

# JAPAN'S PATH TO DECARBONISATION

IN ITS LATEST STRATEGIC ENERGY PLAN, RELEASED IN JULY 2018, THE FIFTH STRATEGIC ENERGY PLAN, THE GOVERNMENT OF JAPAN CONFIRMED ITS OVERALL GOAL OF DECARBONISING JAPAN'S ENERGY MIX BY 2050. BY **JOSEPH KIM**, PARTNER, **MICHAEL LYNCH**, SENIOR ASSOCIATE AND **CHIYOKAZU SHINDO**, SENIOR ASSOCIATE, **HOGAN LOVELLS**, TOKYO OFFICE.

Japan's energy mix has been forever changed by the events of March 11 2011 when the country was rocked by a severe earthquake, triggering a tsunami that destroyed Tokyo Electric Power Company's Fukushima Daiichi Nuclear Power Station, causing the meltdown of the nuclear reactor and a subsequent backlash against nuclear power, the Fukushima Disaster.

In the immediate aftermath, all 39 of Japan's nuclear power stations were shut down and seven years later only nine have come back online. From that moment onwards, Japan became determined to ensure that renewable energy would play a far greater role in its energy future.

This article will examine the policy initiatives and practical results that have occurred in the renewable energy sector in Japan since that time, and what we can expect in the years ahead, in particular what developments the market can expect to see in the offshore wind market.

## Renewable energy development plan

In its latest strategic energy plan, released in July 2018, the Fifth Strategic Energy Plan<sup>1</sup>, the Government of Japan (GoJ) confirmed its overall goal of decarbonising Japan's energy mix by 2050.

There is now huge official momentum behind the expansion of renewable energy, with wind being prioritised over other sources. Indeed, the official stated goal is that by 2030, renewable energy is expected to reach 22% to 24% of the energy mix. It is currently around 12%.

While nuclear power is projected to remain at its current level of 20%–22%, LNG is projected to decrease from about 40% to 27% of the energy mix by 2030.

Industry trade body the Japan Wind Power Association (JWPA) projects that by 2030 there will be at least 10GW of offshore wind energy, of which 6GW will be the fixed type and 4GW will be floating, and that further, onshore wind energy will grow to 27GW from a current level of approximately 9GW.

JWPA notes that the GoJ has set ambitious and clear goals for the introduction of offshore wind power projects, which are 10GW by 2030 and 37GW by 2050. JWPA expects that the 2030

10GW goal can be achieved as a result of the New Law (defined below), whereby additional operations generating about 7GW are expected to start, in addition to existing offshore projects that are expected to generate about 5GW and that are currently undergoing environmental impact assessments.

Specifically, according to the JWPA prediction, currently planned projects will generate 5,043MW and predicted future projects will generate 7GW; therefore, the total power output in 2030 from offshore wind will be about 12GW, and so the 2030 10GW goal can be achieved.

See the below charts from the Ministry of Economy, Trade and Industry (METI) that show the projections for renewable energy by FY 2030.

## Solar

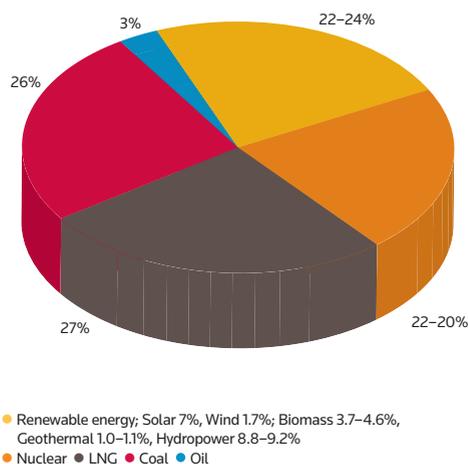
While the focus on developing renewable energy has never been greater and with a major focus now on wind, this has been preceded by a solar boom during which Japan's solar sector grew from 13.6GW as of end-2013 to 48.6GW by end-2017.

This rapid growth was driven largely by Japan's attractive feed-in-tariff (FiT) mechanism, introduced following the Fukushima Disaster. However, in September 2018 the GoJ announced a transition away from FiT to competitive auctions for the procurement of solar projects with 2MW or more, and FiT subsidy cuts for smaller-scale projects, which is expected to slow growth in Japan's solar power sector over the coming decade.

Indeed, in the first auction for contracts to provide solar electricity, which occurred in November 2017, tariffs were pushed down by nearly a quarter from the FiT applicable earlier in 2017. The lowest accepted price for solar projects was ¥17.20/kWh (US\$0.15/kWh), according to documents from METI. The GoJ was seeking bids for 500MW of capacity, but secured valid bids for just over 140MW.

In the second such auction, which occurred in September 2018, none of the nine bids received by the Green Investment Promotion Organisation were below the ceiling of ¥15.50/

**FIGURE 1 - PROJECTED ENERGY MIX (FY 2030)**



kWh and therefore no award was made. Further, METI has revoked FiT approvals for solar projects totalling 14.6GW of capacity, out of 84.5GW of projects that had been approved under Japan’s old FiT scheme because the developers had failed to achieve COD by a March 31 2017 deadline.

METI’s aim is to push down the costs of solar sufficiently low so as to ultimately render solar power economical as a large-scale power source in the future. Although slowing down, nevertheless Japan is forecast to add an additional 14GW of solar power between 2020 and 2027<sup>2</sup>.

**Wind**

Development of wind power is now the main focus of METI and the GoJ. Because of its mountainous topography and high population density in the habitable areas, securing availability of sites is a huge challenge for onshore wind project development, also now the case for solar. Hence the recent emphasis within wind power has been on the development of an offshore wind industry.

The country has an estimated offshore wind power potential in excess of 600GW and this informs the JWPA’s target to develop at least 10GW of offshore wind power by 2030, and 37GW by 2050<sup>3</sup>.

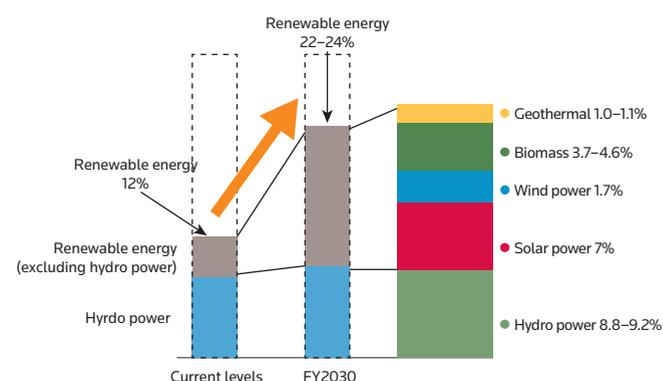
JWPA reports that there are currently just 65MW of offshore wind projects in operation but 5GW of new offshore wind projects are already in the planning stage and JWPA predicts that by 2030 there is the potential for up to an additional 7GW of new offshore wind projects.

In support of this policy to promote offshore wind, we note that the Japanese government has decided to maintain a ¥36/kWh (US\$0.32/kWh) FiT for fixed offshore wind power until fiscal year 2019/20 and for floating offshore until fiscal year 2020/21, amid cuts to the onshore wind tariff.

Further, although the current legislation applicable to offshore wind projects is

**FIGURE 2 - RENEWABLE ENERGY**

TWO-FOLD INCREASE FROM CURRENT LEVELS (FROM 12% TO 22-24%)



fragmented and disjointed, the Japanese government is also aiming to pass a new law entitled Promotion of Use of Sea Areas to Develop Offshore Renewable Energy Facilities<sup>4</sup>, the New Law, by early 2019, in order to stimulate investment in the sector.

**The New Law**

On 22 November 2018, the Lower House of the Diet finally passed the Offshore Wind Bill and on 30 November 2018 the Upper House approved it, meaning that it has now been formally approved by the Diet. The New Law will become effective by spring 2019. The New Law seeks to establish a number of wind energy development zones, termed Promotion Zones within which offshore wind projects will be granted occupancy permits, following a competitive auction process. According to the New Law, the New Law, developers will be required to submit a bid price and occupancy plan and METI/Ministry of Land, Infrastructure, Transport & Tourism (MLIT) will select the winning bidder with the most competitive prices and the most suitable occupancy plan, which also needs to be approved by a specially formed local council (kyogikai) for the relevant Promotion Zone.

Such local council comprises the representatives of METI, MLIT and local stakeholders, which will include fishermen’s trade lobbies, local and regional politicians etc. Such local stake-holder consensus building and support will be particularly crucial to the development of new offshore wind projects, considering that Japanese fisheries and shipping groups have historically been opposed to the development of projects that could conflict with their own operations.

The New Law is expected to stimulate growth in the sector by setting a nationwide standard of a maximum 30-year Occupancy Permit<sup>5</sup>. There are currently no unified laws for the use of offshore and general waters in Japan, meaning that prefectures develop their own frameworks.

At present, offshore wind projects may be granted 20-year permits if they operate in the Ports and Harbour area, whereas in the territorial waters, wind projects may only be granted occupancy permits for between three and five years, depending on the prefecture. While such three to five-year period may be renewed, it is not a stable basis upon which project developers or lenders can be encouraged to develop or finance large offshore projects.

The long-term occupancy permits, the designation of certain “promotion zones”, the involvement of local councils and the added clarity regarding the government’s basic policy regarding offshore wind projects under the New Law are expected to stimulate growth in the sector.

i) *Designation of the Promotion Zones* – The precise location of the Promotion Zones have not yet been revealed; however, under the New Law, the Ministers of METI and MLIT may designate as Promotion Zones areas within the Japanese territorial sea and internal waters that comply with the below standards:

- Natural conditions such as meteorological and hydrographic conditions are appropriate for operating offshore wind power facilities and the power output from such facilities will be adequate;
- The offshore wind power facilities will not interfere with the use, maintenance and management of shipping routes, as well as with the business of any nearby port and harbour area;
- The closest port and harbour area can be utilised for the purposes of transportation of labour and materials that are required for setting up and maintaining, as well as managing, offshore wind power facilities;
- It is predicted that a connection can be made between the offshore wind power facilities and the electricity grid maintained and operated by electric power suppliers; and
- It is predicted that operating offshore wind power facilities will not interfere with eg the fisheries industry, etc<sup>6</sup>.

ii) *Guidelines for the Auction* – Also, following the passing of the New Law, the Ministers of METI and MLIT will be required to publish detailed guidelines for the auction (Auction Guidelines)<sup>7</sup>. The guidelines will clarify the following:

- The size of the required offshore wind power facilities;
- Areas of occupancy within the Promotion Zones for offshore wind power facilities;
- Timing for commencement of the occupancy within Promotion Zones for offshore wind power facilities;
- Standards of output power for offshore wind power facilities;
- Standards for participants’ qualifications for auctions;
- Amount of the bid guarantee deposit, method and deadline for providing such deposit etc;

- Maximum limitation of the supply price;
- Method of deciding the procurement price under the Act on Special Measures Concerning Procurement of Electricity from Renewable Energy Sources by Electricity Utilities (Renewable Energy Act);
- Term of the procurement under the Renewable Energy Act;
- Deadline for the certification for those that are selected by public auction as winning bidders;
- Matters in relation to integrated use of port and harbour areas within the Promotion Zones;
- Matters in relation to the decommissioning of offshore wind power facilities;
- Effective term of the occupancy certification;
- Matters in relation to the communication/interaction between those that operate wind power facilities, the governor of each prefecture and mayor of each municipality; and
- Standard of assessment for selecting successful bidders<sup>8</sup>.

iii) *Occupancy Plan* – Developers that wish to bid in the auction process must submit “Occupancy Plans”. The Occupancy Plans should describe:

- The intended occupancy location within the particular Promotion Zones;
- The intended term of occupancy within the Promotion Zones;
- Technical details regarding the proposed offshore wind power facilities;
- Construction method;
- Timing of the construction;
- Expected power output of the proposed offshore wind power facilities;
- Supply price;
- Maintenance and control methods for the offshore wind power facilities;
- Matters in relation to the integrated use of ports and harbours regarding transportation of labour and materials;
- Methods of decommissioning;
- Organisation and capability for communication/interaction between those that operate offshore wind power projects and the chiefs of relevant administrative bodies as well as the governor of the relevant prefecture and mayor of the relevant municipality; and
- Plans for financing the project, etc<sup>9</sup>.

iv) *Review, selection and certification*

– Ministers of METI and MLIT will review the occupancy plans submitted by bidders considering the below factors that:

- Supply price is appropriate from the Auction Guidelines’ point of view;

At present, offshore wind projects may be granted 20 year permits if they operate in the Ports and Harbour area

**TABLE 1 - SUMMARY OF REGULATORY CHANGES**

Previous regulation	Solutions under the New Law
1. Lack of unified laws regarding occupancy permits	<ul style="list-style-type: none"> <li>The New Law creates a system where the government designates "Promotion Zones" for offshore wind power businesses,</li> <li>Winning bidders are selected from an auction process and are granted long term occupancy permits (maximum thirty years).</li> </ul>
<ul style="list-style-type: none"> <li>No national laws for occupancy permits in general waters – varies by prefecture</li> <li>Each prefecture may allow a business entity to occupy, but for only three to five years. Lack of regulation detracts from mid or long term business planning and so it is difficult to finance</li> </ul>	
2. No forum to negotiate with parties who have pre-existing interests (such as fishermen and marine carriers)	<ul style="list-style-type: none"> <li>The New Law creates "councils" (kyogikai) comprised of various local parties and stakeholders which have an interest in offshore wind development in their region</li> <li>Councils discuss with related authorities when designating the Promotion Zones and assessing individual bids.</li> </ul>
3. High cost	<ul style="list-style-type: none"> <li>The New Law introduces a price bidding system in order to ultimately reduce the cost to electricity consumers by bolstering competition</li> </ul>
<ul style="list-style-type: none"> <li>FIT price is expensive (i.e. ¥36/kWh) compared to the standard FIT in European countries – ultimately consumers bear this cost</li> <li>There is a lack of offshore wind developers with sufficient experience</li> </ul>	

Source: METI<sup>13</sup>

- Proposed occupancy areas will not materially interfere with the other users of the relevant Promotion Zone; and
- Offshore wind facilities and their methods of maintenance and control comply with standards provided by METI and MLIT<sup>10</sup>.

Ministers of METI and MLIT will select those that submit occupancy plans that are most appropriate to operate offshore power projects on a long-term basis, in a stable and efficient manner<sup>11</sup>. Ministers of METI and MLIT will certify the occupancy plan submitted by the successful bidder by designating the occupancy areas and the terms of the Promotion Areas<sup>12</sup>.

**Summary of the regulatory changes**

The New Law is expected to introduce several key regulatory changes, as summarised below in Table 1.

**Environmental Impact Assessment**

Environmental Impact Assessment Law<sup>14</sup> (Act No. 81 of 1997, as amended, the EIA Law) applies a full EIA process to offshore wind farms with net capacity greater than 10MW. It is a notoriously lengthy process – the standard process typically lasts three to four years from start to finish.

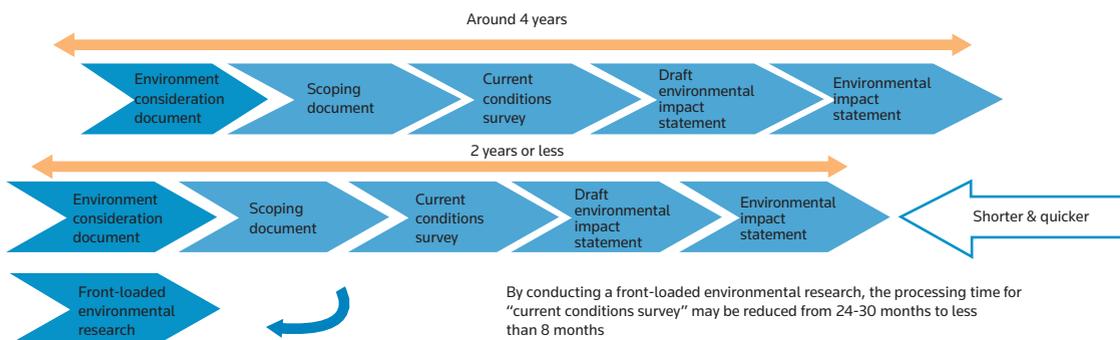
In parallel with the momentum behind the passing of the New Law, efforts are being made to streamline the EIA approval process and it is now possible to "front-load the Environmental Impact Assessment" research process. In front-loading the EIA, the overall approval process can be completed within approximately two years. Note that construction of the project cannot commence until the EIA approval is obtained, at the end of the review of the final Environmental Impact Statement.

During construction of the project, the environmental impact is monitored in a follow-up survey. After construction is completed, the developer of the project is required to provide an impact mitigation report describing issues identified during construction and the steps the developer will take going forward to mitigate such issues.

**Challenges for Japan Offshore wind**

Despite the attractive FiT, there remains caution as to whether projects can be developed in a cost-efficient and timely manner. For example, it was announced in January 2017 that Marubeni Corporation cancelled an offshore wind project by Kashima port in Ibaraki prefecture due to concerns about costs and profitability<sup>15</sup>.

**FIGURE 3 - ENVIRONMENTAL IMPACT ASSESSMENT**



Source: Ministry of Environment (MOE)

**TABLE 2 - ENVIRONMENTAL IMPACT ASSESSMENT PHASES**

No.	Stage	Previous regulation	Front-loaded procedure
1	Government review of "Preliminary Environmental Impact Consideration" document	3 months	3 months
2	Government review of EIA Scoping Document	6 months	5.5 months
3	Current conditions survey	24-30 months	8 months
4	Government review of "Pre-EIS" document	9 months	6.5 months
5	Government review (and approval) of "EIS" document	1 month	10 days

The primary cost concern is the lack of economies of scale in Japan for construction of offshore wind projects. The cost of floating wind turbines is much higher than established fixed-bottom offshore wind monopiles.

Only 53MW of offshore wind capacity is currently installed in Japan, and as a consequence, the supply chains are insufficient to support a substantial step-up and a decrease of costs.

Building such domestic manufacturing capacity takes time, and more domestic expertise will be required for Japan to realise its offshore wind potential. This could nevertheless be stimulated by government measures to encourage foreign manufacturers to set up manufacturing bases in Japan.

Further, Japan's bathymetry is unusually challenging, with very deep waters very close to the shoreline, in comparison to the average depths in European waters where offshore projects have been developed. Add to this the severe weather conditions in Japan such as typhoons, earthquakes and tsunamis, which will clearly stress any offshore installation and which in some areas may make floating offshore turbines the only viable option. This creates an additional challenge for the industry sector.

The below table, Table 3, identifies the most suitable areas for offshore wind development along the Japanese coastline. The best wind resources are in Tohoku and Hokkaido.

#### Regional utility cooperation

There is the additional problem that as the introduction of renewable energy continues to expand, the capacity of the current grid network will need to be upgraded and expanded to make interconnection of the offshore wind projects possible. The 10 different regional grids in Japan have historically functioned in a separate, self-contained fashion with differing voltage and other technical standards.

In some areas, particularly in the Tohoku and Kyushu regions, the existing grid is actually not stable enough to absorb intermittent energy dispatched from renewable energy projects and since existing nuclear, thermal and hydro are prioritised in terms of dispatch, any potential curtailment by utilities is a risk factor that renewable energy developers and lenders in Japan need to consider carefully.

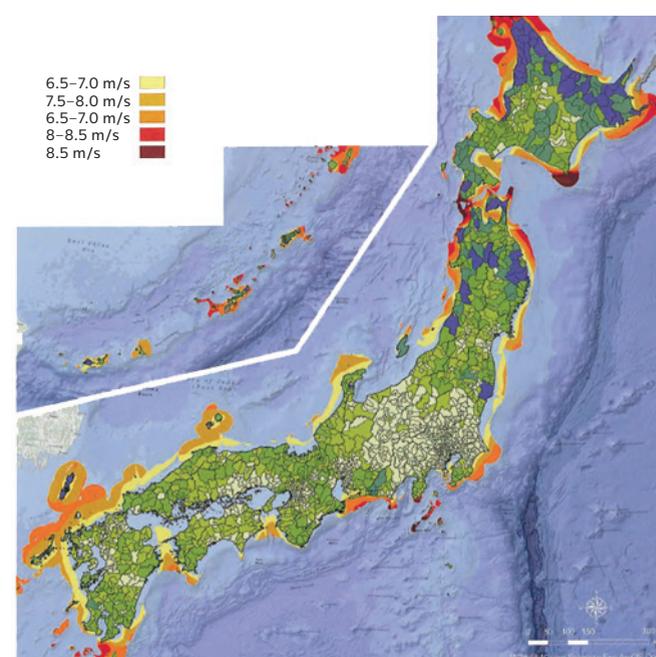
This is particularly the case in one of the areas that has the best wind resource – Tohoku,

where their grid system is currently undergoing a significant enhancement process in order to accommodate more power produced by renewable energy projects. However, there is no assurance that curtailment will not take place after the grid enhancements.

Indeed, on October 12 2018, Kyushu Electric Power Company requested that solar power generators halt operations for part of the following day<sup>16</sup>.

With falling temperatures reducing the need for air conditioning, demand for electricity was expected to drop. Even after sending some of the excess power outside the Kyushu region and storing some more, it was expected to have 430MW remaining, unused.

Disparities in the supply and demand of electricity can potentially lead to blackouts. Kyushu Electric has attempted to rectify this

**FIGURE 4 - WATERS SUITABLE FOR OFFSHORE WIND POWER GENERATION**

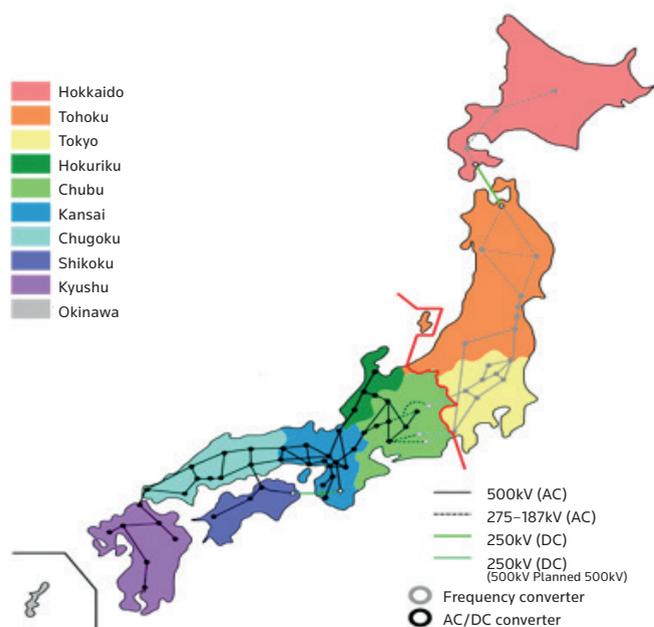
Source: JWPA

**TABLE 3 - THE WIND MIX**

Location	Potential	Average wind speed at 80m
Onshore	210 GW	6.0m/s
Fixed offshore	155 GW	7.0 m/s
Floating offshore	300 GW	7.5 m/s
<b>Total</b>	<b>665 GW</b>	

Source: METI

FIGURE 5 - ELECTRICITY GRID AND COMPANIES IN JAPAN



Source: Callum Aitchison

issue by reducing dispatch of solar power during certain times of the day.

This is the first time in Japan that a utility has asked renewable energy producers across a large area to cut output. Therefore, curtailment for renewable energy projects is a real risk at the moment and grid capacity will need to be substantially enhanced if Japan is serious about decarbonising its energy mix. The diagram below shows the ten different grid regions across Japan and the varying technical standards.

**Conclusion**

The integration of additional renewable energy into the grid system will continue to present a challenge to the existing grid infrastructure and as a result, we expect increased deployment of smart grid development across Japan. Expansion of wind power will need to be balanced by an expansion of electricity storage systems.

We note that the New Law is silent on this point but it strikes us that government incentives are required in the area of electricity storage to give renewable energy developers confidence that their projects will

The target to expand to 10GW of offshore wind power by 2030 seems ambitious in the absence of an established domestic supply chain

be dispatched, either immediately or following a period during which the energy is stored – noting that improvements to electricity storage technology are required in order for it to be deployed for large renewable power projects.

The target of expanding to 10GW of offshore wind power by 2030 from a very low starting point seems ambitious in the absence of an established domestic supply chain and expert local workforce.

However, we see this as a tremendous opportunity for Japan to attract foreign direct investment in offshore wind projects, build its own domestic industry around offshore wind, revitalise isolated coastal towns with employment and economic stimulation, and become a world leader in the technology and engineering that offshore wind requires.

Further, if Japan is truly serious about leading with renewables, it must revisit the priority of dispatch, such that renewables are prioritised, at least over thermal power.

Because of its unique energy environment, including its topography, climate and dense population concentrations around the major cities, we predict that Japan will continue on a multi-track approach to sourcing and managing its energy and will continue to use nuclear to a limited degree.

However, the New Law represents a significant step forward by the GoJ to stimulate growth in the offshore wind sector. Combined with the streamlining of the EIA process and eventual enhancement of grid systems, it is clear that offshore wind projects will play an increasingly important role in Japan’s energy mix in the years to come. ■

**Footnotes**

- 1 - The Fifth Strategic Energy Plan ([http://www.meti.go.jp/english/press/2018/pdf/0703\\_002c.pdf](http://www.meti.go.jp/english/press/2018/pdf/0703_002c.pdf))
- 2 - BMI Research, Japan Renewables Report, 19 October 2018
- 3 - <http://jwpa.jp/englishsite/jwpa/vision.html>
- 4 - (<http://www.meti.go.jp/press/2018/11/20181106001/20181106001-3.pdf>)
- 5 - Para 3 of Art 13 of the New Law
- 6 - Para 1 of Art 8 of the New Law
- 7 - Para 1 of Art 13 of the New Law
- 8 - Para 2 of Art 13 of the New Law
- 9 - Para 2 of Art 14 of the New Law
- 10 - Para 1 of Art 15 of the New Law
- 11 - Para 3 of Art 15 of the New Law
- 12 - Para 1 of Art 17 of the New Law
- 13 - [https://www.renewable-ei.org/pdfdownload/activities/03\\_METI\\_TakyuaYamazaki.pdf](https://www.renewable-ei.org/pdfdownload/activities/03_METI_TakyuaYamazaki.pdf)
- 14 - (<http://www.env.go.jp/policy/assess/2-2law/pdf/EIAA.pdf>)
- 15 - <https://www.windpoweroffshore.com/article/1420784/marubeni-cancels-part-port-based-project>
- 16 - <https://asia.nikkei.com/Spotlight/Environment/Japan-to-slash-fixed-prices-for-solar-power-feed-ins>