTS FOR THE MOON WITH BIODEGRADABLE PLASTICS

By the end of this decade, Japan hopes to have at least three new clean energy solutions for plastics, which has emerged as the fastest growth area for crude oil demand. By 2030, plastics may account for as much one third of the world's petroleum use. This is why Japan's Moonshot R&D Program seeks to improve its sustainable impact, with focus on finding a new generation of non-toxic plastics that won't damage the environment.

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

Cabinet approves GX Basic Policy; Nuclear power to make a comeback

(Government Statement, Yomiuri Shimbun, Japan NRG, Feb. 10)

- The Cabinet approved the GX (Green Transformation) Basic Policy. This leaves the Diet to approve necessary law amendments as the main administrative step before the legal side of the strategy is cemented. It should come into force from April 2024.
- New amendments for older reactors and extension of the operation period will be implemented separately in a period not exceeding two years after these rules take effect.
- According to METI, the GX strategy focuses on two areas: boosting the use of CO2-free electricity from renewables and nuclear, and also introducing carbon pricing and the sale of a new type of bond as a way to help fund decarbonization.
- CONTEXT: *The strategy greatly alters Japan's nuclear policy. Previously, the government said it neither intends to build new NPPs, nor replace old NPPs. The GX policy states that next-gen reactors will be built on the site of aging units due for decommissioning.*
- GX strategy also covers the issues of nuclear decommissioning and the construction of an undersea cable between Hokkaido and Honshu islands to facilitate the development of offshore wind projects in northeast Japan.

- TAKEAWAY: Nearly 12 years after the Fukushima accident, Japan has finally decided to fully restart its nuclear industry. As many engineers have changed professions or retired, however, the challenge now is how to find a new generation of qualified personnel.
- While many focuses on the nuclear sector developments, we expect GX to have an even greater impact on fund-raising and investments for clean energy projects, especially in offshore wind, carbon capture, energy management, and carbon recycling areas.

METI to rewrite plan for carbon neutral city gas; synthetic methane falls from favor

(Japan NRG, Feb. 8)

- METI will rewrite its plan for decarbonizing the city gas sector, decreasing the role of synthetic methane that was expected to replace 1% of city gas supplies by 2030, and 90% by 2050. These targets were originally set in the 2021 Basic Energy Plan and the Cabinet Clean Energy Strategy.
- METI proposes diversifying the approach to decarbonization that will include: 1) synthetic methane; 2) biogas/biomethane; 3) hydrogen; 4) LNG and CCUS; and 5) LNG and carbon offsets.
- In June, METI will publish an interim report on this strategy.
- CONTEXT: *METI prefers having various options to choose from and then to pursue the best combination; this might open opportunities for companies exploring technologies that compete with synthetic methane.*

- TAKEAWAY: This is a big move after the fanfare with which METI and industry players launched the "synthetic methane" rebranding as "e-methane" in the fall of 2022. It's possible that the cooling of expectations for the

sector came after hard-nosed calculations were done about the volumes and costs involved in meeting the 2030 targets.

- Now, the ministry plans to set up an expert panel to draft new GHG accounting standards for city gas utilities that would allow the use of credits to calculate the carbon emission factor. But this does raise the question: should credits be used to cut down on Scope 1 emissions?

    - SIDE DEVELOPMENT:
      METI to consider making a new international offset credit system for industrialized nations
      (Japan NRG, Feb. 8)
        - METI will study the potential for a new international carbon offset credit transfer system, mainly to allow the participation of industrialized nations.
        - The Joint Crediting Mechanism (JCM) was originally designed to support green initiatives in developing countries. Currently, hydrogen and synthetic methane projects planned in North America and Australia are not applicable.
        - The study is a part of METI's effort to rewrite decarbonization plans for the gas sector.
        - The new system will be useful for the transfer of credits of CCS and ammonia projects.
- TAKEAWAY: There are two approaches to realize credit transfer in industrialized nations: by expanding JCM to include them, or by establishing a new system similar but separate from JCM. METI appears to favor the latter approach.

Village mayors in Ohma NPP vicinity ask METI to promote the project

(Denki Shimbun, Feb. 8)

- The village mayors of Ohma, Sai and Kazama-ura, all in Aomori Prefecture, visited METI on Feb 7 to ask to promote construction of the Ohma NPP, a project that was frozen in the wake of the 2011 Fukushima accident.
- Ohma NPP is the first nuclear generation project for Electric Power Development Co. (J-Power). Building began in May 2008, but stopped in March 2011. Now, a possible resumption of construction is under review by the NRA.
- TAKEAWAY: The resumption of construction would be a major topic in itself and likely not an easy engineering feat. However, there are other points of interest at Ohma. The NPP would be the first in the world built to run on 100% mixed oxide fuel (MOX), which is manufactured from recycled nuclear fuel. MOX mixes plutonium recovered from used reactor fuel with depleted uranium. Ohma was originally slated to start operation in July 2010, but the project has been in limbo ever since 2011.

IHI shares details of world's first e-methane powered bus project

(Japan NRG, Feb. 6)

- IHI shared with Japan NRG details of the world's first buses that will run on e-methane, which is a synthetic methane produced from captured CO2 and green hydrogen.
- IHI's solar power plant will provide the energy required to produce hydrogen, while it will purchase CO2 from third parties.
- The buses can run for 150 km on a single tank of e-methane, which is in gas form.

- E-methane may contain excess hydrogen, so extra processing is required to cut the hydrogen content to less than 2%, a requirement for it to be uses as vehicle fuel.
- CONTEXT: *The buses started to run on Feb 1 in Soma City in Fukushima Prefecture. The goal is to show that synthetic methane can replace fossil-gas vehicle fuel. IHI also aims to find a way to control costs of power and green hydrogen production in Japan.*

- TAKEAWAY: Japanese companies look overseas for hydrogen projects because domestic production is believed to be nearly impossible due to high costs of renewable power. IHI will verify if the use of surplus electricity from renewables to produce hydrogen is feasible. IHI is implementing various cost saving measures, such as running the methanation plant under remote control to cut labor costs. Direct use of e-methane gas, without converting it to liquid, also cuts costs.

Fossil-fuel	¥50/ km
Hydrogen	¥95-100/ km
E-methane	CO2 (¥3,000-¥5,000/ ton) + hydrogen + power + other running costs

Japan Wind Power Association calls for more discussions over govt tender rules

(New Energy Business News, Feb. 8)

- The Japan Wind Power Association (JWPA) has asked the govt for further clarity on the new offshore wind auction system around the upper limit supply price and the evaluation criteria. The group is concerned that there is not enough understanding in the industry around how the proposed cost of power generation (kWh) will be verified by officials.
- JWPA said it is speaking with relevant ministries and agencies, but has so far only been briefed on the appropriateness of new govt rules. It believes further dialog is necessary to improve the rules even after the recent changes.
- JWPA said it doesn't want to make changes to the upcoming auctions (known as Round 2). However, to improve future auctions, it said more discussion is needed around:
  - (1) upper supply ceiling price,
  - (2) escalation clause,
  - (3) application of the FIP system,
  - (4) zero-premium level of the FIP system, and
  - (5) other evaluation criteria.
- JWPA also said that it seeks to make the discussion process more transparent.

Chubu Electric and BP start CCS study for Nagoya Port

(Kankyo Business, Nikkan Kogyo, Feb. 7)

- Chubu Electric and BP signed an MoU for decarbonization in Japan and Asia. The two plan to capture, store, and utilize 3 million tons of CO2 emitted from the Port of Nagoya.
- Nagoya Port is Japan's largest in terms of cargo volume; its target is to reduce CO2 emissions by 35% (over 2013 levels) by 2030.
- The companies will make a final investment decision on the CCUS project by around 2026.

Mitsubishi partners with RWE and Lotte Chemical on fuel ammonia supply chain

(Company Statement, Feb. 8)

- Trading house Mitsubishi Corporation announced a partnership with Germany's RWE and South Korea's Lotte Chemical to establish a supply chain for fuel ammonia in Asia, Europe and the U.S.
- The group will examine the potential for fuel ammonia production at the Port of Corpus Christi, Texas, U.S. The idea is to produce annually as much as 10 million tons of fuel ammonia, starting in 2030.
- CONTEXT: *Japan's public-private council for the introduction of fuel ammonia has released a roadmap that estimates the country's import needs at 3 million tons of fuel ammonia in 2030 and 30 million tons in 2050.*

Japan will push the issue of nuclear waste disposal with municipalities

(Nikkei, Feb. 10)

- Japan hosted a ministerial group to formulate its draft revision to an existing law which regulates the final selection of nuclear waste disposal sites.
- The government, together with EPCOs and the Nuclear Waste Management Organization of Japan (NUMO), will visit over 100 municipalities to ask them to research possible sites for a final disposal of high-level radioactive waste.
- The draft revision says the central government will be responsible for site selection.

- TAKEAWAY: Since only two Hokkaido municipalities agreed to a final disposal site inspection, the national government has changed the system to allow it to directly ask local governments. Under the previous system, the sites often faced standoffs between proponents and opponents. However, as these requests will now come from Tokyo, such standoffs will be considerably reduced.

CCS: ANRE roadmap puts a price target on cost to store 1 ton of CO2

(Gas Energy News, Feb. 6)

- A final roadmap by the Agency for Natural Resources and Energy (ANRE) calls for building enough capacity to store between 6 to 12 million tons of CO2 annually by 2030.
- It currently costs about ¥20,000 yen to isolate, recover, transport, and store a single ton of CO2. The roadmap sets a goal to reduce this cost by over 60% by 2050.
- It also calls for new laws, as soon as possible, to regulate carbon capture and storage.

Mitsui and MOL get approval for design of an ammonia-fueled bulk carrier

(Company Statement, Jan. 27)

- Trading house Mitsui and shipping company Mitsui O.S.K. Lines (also known as MOL) received approval in principle (AiP) for the design of a 210,000-ton dry bulk carrier fueled by ammonia.
- The fuel will be switched from heavy oil to ammonia. The ship's deck will have two ammonia fuel tanks.

Shin Energy completes biogas power plant in Nishinomiya

(Denki Shimbun, Feb. 7)

- Shin Energy completed construction of a biogas power plant (720 kW) in Nishinomiya. Its fuel will be produced by fermenting organic waste such as food waste. Operations start in June.
- The plan's electricity will be sold to Kansai Electric Power Transmission and distributed through a FIT scheme.
- CONTEXT: *According to Shin Energy, it's unusual to build a large biogas power plant in the city suburbs. In addition to reducing fuel transportation costs, the plan will help with food waste recycling.*

TEPCO will help Laos with its carbon neutrality goals

(Denki Shimbun, Feb. 10)

- A consortium led by TEPCO Power Grid is formulating a comprehensive plan to make Laos carbon neutral. The plan will be ready by May and is part of a project commissioned by the Japan International Cooperation Agency.

Euglena supplies innovative biofuel to construction site machinery

(New Energy News, Feb. 9)

- In January 2023, Euglena started supplying its next-gen biodiesel to SC Machinery, a 100%-subsidiary of Shimizu Corp., to power a crane at a construction site in Shibaura.
- CONTEXT: *Euglena is promoting the use of its biodiesel, branded SUSTEO, in various kinds of machinery and engines from cars to ferries to tractors. This is expanding the use case list while testing the viability of the fuel.*
- The company claims that using its fuel does not emit additional CO2 because CO2 is taken from the atmosphere to create the biodiesel in the first place.

Group to build 30 zero-emission houses with solar PVs in Saitama

(New Energy Business News, Feb. 7)

- Kaneka, Takasago Kensetsu, TEPCO Energy Partner, TEPCO Power Grid, and the city of Saitama set up a consortium for "Creating a carbon neutral town in Saitama" by 2030. The goal is to achieve an "innovative and sustainable green transformation model."
- Kaneka, which leads the consortium, plans to build 30 zero-net energy houses (ZEH) equipped with high efficiency, roof-top solar PVs to promote decarbonization.

Real estate developer swaps 20% of company fleet to battery EVs

(Company Statement, Feb. 7)

- With its long-term green vision of "Challenge ZERO 2055," Daiwa House introduced 70 BEVs as company cars, which account for about 20% of its total fleet.
- Daiwa also installed EV chargers in all 36 offices; this will reduce 96 tons of CO2 emissions yearly.
- By 2026, Daiwa House intends to switch all its company cars to BEVs.

NEWS: POWER MARKETS

Toyota Tsusho buys control in SoftBank's renewables unit, becoming Japan's top RE player

(Company Statement, Feb. 9)

- Toyota Tsusho acquired 85% of SB Energy, a subsidiary of SoftBank Group that develops renewable energy projects. The two intend to collaborate in developing renewables assets and in the power demand and supply adjustment business.
- Toyota Tsusho didn't reveal the price paid for the shares.
- Toyota Tsusho says it will become one of Japan's largest solar players in terms of installed capacity. It is already Japan's biggest wind power generator via its subsidiary Eurus Energy. As of last December, Eurus had 3,055 MW of wind capacity and 350 MW of solar capacity installed. Its total renewables capacity was 3.7 GW.
- SB Energy has 667.1 MW of solar and 55.9 MW of wind power capacity in Japan, as well as 50 MW of wind power capacity in the Gobi Desert, Mongolia.

- TAKEAWAY: Toyota Group, led by the world's biggest automaker, has committed to carbon neutrality. As such, it needs to secure large volumes of CO2-free electricity and has moved quickly to acquire sizeable assets in the renewables space in Japan over the last year. Toyota Tsusho, the trading house of the Toyota group, took full control of Eurus Energy from TEPCO and has now acquired control of SoftBank's renewables unit. That gives Toyota Tsusho almost 4.5 GW of renewables capacity, of which solar makes up just over 1 GW. Potentially, this makes Toyota not only the biggest player in renewables in Japan but also the top runner in the solar space.

Power companies burn more coal; consumption up 4.4% YoY, highest since 2011

(Denki Shimbun, Feb. 7)

- In the December quarter, Japan's nine largest power companies used more fuel oil and coal than they did the year before; but less crude oil and LNG.
- Coal consumption for the quarter was up 4.4% YoY, the highest since 2011.
- LNG consumption fell by 1.6% to its lowest level since 2011.

Kashiwazaki mayor is positive for October restart of TEPCO nuclear plant

(Broadcasting System of Niigata, Feb. 8)

- The mayor of Kashiwazaki City, where TEPCO's Kashiwazaki Kariwa NPP is located, said he expects the restart of Unit 7 of the facility in October 2023.
- In January, TEPCO hiked electricity rates due to soaring fuel prices, calculating the impact of the Unit 7 restart.
- The mayor said: "It's better for Japan if the nuclear power plant, which has completed the appropriate inspections and has been assured of safety, remains operational."

- TAKEAWAY: Since all reactors at Fukushima Dai-Ichi NPP and Fukushima Dai-Ni NPP were decided to be decommissioned, Kashiwazaki Kariwa is TEPCO's last remaining NPP. With fuel prices rising sharply, TEPCO is

now committed more than ever to restart Kashiwazaki Kariwa as it will have a major impact on its financials. The company recently posted its worst loss in at least a decade.

NGK and Ricoh join forces to develop VVPs

(Nikkan Kogyo Shimbun, Feb. 9)

- NGK and electronics major Ricoh created a joint venture to develop virtual power plants (VPPs), as well as services to monitor and predict electricity demand.
- The company, which has been named 'NR Power Lab', begins operations in 2025.
- NR CEO Nakanishi Yuichi says the company will pool the technological capabilities and know-how of its parent companies, notably NGK's "NAS" grid batteries and Ricoh's blockchain solutions.

Kyushu Electric avoided electricity price hike thanks to restart of Genkai NPP unit 4

(Fukuoka Broadcasting, Feb. 9)

- On Feb 9, Unit 4 of the Genkai NPP in Saga Prefecture restarted. It had been shut since September in order upgrade the facilities with anti-terrorism measures.
- Power output will gradually increase, and after a government inspection, the plant is expected to return to normal operation in early March.
- This means that both operable units at Genkai NPP are now online.

- TAKEAWAY: While many power companies are applying for price hikes due to soaring fuel costs, Kyushu Electric says it can avoid a price hike thanks to stable operation of its NPPs. Also, Kansai Electric expects to avoid a rate hike because it has five reactors in operation. Meanwhile, Hokuriku Electric wants a rate hike of 42.7%, and Okinawa Electric has applied for 39.3%. Such a wide gap in electricity prices among EPCOs has never before been seen in Japan.

    - SIDE DEVELOPMENT:
      Editorial: recent announcements suggest TEPCO is struggling to stay afloat
      (Diamond, Feb. 11)
        - CONTEXT: *This is an opinion article by the Diamond editorial team.*
        - TEPCO sought state approval to hike power bills by just under ¥3000/ month.
        - Industry insiders speculate that TEPCO only decided to keep the increase below ¥3000 for optics and to appease the government, because the increase won't be enough to put the utility back in the black.
        - Another telling detail is that TEPCO's rate hike calculation is based on the assumption that Unit 7 of its Kashiwazaki-Kariwa NPP will restart in July. However, TEPCO reassured residents near the plant that the reactor won't restart until October.
        - If Unit 7 restarts in October as announced, the three months of lost revenue will further compound TEPCO's losses.

Tokyo Gas plans floating wind farm off Fukushima coast

(Company Statement, Feb. 3)

- Tokyo Gas and Shinobuyama Fukushima Power filed a plan with METI to build two floating offshore wind farms, with a total 30 MW capacity, off the Fukushima Prefecture coast, near Naraha and Tomioka townships.
- The wind farms will be about 16 km off the coast and will connect with Tohoku Electric's network via submarine cables.
- Project details and environment assessment findings will be open to the public until March 6. Comments and opinions will be accepted until March 20.
- CONTEXT: *Japan's first floating wind farm, the 16.8 MW Goto facility in Nagasaki prefecture, is expected to start commercial operation in January 2024.*

- TAKEAWAY: Floating wind farms are less likely to cause community conflicts as there are no fishery rights at stake and possible noise complaints. However, since floating wind power is new, there are inconsistencies in the regulatory framework. Marine safety regulations classify floating wind power installations as "sea vessels", while other regulations say they're "structures".

Data breach scandal worsens as TEPCO gets accused of accessing METI system

(Abema Times, Feb. 10)

- METI said employees of TEPCO Energy Partner, the retail company of TEPCO, gained unauthorized access to METI's renewable energy business management system.
- The access to METI's business management system for renewable energy is only allowed for power transmission companies. In this case, a TEPCO Energy Partner employee gained unauthorized access using the TEPCO Power Grid account.
- Viewed information included names of power generators and electricity prices.

- TAKEAWAY: Recently, an illegal access case by other EPCOs was reported, but they gained access to information about the system inside their own group. For example, a Kansai Electric employee gained unauthorized access to Kansai Transmission and Distribution. However, in the TEPCO case, this can be more serious because their employee saw data from METI's system.

JERA to sell stake in one Taiwanese offshore wind project, but keep two other stakes

(Nikkei, Feb. 10)

- JERA will sell its stake in the Formosa 3 offshore wind project, which is under construction in the midwest part of Taiwan. JERA owns 44% of the project and the remaining 56% is owned by Australian investment bank Macquarie Group Limited.
- JERA also invested in two more Taiwanese offshore wind projects – Formosa 1 (128 MW) and Formosa 2 (376 MW). JERA will hold on to those two.
- JERA decided to pull out of Formosa 3 because building costs sharply increased due to COVID-19 and geopolitical risks between China and Taiwan.

Toshiba ESS supports solar projects to switch from FIT to FIP

(Denki Shimbun, Feb. 9)

- Toshiba Energy Systems (Toshiba ESS) will support Nippon Benex's switch from FIT to FIP for their three solar projects in Miyagi and Chiba prefectures.
- Corporate off-site PPAs were concluded for three solar power plants rented on roofs in eastern Japan that had operated under the FIT system.
- Toshiba ESS will support the transition to FIP as an aggregator. The power generated will be supplied to Kokusai Kogyo. The switchover will be completed in March or later.

- TAKEAWAY: While the FIT is a system to purchase renewable energy by fixed price for certain years, FIP is a system to purchase by market price plus premium. More importantly, while solar power suppliers can sell power to EPCOs, they need to find their customers by themselves. In view of this, Toshiba's new service is helpful because it won't only allow Nippon Benex to enjoy fixed income, but also secures customers to sell to.

Yufutsu Energy begins commercial operation for 75 MW biomass power plant in Hokkaido

(New Energy Business News, Feb. 6)

- Trading house Sojitsu Corp and Nippon Paper Industries began commercial operation of a biomass power plant in Hokkaido.
- The 75 MW plant is now one of Japan's largest biomass facilities.
- The plant runs on imported wood chips and palm kernel shell (PKS) as feedstock, and makes use of unused biomass resources in Hokkaido - such as thinned wood or forest residue. This will help to preserve Hokkaido's forests.

J-POWER begins demand-response in Hiroshima with 710 kW of power generation

(New Energy Business News, Feb. 8)

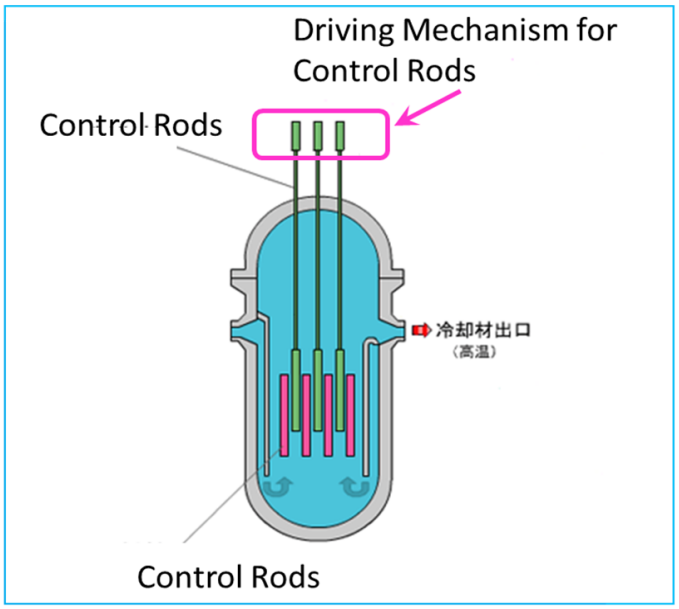
- J-Power and Mizu Mirai Hiroshima will cooperate on demand-response (DR) supply of electricity in summer and winter when electricity supply may be strained at peak hours.
- When power demand is tight during the summer and winter peaks of FY2023, the water utility plans to turn off pumps at its facilities. This will reduce power demand for a period of time and create nega-watts.
- As an aggregator, J-Power will combine the nega-watts supplied by Mizu Mirai with those supplied separately by its own facilities and use them as a regulating power source in times of tight power supply and demand.
- CONTEXT: *This kind of arrangement allows J-Power to avoid investing in new power capacity to meet peak demand, saving money.*

NRC rules out severe nuclear reactor accident as cause of automatic stop of Takahama unit 4

(Fukui Shimbun, Feb. 9)

- The NRC determined the cause of an automatic stop at Takahama NPP unit 4. It was a problem with the driving mechanism for the control rods.
- After the reactor was stopped, the remaining 46 control rods all fell into the reactor.
- Power output is controlled by the rods going up and down into the reactor core

- CONTEXT: *On Jan 30, Takahama unit 4 automatically shut down after an alarm warned of a sudden decrease in the amount of neutrons in the reactor. Since this trouble is not expected to be connected to past issues, the NRA decided to hear from KEPCO at an open meeting to determine the cause of the trouble and measures to prevent recurrence.*



(Source:The Federation of Electric Power Companies / FEPC)

NEWS: OIL, GAS & MINING

INPEX posts record revenue and profit on high gas and oil prices, weak yen

(Denki Shimbun, Feb. 10)

- INPEX posted a record revenue and net profit for FY2022.
- Revenue increased by over 86% to ¥2.32 trillion, while net profit increased by over 96% to ¥438 billion.
- The strong results owe to high oil and natural gas prices, combined with a weak yen.
- SIDE DEVELOPMENT:
  INPEX completes 5 km pipeline in north Kanto
  (Denki Shimbun, Feb. 8)
  - INPEX finished laying a 5.2 km natural gas pipeline in north Kanto, a significant upgrade for gas infrastructure between Sano (Tochigi) and Tatebayashi (Gunma).
  - The new pipeline complements an existing one.

Mitsui and Mitsubishi bullish on new LNG investment; see demand rising

(Denki Shimbun, Feb. 6)

- Trading houses Mitsui and Mitsubishi Corp are becoming more proactive in investing in LNG.
- Mitsui CFO Shigeta Tetsuya said his company would like to expand existing LNG investments and also begin new ventures.
- Mitsubishi said that the weighting of LNG within the company's energy portfolio would increase by over 20% by the mid-2020s.
- LNG is seen as a transitional fuel for which demand is expected to continue to rise.

Japan sets price caps on imports of Russian refined oil products; Sakhalin-2 excluded

(Government Statement, Feb. 6)

- Japan has set price caps on refined oil product imports from Russia, effective Feb 6. This follows the price caps on Russian crude in December.
- Price caps will apply to items with customs codes of 27.10, which pertain to refined oil products; the only exception will be waste oil and Sakhalin-2 products.
- CONTEXT: *When formulating sanctions against Russia, the G7 agreed to exclude the Sakhalin-2 project. The rationale was that if crude production stops at Sakhalin-2 as a result of the price cap, LNG production may be affected, and thus expand the energy crisis.*

Idemitsu to sell coal mine in Australia, leaving it with one coal mining asset

(Company Statement, Feb. 3)

- Idemitsu will sell its entire stake (85%) in Australia's Ensham coal mine to South Africa's Thungela Resources and two other companies. The fee is A$340 million upfront and a royalty payment based on the price and volume of coal sold from the Ensham mine in 2023 and 2024.
- After the sale, Idemitsu's only operating coal mine will be the Boggabri, in New South Wales, Australia. The Japanese energy firm has sold or stopped mining at its other thermal coal assets.
- Idemitsu expects to meet its domestic thermal coal contracts with just the Boggabri mine while also promoting the use of semi-carbonized wood pellets as an alternative for coal-fired power plants. Idemitsu has developed its own version of the pellets and plans to commercialize it.

Osaka Gas estimates loss due to Freeport LNG terminal outage at ¥150 bln

(Company Statement, Feb 6)

- CONTEXT: *Osaka Gas holds a 10.8% stake in the U.S. LNG operator Freeport, which has been offline since June 2022 following an onsite explosion and fire. Freeport has stopped exports since then and is still waiting for regulator permission to resume them.*
- Osaka Gas loss estimate assumes that it won't be able to receive Freeport LNG cargoes before the end of next month and that it will need to utilize alternative, more expensive fuel purchasing options, according to media reports.
- The ¥149.5 billion forecast loss is higher than originally estimated by the company.

LNG stocks of 10 power grids stood at 2.42 million tons, down slightly

(Government data, Feb. 9)

- LNG stocks of 10 power grids stood at 2.42 million tons as of Feb 5, down from 2.53 million tons a week earlier.
- The end-February stocks last year were 1.69 million tons. The five-year average for this time of year is 1.98 million tons.

Tayo Nippon and Astomos start talks to merge LP Gas businesses

(Company Statement, Feb 6)

- Taiyo Nippon Sanso, and Astomos Energy will begin talks to integrate their consumer LPG (liquefied petroleum gas) businesses. The merger is scheduled to take place in January 2024.
- The new company is expected to have ¥44 billion in revenue from the sale of about 240,000 tons of LPG.

ANALYSIS

BY YOSHIHISA OHNO

METI's Plan to Diversify Low-Carbon Fuels, And the Future of Biofuels

As part of the national Green Transformation (GX) program, which the ruling party chiefs approved last week, the energy transition roadmap through 2050 calls for the development of three carbon recycling technologies: sustainable aviation fuel (SAF), synthetic fuel and synthetic methane.

More than a year earlier, however, in October 2021, METI's Sixth Strategic Energy Plan called for more research on how to expand use of bioethanol and biodiesel, which are the more established low-carbon fuels growing in popularity in Europe and the Americas.

As such, Japan's energy policy seems to be supporting two different roadmaps for fuel decarbonization. On the one hand, GX wants to see the development of new low-carbon fuel tech that recycles CO2; on the other, METI is backing stronger utilization of biofuels that are already on the international market.

The apparent contradiction could be explained by looking at what Japan can implement now to reduce emissions this decade and what will drive the nation's decarbonization closer to the 2050 carbon-neutrality deadline. How the two pathways will co-exist, however, is less clear.

Background

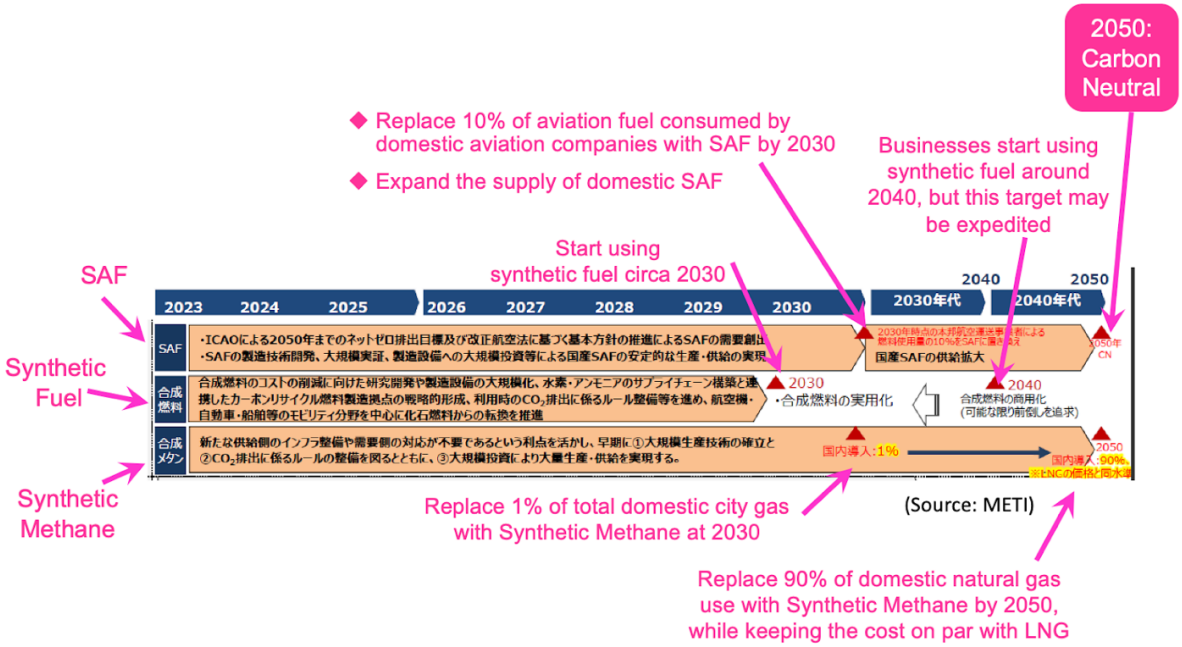
From Dec 23, 2022 to Jan 22, 2023, METI solicited public comments for its draft of the *Basic Policy to Implement a Green Transformation (GX)*. The draft law was approved by the joint meeting with 5 LDP committees including the GX Headquarters of PM Kishida's party on Feb. 8.

The GX policy paper calls for the development of low-carbon technologies such as those that can produce fuel that uses captured CO2. Over the next decade, R&D into this technology will be supported and accompanied by a necessary legal framework. Finally, the government plans to promote wide use of such fuels in the 2030s and 2040s, with an eye toward the goal of carbon neutrality by 2050.

According to the new policy, bioethanol and biodiesel won't play a major role in the GX, but they clearly align with the next-generation synthetic fuels outlined in the 6th Basic Energy Plan that was published in October 2021.

So far, METI has not clarified a detailed roadmap for existing biofuels, but has commented that: "The role of bioethanol and biodiesel should be decided in the future according to international trends".

So, what is the status of biofuel development and usage in Japan today?



Pioneering carbon recycling tech

【*SAF…Algae or woody biomass → Biojet fuel*】

According to the International Civil Aviation Organization (ICAO), SAF is defined as renewable or waste-derived aviation fuel that meets sustainability criteria. ICAO research shows that SAF has the greatest potential to reduce CO2 emissions for the aviation industry.

The ICAO has called for the industry to achieve net-zero CO2 emissions by 2050. Japan's goal by 2030 is to replace 10% of aviation fuel consumed by domestic airlines with SAF; this amounts to 1.3 million tons of fuel.

Major Japanese aviation firms are very focused on SAF. All Nippon Airways (ANA) plans to replace more than 10% of its fuel consumption with SAF by FY2030, and usually only SAF by 2050. Rival Japan Airlines (JAL) set a target of using SAF for 1% of its fuel by FY2025 and then matching ANA's 10% by 2030.

【*Synthetic Fuel…CO2+hydrogen → Liquid fuel*】

Synthetic fuels can be produced by synthesizing CO2 and hydrogen, which is why they are referred to as "artificial crude oil" or "e-fuel". Synthetic liquid fuels have an energy density much higher than that of fuels made from renewable energy sources and are suitable as direct replacements for existing engines and other equipment. They could work with internal combustion engines or oil refueling systems.

Large vehicles, vessels and aircrafts tend to struggle to travel long distances on battery power, but could switch to synthetic fuels while maintaining many of the operational characteristics. What's more, synthetic fuels can be produced in larger volumes than SAF, naturally creating separate market niches for the two.

A need for low-cost CO2 and H2O

According to the GX, over the next seven years METI plans to develop synthetic fuels tech while supporting the build out of the supply chain for hydrogen and ammonia.

This would allow for synthetic fuels to enter use in the 2030s and ramp up to commercial scale by the 2040s.

The challenge in developing viable synthetic fuel is how to secure a large amount of low-cost CO2 and hydrogen through renewable energy. One of the world's biggest projects in this field is taking place in Chile. The Haru Oni Project will capture CO2 from the atmosphere and use synthesis to combine it with hydrogen to make eFuels such as carbon neutral gasoline (eGasoline) and carbon neutral Liquefied Gas (eLG). While the fuels would release CO2 when burned, capturing the carbon is supposed to lead to a continuous cycle of its reuse and recycling.

No Japanese firms are active in the Chile project, so METI has decided to push e-fuels in the domestic market through a newly established public and private partnership. The PPP will get financing from the state's Green Innovation Foundation (GIF) for R&D into synthetic fuels. To date, only a handful of major Japanese companies such as Toyota, Nissan, Honda and ENEOS have begun research into synthetic fuels.

【*Synthetic Methane…CO2+hydrogen→Gaseous fuel*】
Synthetic methane is made from CO2 and hydrogen; "e-methane" is a synthetic methane made from CO2 and hydrogen produced by renewable energy sources. While synthetic fuels are mainly used for vehicles - cars, ships and airplanes - synthetic methane is mainly deployed by utilities in place of natural gas. In theory, synthetic methane could also fuel LNG-powered vessels; however, such plans have yet to materialize.

The GX strategy calls for e-methane to replace 1% of total utility gas consumption by 2030, and to increase that figure to 90% by 2050. According to the Japan Gas Association, switching just 1% of city gas demand to e-methane would cut emissions by about 800,000 tons of CO2 equivalent a year.

Should Japan manage to hit the 90% target, it would save 80 million tons of CO2, which is equivalent to 7% of the nation's current emissions total.

In addition to the environmental benefit, synthetic methane can utilize existing utility gas networks and equipment.

Demo-scale production and use of e-methane started earlier this year in the Fukushima prefecture, where engineering group IHI has started to supply the fuel to local government run buses.

A more meaningful amount will be produced domestically by Tokyo Gas from around 2025. By 2030, the company plans to import synthetic methane from the U.S.

Other Japanese firms interested in developing synthetic methane now include Osaka Gas, Saibu Gas, Hiroshima Gas, Toho Gas, Mitsui OSK Line, IHI, and Hitachi Zosen.

Near-term low-hanging fruit

The biggest gains for biofuels in the near term could come from increasing the ratio of bio stock to regular gasoline. Internationally, the practice of blending 10% of ethanol in every liter of gasoline is common. Japan, however, has among the world's lowest blending ratio, with just 1.7% of locally sold gasoline made up from ethanol as base

material of ethyl tert-butyl ether (ETBE).

These numbers may change as political support for a higher blending ratio in Japan picks up. In a joint announcement last year, President Joe Biden and Prime Minister Kishida said Japan will aim to double its bioethanol demand by 2030.

Implementation of the political pronouncement has been slow and policies remain vague. After all, the GX strategy barely mentions biofuels like ethanol. However, industry experts claim that Japan could score an easy win by increasing its 1.7% blending ratio to 10% (the so-called E10 standard), reducing emissions and cutting costs at the same time.

According to Nippon Environmental Energy Development (NEED), the price of E10 fuel is ¥8/ liter cheaper than regular gasoline. Moreover, global supply of ethanol is plentiful. If Japan introduced E10, its total ethanol demand would reach 2.47 million liters per year, NEED calculations show. That's a fraction of the 55 million liters produced in the U.S. and 38 million liters in Brazil.

At a time of energy security tensions, increasing the ethanol component in the gasoline mix could also help Japan eliminate the need to import crude from places like Russia, according to NEED.

Conclusion

Policy documents like the GX seek to paint ambitious targets and present a future that is at least a decade away. They present markers for the sector R&D and indicate which net-zero pathways the government will likely support with policies and funding.

In that sense, e-fuels or synthetic fuels that recycle carbon will grab most of the attention. However, in the more immediate future, METI is likely to open up the domestic market to existing biofuels and blended fuels to meet 2030 CO2 reduction objectives.

In the meantime, an area to watch is the evolution of nature-based biofuels. Today's green fuels are made from corn, wheat and sugar beet – a direct starch to sugar to ethanol process. But a so-called second generation of biofuels seek to harness cellulose matter like wood and plants and even city waste. The cellulose can be converted to sugar and then ethanol, while also not competing with food crops for land.

With so much R&D going in the sector, it is understandable why the government is keeping the roadmap for clean fuels vague. With several irons in the fire, Japan hopes for a chance to pick the best trends in the markets and technologies.

ANALYSIS

BY KYOKO FUKUDA

Cutting Back on Crude: Shooting for the Moon with Biodegradable Plastics

By the end of this decade, Japan hopes to have at least three new clean energy solutions for plastics, which has emerged as the fastest growing area for crude oil.

Plastics are everywhere, but few people realize the significant amount of fossil fuels that go into their production, and that they are a major product for the petrochemical industry. By 2030, the sector may account for as much one third of the world's petroleum demand, according to International Energy Agency forecasts.

According to Plastics Europe, 390 million tons of plastics were produced globally in 2021. Only 10% are recycled. Equally, only 10% of all plastics produced in 2021 came from a "green" source. Plastic-related GHGs constitute close to 3% of the world's CO2 emissions.

This makes the widespread use of plastic for both industrial and personal consumption an overlooked aspect of the energy transition. In addition to the threat from greenhouse gas emissions (GHGs) during their production, plastics carry the threat of environmental contamination since they break down very slowly, until they become microplastics that permeate every aspect of our environment. These materials were recently detected in the bloodstream of people, animals and fish.

According to the Center for International Environmental Law (CIEL), emissions from the plastics sector already rose 15% from 2012 to 2018. One year's worth of emissions from plastic production is estimated to contribute the equivalent of 189 large coal plants. That figure could triple by 2050, unless action is taken.

While Japan is not among the top 10 big plastic consumers in the world on a per capita basis, Japan ranks No. 2 in discarding plastic waste, which indicates that single-use plastics account for much of the total.

This is why Japan has embarked on an ambitious program to improve its sustainable impact, with special focus on finding a new generation of non-toxic plastics that won't detrimentally impact the environment. Last month, the so-called Moonshot R&D Program delivered promising early-stage results.

Background

Plastics are a very convenient material for the modern world – tough, durable, and readily available at an affordable price. But when discarded in public dumps the rains can slowly wash them to the ocean where they harm the fragile aquatic environment.

The United Nations Environment Program estimates that nine million tons of plastic flow into the sea annually, and that as many as 700 species in the sea, including endangered species, have been damaged by plastic tangles or accidental ingestion of plastic. This has adverse impacts on food chains and ecosystems.

The feedstocks for plastics are derived from natural gas processing, as well as from crude oil refining. Petrochemicals have become a huge moneymaker for oil and gas firms over the past decade. The IEA predicts that plastics' consumption of oil will outpace that of cars by 2050. Oil majors such as ExxonMobil are betting on this trend in the face of a shift to the electric-powered engine.

Left unchecked, this explosion of plastics would have a significant impact on global biosystems. Towards a solution, Japan has set up a new program that could find radical solutions to the plastics issue and other key areas of sustainability.

The Moonshot R&D Program was established in 2020 via the Council for Science, Technology and Innovation (CSTI) to promote ambitious R&D goals based on bold ideas that were not just extensions of conventional technologies. The program is led by NEDO, the state R&D hub, and aims to help the country create a circular and sustainable economy by 2050, as well as touting Japanese innovation on the global stage.

At present, there are 13 Moonshot projects and they are divided into three categories:

1) development of tech to recover GHGs and convert them into valuable materials;
2) development of tech to recover nitrogen compounds and convert them into harmless or useful materials; and
3) development of marine biodegradable plastics that can control the timing and speed of their degradability.

In mid-January, several groups of researchers working on plastics issues shared their latest progress results.

Solution 1: Degradable biopolymers

There are three Moonshot teams working to develop and commercialize an ideal polymer that degrades in the ocean. The first team is developing **multi-lock biopolymers made from non-food biomass** that can degrade in ocean water. This project is led by Dr. Kohzo Ito of the University of Tokyo and involves Mitsubishi Chemical, Bridgestone, Teijin, Kureha, Kyushu University, Nagoya University, Yamagata University, AIST, Ehime University, and the Tokyo Institute of Technology.

Dr. Ito and his team seek to develop an ideal polymer that remains tough during use and degrades easily when released into the environment, triggered by multi-lock degradation.

By late 2024, the team plans to fully develop technologies for commercialization of the new polymers. Then they'll set up the production process, optimize it, start mass production, and strive to bring costs down through 2027. By the end of 2029, the plan is to have the new material be ready for commercial production.

Organization/ Material	Technological Challenge	Target by 2029	Achievements (as of 2023)
Mitsubishi Chemical / Plastic	R&D of multi-lock type biopolymer using non-edible biomass	Produce polyester from non-edible material with 40% of degradability in 30 days (at 25°C), while achieving a toughness 10 times that of existing bio-polymers	With an additive, degradability increased drastically with some speed control; toughness increased with polyrotaxane
Bridgestone / Tire	Development of polymer/tire that is tough and durable yet degradable using non-edible biomass	Start production of tires from bio-tough-polymer at pilot level; confirm acceleration of degradability	Successfully developed rubber to achieve degradability that's 10 times faster than current products, yet with twice the toughness
Teijin / Fiber	Enable non-degradable polymer (PET) to be degradable and more durable using bio-based material	Develop multi-lock type bio-tough-polymer with high degradability, and set up production; launch operation of monomer synthesis equipment; target degradability of 90% in six months at 30°C	Identified seven kinds of PET oligomer bacteria. Succeeded in developing PET polymer with biodegradability, yet durable enough for practical use
Kureha / Fishing net	Development of a fishing net using biopolymer from polyamide 4 and polyglycolic acid	Develop a material that has both durability and marine degradability (80% within three years); confirm the probability of commercialization using a pilot plant	Developed a fishing line that's as tough as a non-degradable product but which also has reasonable degradability; the fishing line accelerates degradation once it is sunk in ocean water
Academia / Multi-lock	Making the polymer durable yet degradable; development of a multi-lock structure	Achieve degradation that's 10 times faster, and durability that's 10 times current products; activate the degradation enzyme and accelerate the process	Polyrotaxane helped maintain both durability and degradability and a multi-lock structure was established; improved activation of degradation enzymes and increased their production volume

Solution 2: Switch functions

A second team is investigating marine **biodegradable plastics with degradation initiation switch functions**. Led by Dr. Kenichi Kasuya of Gunma University, project members are from the University of Tokyo, Tokyo Institute of Technology, Institute of Physical and Chemical Research, and Japan Agency for Marine-Earth Science and Technology (JAMSTEC), and supported by Kaneka and Nisshinbo Chemical.

Among currently available biodegradable plastics, only a few are able to degrade in the ocean. The best examples are polyhydroxy alkanoic acid (PHA) and polycaprolactone polyester (PCL). But even these two take six to seven years or longer to degrade, so the research team is trying to devise a so-called "switching function" to shorten the time to two years or less.

In 2020-2022, more than 40 different kinds of switches and new materials were tested by placing them deep under the ocean off the coast of Japan where there's a lot of plastic waste. Some of those switches were collected for verification and analysis.

As a result, the team developed four of the most promising switching functions, which trigger degradation of the material when it flows into the ocean or touches sea bottom.

Using this know-how, the team aims by 2029 to develop at least three new biodegradable plastics that degrade 90% or more within six months in water at a temperature of 30°C. In addition, the team will create a new marine bio-degradable material using biomass and CO2 as main ingredients.

Solution 3: Edible plastics

A third project is focused on one of the most innovative and promising technologies – **ocean degradable plastics with edibility**. The project is led by Dr. Tatsuo Kaneko of Japan Advanced Institute of Science and Technology (JAIST) in partnership with Kobe University, Nagoya University, Kagoshima University, Tokyo University of Science, Tokyo University of Agriculture and Technology, AIST, and the Osaka Research Institute of Industrial Science and Technology (ORIST).

The team aims to develop photo-switching, ocean-degradable plastics. This photo-switch, however, isn't turned on by any light source, but rather turned on only under specific conditions, such as in the ocean or alkaline underwater environment.

The goal is to make the plastic "edible" – meaning it will be soft and easily degradable by water and light, or it decomposes in the digestive tract, and decomposes completely with nothing left undigested.

As of today, the team has successfully developed a bio-nylon polymer with marine biodegradability from sorghum. They've also identified composites of photo-switch models that are fed to marine life and have so far been digested with no negative effects.

The extraordinary work of these Moonshot projects gives hope that a major breakthrough is on the horizon. The hope is that once biodegradable plastics are commercialized, the world will again see cleaner oceans.

Yet with these solutions only expected to be widely available by 2030, will a solution come too late? In seven years even greater amounts of plastics will have poisoned our oceans, our food sources and thus, ourselves. Plastics are convenient and indispensable for modern lives, but they also leave a strong impact on the environment.

Experts say that the issue of cost remains the biggest obstacle for biodegradable plastics. If these solutions are too expensive, then they won't be widely implemented. At some point, society may need to start putting a value not only on CO2, but also on human health.

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.*

Algeria/ Oil and gas
Chevron is in talks to conduct energy exploration with state-owned Sonatrach, the third-biggest natural gas exporter to the EU. Nearly 85% of Algeria's gas exports already go to the EU, but it plans to double that volume.

Asia/ Pipelines
Over the next five years, about $24 billion is expected to be spent on subsea and offshore pipelines in Asia Pacific, according to Wood Mackenzie. In 2023 alone, about $6.4 billion will be spent to upgrade the region's subsea and offshore pipelines, up 64% from the $3.9 billion spent in 2022. Australia will be the largest destination for subsea investment,

China/ Energy transition
China again led the world in clean energy investments, accounting for nearly half of low-carbon spending in 2022. Beijing invested $546 billion; the EU – $180 billion, and the U.S. – $141 billion, reported Bloomberg.

Denmark/ Carbon capture
The first licences to capture and store carbon went to Wintershall Dea, INEOS Energy and TotalEnergies. By 2025, the $65 million Greensand project will annually inject up to 1.5 million tons of CO2 into depleted North Sea oil and gas fields. Annual capacity will increase to 8 million tons by 2030.

Denmark/ Wind power
The Danish Energy Agency suspended reviews of existing and new applications for installing wind farms and other renewable energy projects, citing a potential conflict with EU law.

India/ Hydrogen
TotalEnergies paused a $4 billion investment in a green hydrogen project that involves taking a 25% stake in Adani New Industries. Total has just over $3 billion of investments with Adani, including in gas distribution and solar projects.

India/ Natural gas
ONGC Videsh, the overseas exploration arm of the Oil and Natural Gas Corp, is looking for opportunities in Africa and Latin America. PM Modi said India's gas demand will rise 500%, while its share of global oil demand will double. Modi, however, didn't specify a timeframe for those increases.

Italy/ Natural gas
"REPowerEU", the EU's plan to wean itself off Russian gas and turn Italy into an energy hub, might help build the so-called SoutH2 Corridor. This link would bring hydrogen produced in North Africa to northern Europe.

Nord Stream

U.S. investigative journalist Seymour Hersh published a report accusing the White House of ordering the destruction of the Nord Stream pipeline in September, and that Norway cooperated. Both the U.S. and Norway producers have profited from selling gas to the EU in place of Russian supply. The White House denied the accusation.

Russia/ Oil

Since Asia is now the leading buyer of Russian oil, the EU will no longer set the reference price for Urals crude. Around 70% of January-loading cargoes of Urals oil is destined to India. In return, Russia is now India's largest supplier of oil, replacing Iraq.

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

May	○ May Golden Week holidays (May 3-5) ○ General election in Thailand (May 7) ○ World Hydrogen Summit (May 9-11) ○ G7 Hiroshima Summit (May 19-21)
June	○ 35th OPEC and non-OPEC ministerial meeting (June 4) ○ IEA annual global conference on energy efficiency (June 6-8) ○ General and presidential election in Turkey (June 18) ○ Lithium Supply and Battery Raw Materials 2023 (June 20-22) ○ Happo Noshiro, Murakami-Tainai, Oga-Katagami-Akita and Saikai-Eshima wind project auctions close (June 30) ○ 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) ○ 2023 UN SDG Summit (September 19-20)
October	○ IEA World Energy Outlook 2023 Release ○ BP Energy Outlook 2023 Release ○ Connecting Green Hydrogen Japan 2023 ○ Japan Wind Energy 2023 summit
November	○ COP 28 (November 30-December 12) ○ U.S. hosts the APEC summit in San Francisco
December	○ ASEAN-Japan summit to mark 50 years of cooperation ○ Last market trading day (December 30)

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