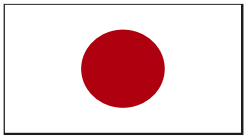
European Commission

Sectoral Study:

Analysis of the offshore wind tender results in Japan

October 2022



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This report represents the status of the Japanese offshore wind sector through June 2022.

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1. Introduction

Offshore wind power (OWP) has become a major source of electricity in many parts of the world. The Government of Japan has announced its intention of constructing 30-45 GW of offshore wind capacity by 2040 in support of attaining carbon neutrality by 2050. In the first offshore wind tender held under the Act on Promoting the Utilization of Sea Areas for the Development of Marine Renewable Energy ("Marine Renewable Energy Act" or "MREA") in late 2021, three commercial-scale offshore wind projects were awarded a feed-in tariff (FIT) for the delivery of electricity in the late 2020s. Together, the awarded Akita Noshiro-Mitane-Oga, Akita Yurihonjo, and Chiba Choshi projects amount to a total capacity of 1,689 megawatts (MW). The FIT level for this most recent tender in 2021 was determined competitively through a combination of price and non-price criteria. The resulting FIT levels, all awarded to the winning Mitsubishi-led consortia, were far below the expectations of many industry observers, reaching levels of 11,990-16,490 ¥en/MWh. A future tender under MREA is scheduled to be held in late 2022. Earlier FITs were awarded under the Port and Harbor Act to smaller scale projects in 2015 and at a pre-determined level of 36,000 ¥en/MWh in the Akita Noshiro Port area.

This first commercial-scale round of offshore wind tendering under MREA was held against the backdrop of an accelerating offshore wind deployment and procurement activity globally. In Europe, the United States, and Asia, offshore wind capacity has been procured through a variety of support regimes with a select few tender awards in Europe even being labelled as 'subsidy-free' (i.e., implying that they operate by directly selling into wholesale power markets without any subsidy payments from governments). In this report, we provide an analysis of the Japanese tender procedures and results and compare those to the results obtained in recent European and U.S tenders. This can provide a perspective on the competitiveness of the Japanese tendering regime and OWP sector at large. We also discuss the evolving tendering design in Japan, assess price drivers, and make recommendations of how the tendering design could be improved to ensure fair, transparent, and consumer-oriented tendering of OSW in going forward. The study was conducted based on a review of the relevant literature, the use of an existing price model to harmonize global tender results, and a limited set of expert consultations. The study is organised as follows:

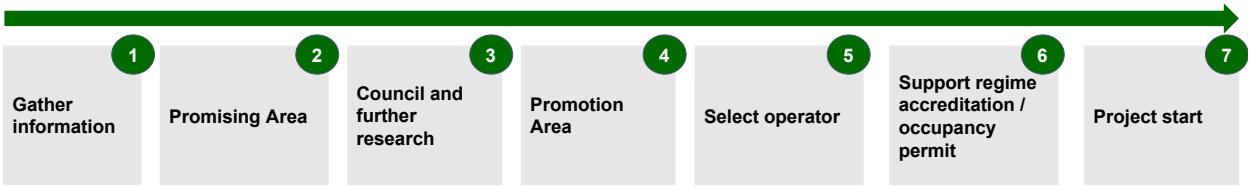
- Section 2 provides an overview of Japan's OWP tendering system, including the legislative framework, procedures, evaluative criteria and awarded support regime;
- Section 3 consists of a comparative evaluation of the prices established in recent Japanese tenders compared to those in other major OWP markets globally;
- Section 4 discusses potential factors impacting the OWP tender prices in Japan and that could account for differences in comparison to other global markets;
- Section 5 provides recommendations for increasing fair tender competition in the Japanese OWP market as a means of ensuring lasting and economically-efficient deployment of OWP in Japan; and
- Section 6 (Annex) includes details on the methodology applied in the price analysis.

2. Japanese Tender Design

Japan's commercial-scale offshore wind sector is regulated primarily by the *Act on Promoting the Utilization of Sea Areas for the Development of Marine Renewable Energy* (Act No. 89 of 2018; hereafter the "Marine Renewable Energy Act" or "MREA"). Taking effect on 1 April 2019, the MREA sets out the process by which all maritime areas not under the administration of the country's ports and harbours can be designated for offshore wind development by the Ministry of Economy, Trade and Industry (METI)

and the Ministry of Land, Infrastructure, Transport and Tourism (MLIT) (the "Ministers"). MREA also establishes guidelines for conducting the tender process. The MREA governs Japan's territorial waters up to 12 nautical miles (nm) from the coast except for ports and harbour areas. [1]

Figure 1.Tender process for OWP in Japan



A series of steps are involved in developing offshore wind projects in Japan (Figure 1). At the preliminary stage, potential areas are identified through a screening to ensure that they meet basic criteria for OWP development. According to the MREA these include that an area under consideration:

- possesses significant, long-term and stable OWP generating potential;[2]
- has adequate access to base ports that can be used for activities related to construction, operation and maintenance;[3]
- has suitable and secure access to the power grid; and
- be unlikely to interfere with local fisheries or shipping lanes.

Once it is determined by the Ministers that an area meets these basic requirements, they officially designate the zone as a 'Promising Area' (有望な区域) and additional research into the area's suitability is conducted. At this point, a Council is formed consisting of officials from the MLIT, METI, Ministry of Agriculture, Forestry and Fisheries (MAFF), and local government (prefectural and municipal), as well as representatives of local fisheries, relevant experts and academics.[4] This Council is instrumental in determining whether a Promising Area will advance to the tendering stage.[5] Towards these ends, the Council will pursue dialogue among its members as well as with external stakeholders in order to determine whether the Promising Area may be tendered; identify and address any potential areas of concern that should be resolved before moving forward with development; and, at a more advanced stage, suggest considerations that should be represented in the tendering guidelines.[6]

[1] The *Port and Harbor Act* and several local ordinances issued under the *National Government Asset Act* (Act No. 73 of 1948) and its supplementary provisions governs OWP being developed in ports and harbours, which together comprises less than 1.5 percent of Japan's territorial waters (Ashurst, 2019).

[2] For example, the government has identified target wind speeds of at least 7 m/s, a capacity factor of at least 30% and a water depth of less than 30 metres for fixed-bottom turbines (Kim, Shindo, and Hill, 2021).

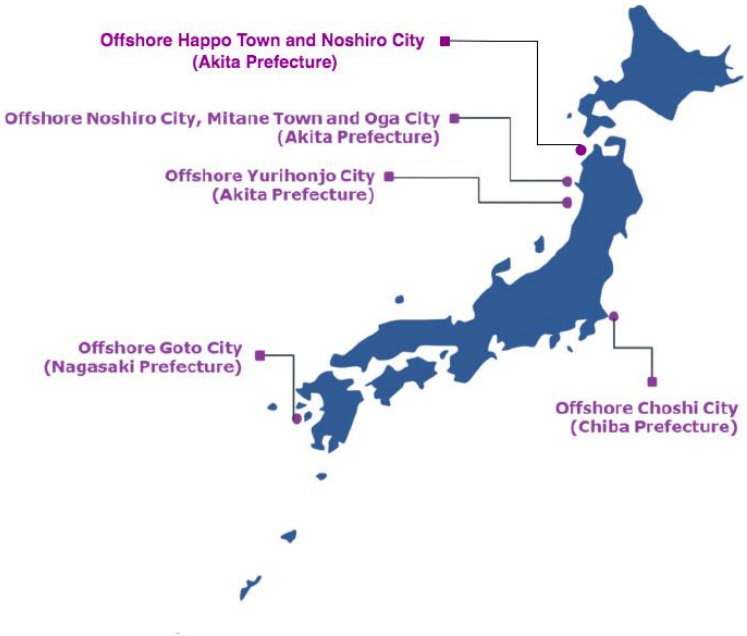
[3] The base port must have a quay that is suitable for the transportation of imported goods or domestic cargo. This quay must have sufficient load-withstanding capacity and a pier site of appropriate size. Base ports should, among other requirements, be fitted to accommodate the use of Self Elevating Platform (SEP) vessels, have a load-bearing quay and pier zones with sufficient space (Kim, Shindo, and Hill, 2021).

[4] Once this designation to a Promising Area is made, a Council must be formed (Article 9 of the MREA). The MREA also allows for a Council to be formed at prior stages provided such a request is made by the governor of a Prefecture (Art. 9.3).

[5] Goodwin and Nakajima (2022).

[6] Fukatsu (2021).

Figure 2. Japan's designated Promotion Areas (as of May 2022)



Source: Adapted from Ashurst (2019).

If the basic criteria for OWP development are met and any issues raised by the Council have been resolved, METI and MLIT will designate the area as 'Promotion Area' (促進区域) and issue a public tender.[7] At this time, the Ministers publish area-specific tender guidelines (Article 13.2 of the MREA), which include: the category of the power generation facility (i.e., offshore wind that utilises either fixed-bottom or floating substructures); the specific ocean area to be developed; the expected commencement date of occupation; the expected output capacity of the power generation facility;[8] the criteria for participating in the tender; the amount and terms of the security deposit to be provided by the tender participants; the maximum supply price that can be offered (per kWh); the method for determining this maximum supply price; the number of years for which the supply price is applicable (e.g., typically 20 years); the deadline for applying for certification of the supply price and the validity period of this certification; the use of base ports; the term of the occupancy period (e.g., typically 30 years); coordination with relevant government authorities; decommissioning matters; and the evaluation criteria to be applied in selecting the successful tenderer.

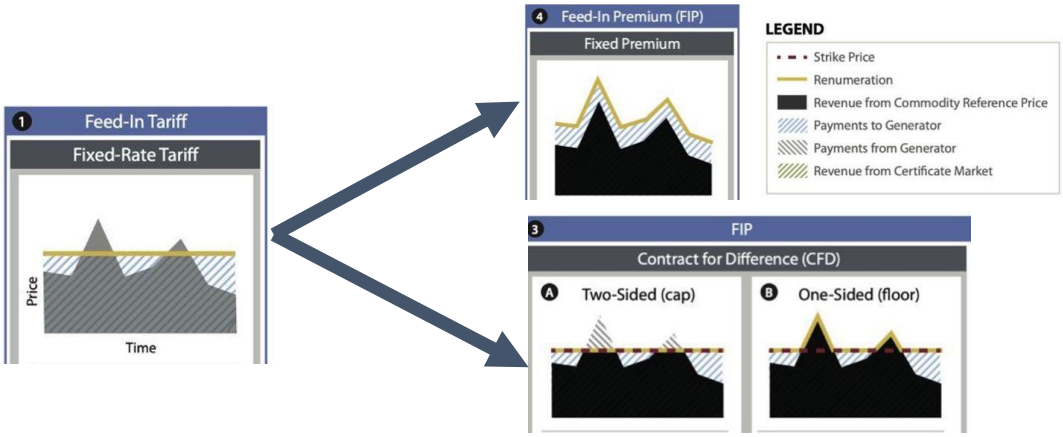
[7] These basic criteria are, again, sufficient OWP generation capacity, access to base ports and a grid connection, and no disruption to fisheries and shipping (Article 8 of the MREA). It is estimated that the period between Council formation and designation as a promotion area takes approximately 10 months (Kim, Shindo, and Hill, 2021).

[8] Tender guidelines include an expected power output from the site's development. The business operator must propose a total that is, at a minimum, within ±20% of the guidelines' specified output. There is no cap, however, on the maximum amount that can be proposed (Kim, Shindo, and Hill, 2021).

Under the current legal framework, the rights for exclusive occupancy and use of a Promotion Area cannot exceed 30 years.[9] Prices and terms for the supply of electricity generated by OWP projects are established by the *Calculation Committee for Procurement Prices* in accordance with the *Act on Special Measures Concerning the Procurement of Electricity from Renewable Energy Sources by Electricity Utilities* (hereafter the "Special Measures Act") and granted for a period of 20 years.[10] In the last round of tenders held in 2021, the guidelines included a maximum feed-in-tariff (FIT) of ¥29/kWh for fixed-bottom and ¥36/kWh for floating OWP projects. Under the tendering process established by the MREA, the procurement price is determined through auction, with the maximum FIT solely representing a maximum supply price that can be proposed by bidders.

In April 2022, amendments to the *Special Measures Act* came into effect that will introduce a feed-in-premium (FIP) system. Intended as a bridge between procurement of electricity through feed-in-tariffs and direct participation of OWP in wholesale electricity markets (without a government support regime such as FIT or FIP), the FIP system will require qualifying projects to sell their output at wholesale market prices while the government provides an additional premium to all output sold to limit the risks associated with price fluctuations. Based on recommendations from the Procurement Price Calculation Committee, METI will determine the categories of renewable power sources that are to be eligible for either the FIT or FIP pricing system going forward. Based on the Committee's initial opinion, however, it has been determined that fixed-bottom OWP projects will not be eligible for the FIP scheme until April 2024 at the earliest, while floating OWP projects can currently be priced under either scheme.[11] The exact design of the FIP is not yet clear. Two principal FIP designs exist globally with a fixed FIP (#4 in Figure 3) exposing the winning bidder to a higher level of market price exposure and risk than a FIP in form of a CfD (#3 in Figure 3). Initial planning documents (e.g., issued by the Offshore Wind Promotion Group and METI) seem to make different proposals as to whether the FIP will be implemented as a fixed FIP or more akin to a CfD.

Figure 3. Comparison of FIT and FIP pricing schemes



Source: Adapted from Beiter et al. (2021) and informed by Wakabayashi & Kawamura (2022).

[9] All commercial-scale tenders have thus far awarded the maximum period and there is generally no expectation for future tenders to deviate from this practice.

[10] While this would, in principle, allow for the selected business operator to continue selling electricity at market prices following expiration of the 20-year FIT period, it is unclear whether this would be feasible in practice. Towards this end, it is noted that the 30-year occupancy period appears to have been designed to cover the time needed to carry out other activities, including the environmental impact assessment (4-5 years), construction (2-3 years) and decommissioning (1-2 years).

[11] Wakabayashi and Kawamura (2022)

Prospective bidders are required to submit an occupancy plan which must address all matters set forth in the tendering guidelines issued by the METI and MLIT. In principle, there are no limitations on participation of foreign companies and the selected operator can be wholly-foreign owned. While each bidder must be a Japanese entity, foreign companies that have not established a legal presence in Japan may submit bids provided they are a shareholding member of a Special Purpose Company (SPC).[12] In practice, however, the importance placed on coordinating with local stakeholders and responding to emergency situations (such as natural disasters) introduces criteria that favour bids that include significant local expertise and foreign companies that have participated in public bidding routinely choose to partner with domestic companies.[13]

Article 14 of the Marine Renewable Energy Act specifies that the bidder's Occupancy Plan must include details related to the following items:

- the intended areas of occupancy within the designated promotion area;
- the wind turbine generators (WTGs) that will be used as well as the proposed methods for construction of the OWP facility (including the timeline for carrying out these activities);
- the plan for operation and maintenance of the OWP facility;
- the ports that will be used in construction, operation and maintenance;[14]
- the plan for coordinating with local officials;
- the plan for cooperating and coexisting with local fisheries;
- the proposed supply price and requested FIT period;
- a financial, revenue and expenditure plan; and
- the intended methods of decommissioning the OWP facility.

Qualifying bids are evaluated through a competitive tender process according to the criteria detailed in Section 2.1. Following notification of the tender award, the selected operator must have METI certify the Occupancy Plan. In accordance with the Special Measures Act, this certification lists the awarded procurement price and terms (i.e., the proposed price of the winning bid), which will allow the operator to sell electricity generated at the specified price for a period of 20 years typically.[15]

Following certification of the Occupancy Plan, the operator will then receive a permit from the MLIT granting it exclusive occupancy and use of the designated ocean area for a period of 30 years. Once in possession of the occupancy permit, the business operator will be permitted to commence with business activities related to development of the OWP facility. The bidder must commit to a scheduled operation date that occurs no later than 8 years after certification of the Occupancy Plan.

Before construction activities can begin, the operator must complete the environmental impact assessment (EIA) pursuant to the *Environmental Impact Assessment Act*. While limited experience exists in conducting EIAs specific to offshore wind in Japan, numerous sources estimate that this process should be expected to take four to five years, on average.[16]

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[12] Japanese companies may participate in the public auction without establishing a SPC. However, if Japanese companies have applied as a Consortium, its members would be required to establish a SPC in the event that their bid is successful.

[13] Goodwin and Nakajima (2022).

[14] Tendering guidelines will specify the port that is expected to be used by the selected operator. At present, four base ports for offshore wind construction, operation and maintenance currently exist throughout Japan: Noshiro, Akita, Kashima and Kitakyushu. If, in the operator's Occupancy Plan, it is determined that more space is needed at the designated port area, it is expected that bidders will make their own arrangements and secure additional areas for use (Ashurst, 2020).

[15] The application for certification must occur within one year of being notified of the tender award, while METI must provide certification within 6 months of receipt of the completed application (Linklaters, 2020).

[16] This is the assumed period noted in the guidelines issued by METI and MLIT for those Promotion Areas that have already been opened to public tender and is also the timeframe estimated by private law firms (see, e.g., Goodwin and Nakajima, 2022; Ashurst

Business operators will be left to separately negotiate grid connection agreements directly with the relevant local utility company. In line with the METI certification of the Occupancy Plan, the power purchase agreement (PPA) established between the business operator and a utility company will be valid for a period of 20-years, with the utility company required to purchase the output at the supply price certified by METI. While utilities are responsible for planning and construction of the grid, the business operator will be required to contribute some of the costs related to connecting the OWP facilities to the onshore grid.[17]

Following expiration of the FIT period (i.e., 20 years), any additional electricity generated can be sold at market price, provided the Occupancy Permit remains valid. While the 30-year occupancy period may be renewed in principle, it is unclear whether this will occur in practice. According to comments provided by the Ministers, the renewal of occupancy permits will be considered in instances where doing so would lead to further reductions in supply price while also ensuring the continued use and preservation of the Promotion Area. Factors contributing to such a decision include the ability of the OWP facility to continue generating electricity and the performance of the business operator over the initial occupancy period.[18]

There has also been reporting that the winner of the 2021 tenders (the Mitsubishi-led consortia) intends to establish a second revenue stream through a "FIT Specified Wholesale Supply" (FIT特定卸供給), which would allow the awarded party to earn a premium on electricity sold to consumers from a renewable energy source.[19] Details on this arrangement remain unclear, however, and it is appears that Mitsubishi has recently denied its intended use of this second revenue stream for the projects awarded in 2021.[20]

Box 1. Operator engagement in the Japanese OWP tendering process

Japan's tendering system is structured in a way that incentivizes OWP operators to begin participation in the process well in advance of a site formally being designated a Promotion Area. Most commonly, potential operators may choose to carry out site surveys and begin the environmental impact assessment during the earliest stages of the process despite the inherent risk of investing in these activities prior to tender selection.

Stakeholders consultation suggests that this occurs for several reasons. First, operators may decide to take the initiative in gathering site-specific data on behalf of government authorities so that the latter can expeditiously open an area to competitive tendering. Additionally, operators may proactively seek to get an advanced start on the lengthy EIA process in order to bring the project's commercial operation date (COD) forward and address one of the principal challenges to adhering to their proposed construction timeline.[21]

Given the importance of local coordination in the tender evaluation, a number of OWP operators have also opted to undertake consultations with local stakeholders (e.g., government officials and fisheries cooperatives) prior to an area being opened to tender. As several relevant stakeholders are likely to

2021). Given the significant length of time required, there have been reports of potential developers often initiating the EIA process very early in the process – even before an area has been formally designated as a Promotion Area (Goodwin and Nakajima, 2022). Note that the GoJ is in the process of revising these EIA provisions (as of August 2022) with future base investigations of potential sites being conducted by the government.

[17] Kim, Shindo, and Hill (2021). The exact amount to be provided by the business operator will vary.

[18] Linklaters (2020).

[19] Horiuchi (2022).

[20] Source: https://www.youtube.com/watch?v=wDz-JM7heiE.

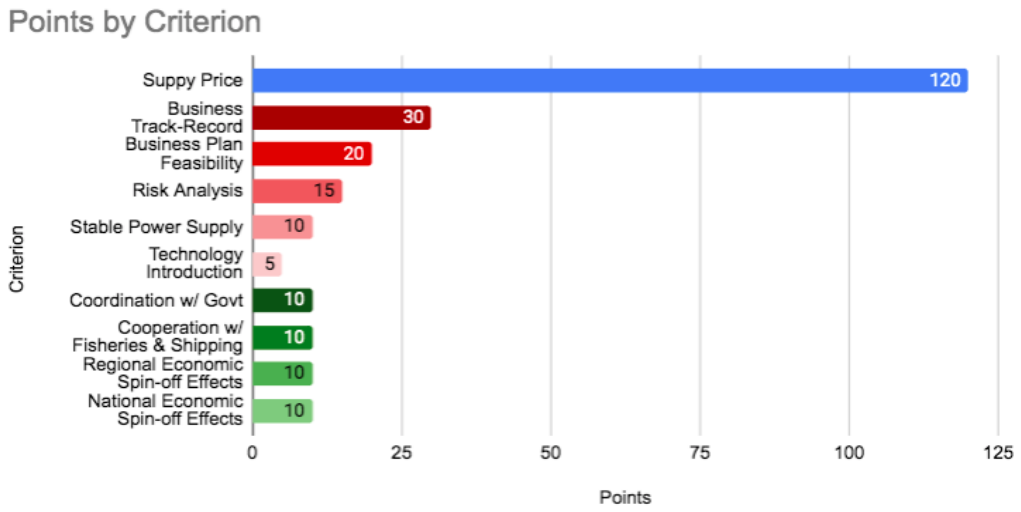
[21] Stakeholder consultations; Goodwin and Nakajima (2022).

occupy positions in the OWP Council, these early-stage consultations are seen by some participants as necessary given limits on engaging with Council members once a competitive tender has opened.[22]

2.1. Tender Evaluation

Article 15 of the Marine Renewable Energy Act outlines the procedures for selecting a winning bid. The process begins with the Ministers reviewing the submitted occupancy plans to ensure that they conform to the minimum criteria established in the tendering guidelines.[23] Plans that adhere to these requirements will proceed to the evaluation stage and are scored according to the criteria established in the guidelines. As detailed in the following sections, tenders can receive a maximum of 240 points divided evenly between the proposed supply price (120 points) and the strength of the proposed business feasibility plan (120 points).[24]

Figure 4. Points awarded in Japan's OWP tenders (by criterion)



Supply price evaluation (120 points)

Representing half of the bidder's total score of 240, the supply price currently represents the most heavily weighted single criterion in the tender evaluation. Points are awarded according to the following equation:

[22] Kim, Shindo, and Hill (2021).

[23] Article 15.1 of the MREA. The submitted Occupancy Plan will be considered as passing the initial conformity test provided: (i) the proposed supply price does not exceed the maximum price specified in the Tendering Guidelines; (ii) the plan is not expected to hinder the utilization and conservation of the sea areas within the promotion zone; (iii) the proposed OWP facilities match those specified in the Tendering Guidelines; and (iv) the business operator "is not considered likely to commit a wrongful and dishonest act".

[24] As of May 2022, METI and MLIT have issued four public tenders for commercial-scale wind farms. The allocation of points is not enshrined in the MREA and may evolve in the future to reflect changing priorities. Among these four, however, the same 240-point scale has been used.

$$Eq.1: \quad Supply\ price\ score = \frac{lowest\ supply\ price\ received\ among\ all\ bids}{bidder's\ proposed\ supply\ price}\ X\ 120\ points$$

Notably, with this equation only being applied to price but not to the non-price criteria during the 2021 tender, the price score effectively receives more weight. While both have a maximum score of 120, the supply price score is effectively scaled to 120 points (Eq. 1) because the winning price bid is awarded 120 points, while the best performer might not be awarded a total of 120 points for the non-price criteria depending on the evaluation committee's scoring. This effect materialized in the first tender round with the best performer in the supply price category being awarded 120 points and a total of 88 points for non-price criteria, respectively (Diamond News, 2022).

Business feasibility (120 points)

The remaining points are based on the overall feasibility of the proposed business plan. This is divided between the bidding company/consortium's:

(i) ability to carry out the offshore wind business in line with the project requirements specified in the Tendering Guidelines ("ability to feasibly implement the business") (80 points); and

(ii) capacity to coordinate with local actors and promote "spin-off" economic effects (40 points).

For each of the non-price items, scores are assigned according to five categories. Bids that attain the highest possible evaluation ("top-runner") for a particular item will receive a score of 100% and are awarded all of the possible points assigned to that item. Bids that are ranked as "middle-runners" receive 70% of the possible points, while those that are deemed as only meeting the "minimum necessary level" receive 30%. Bids that are ranked as "close to inadequate" for an item receive a score of 0, while those deemed "inadequate" for any item are disqualified.

Ability to feasibly implement the business (80 points)

At present, the evaluation of the bidder's "ability to feasibly implement the business" is based on the extent to which the Occupancy Plan demonstrates a sufficient ability to (i) reliably execute the business; and (ii) ensure a stable supply of electricity during the project's duration. Each of the assessment items, including the points assigned and the basis for assessment are described in the following table.

Table 1. Evaluation of the bidder's ability to feasibly implement the business

Assessment item	Area of assessment	Basis for assessment
Reliable execution of the business (65 points)	Business Track-record (30 points)	Extent to which the bidder has a track-record of installing, operating, maintaining and managing offshore wind power infrastructure OR Extent to which the bidder has a track-record of offshore construction work coupled with experience in

		installation, O&M and managing onshore wind power infrastructure.[25]
	Feasibility of the business plan (20 points)	Dependability, feasibility and concreteness of the plans related to OWP equipment/infrastructure, installation/construction, O&M and income and expenditures
	Analysis and identification of risks (15 points)	Extent to which the bidder's proposed plan identifies and mitigates potential exposure to risk. This is related to: ● Construction risks (e.g., have they identified and secured appropriate manufacturers, installation vessels and specialised installation equipment); ● O&M risks ● Financial management risk (e.g. responses to fluctuations in wind conditions)
	Appropriateness of the financial plans (financing, income and expenditures) (0 points)	[Note: no points are awarded to this item, implying that it is only used as a basis for disqualification in instances where it is not deemed appropriate]
Stable electricity supply (15 points)	Countermeasures for ensuring rapid recovery during periods of supply disruption; supply chain development; potential for reducing future electricity prices (10 points)	● Location of the proposed equipment and parts manufacturers and storage facilities ● Availability of repair facilities ● Submission of a supply-chain formation plan that lists efforts towards ensuring resiliency and rapid procurement in moments of disruption ● Submission of a supply-chain formation plan that includes cost-reduction policies
	Introduction of state-of-the-art technologies (5 points)	Extent to which the plan promotes the introduction and application of state-of-the-art technologies (with emphasis on those that have an empirically proven track-record of reliability)

Local coordination and economic spin-off effects (40 points)

The remaining 40 points are based on the bidder's ability to demonstrate its capacity to coordinate with local actors and promote economic spin-off effects at the regional and national levels. Each of the assessment items, including the points assigned and the basis for assessment are described in the following table.

[25] When participating in the public offering through a consortium or SPC, each member with voting rights is subject to the same performance evaluation and must satisfy all eligibility requirements. When multiple members are assigned overlapping responsibilities in the Occupancy Plan, the lowest scoring track-record among the members will be assigned.

Table 2. Evaluation of the bidder's ability to coordinate with local officials and promote economic development

Assessment item	Area of assessment	Basis for assessment
Regional coordination (20 points)	Ability to coordinate with relevant government authorities (10 points)	• Track-record of coordinating with relevant government authorities • Track-record of carrying out domestic offshore wind power projects • Track-record of carrying out domestic onshore wind power projects • Track-record involving other relevant coordination (includes overseas track-record)[26]
	Harmony and symbiosis with nearby shipping lanes and fisheries (10 points)	Extent to which the plan demonstrates a clear method for ensuring dialogue with local fisheries and shipping companies
Economic spin-off effects (20 points)	Regional economic spin-off effects (10 points)	• Extent to which the bidder's plan will increase regional employment • Extent to which the bidder's plan will promote regional investment and construction of regional production facilities
	National economic spin-off effects (20 points)	• Extent to which the bidder's plan will increase national employment • Extent to which the bidder's plan will promote national investment and construction of domestic production facilities

Proposed changes to the tender evaluation criteria

In response to requests for improved transparency following the first round of OWP tenders, the Ministers have been exploring possible modifications to the tendering criteria. Although final changes are not expected to be announced until later in 2022, several proposals have been tabled at the Offshore Wind Promotion Group bringing together government officials, academic experts and industry representatives, which provide insights into potential directions.[27]

Specifically, these proposals suggest retaining most of the current format, including the 240-point scoring format; the formal one-to-one ratio between price and non-price components (i.e., 120 points for each); and the allocation of 40 points for local coordination and economic spin-off effects. Notable changes have been proposed with respect to how the Ministers evaluate the 80 points assigned to a bidder's 'ability to feasibly implement the business'. As detailed in Table 3, the main modifications currently being discussed include:

[26] Foreign experience can be used to demonstrate a participant's track record, but priority will be given to experience that is seen as relevant to the natural conditions of Japan (Kim, Shindo, and Hill, 2021)

[27] See, specifically, METI and MLIT (2022).

- reducing the weight given to prior experience by eliminating the 30-point "business track-record" criterion and instead evaluating experience as a subcomponent of the newly created 20-point criterion "foundation of the business plan";
- assigning 10 points to the bidder's financial planning as opposed to making it solely grounds for disqualification;
- introducing a 20-point criterion that would reward projects that propose earlier operation dates ('promptness of the business plan')'
- replacing 'feasibility of the business plan' with 'execution of the business plan' and distinguishing between the bidder's plans before (15 points) and after (5 points) the commencement of operations;
- doubling the points assigned to the bidder's proposed plan for ensuring a stable power supply (from 10 to 20 points), while eliminating the criterion's emphasis on future reductions in price as well as the 5-point sub-criterion related to introducing state-of-the-art technology.

Table 3. Newly proposed evaluation criteria related to 'business feasibility'

Current areas of assessment	**Newly proposed areas of assessment**
Business Track-record (30 points)	Promptness of the business plan (20 points)
Feasibility of the business plan (20 points)	Foundation of the business plan (20 points) ○ Business implementation system and business track-record (10 points) ○ Financing and income expenditure plan (10 points)
Analysis and identification of risks (15 points)	Execution of the business plan ○ Business plan prior to that start of operation (15 points) ○ Business plan following start of operation (5 points)
Countermeasures for ensuring rapid recovery during periods of supply disruption; supply chain development; potential for reducing future electricity prices (10 points)	Stable power supply (20 points)
Introduction of state-of-the-art technologies (5 points)	n/a

Source: METI and MLIT (2022)

3. Japanese Tender Prices in Global Perspective

Offshore wind is a global industry with components and logistical solutions sourced from around the world and developers pursuing opportunities across continents. A comparison of the price established in Japan's offshore wind tenders can provide perspective on the level of competitiveness of the Japanese market versus others.

Two critical events in the development process of an offshore wind project are the award of a seabed lease[28] and a support regime (the latter sometimes also referred to as 'remuneration' regime). These can either be awarded jointly or separately. Different strategies for seabed leasing exist around the world, which are commonly distinguished by the types of roles that the government and private entities assume in site development. Under a *centralized* approach, a government entity identifies offshore areas for wind deployment, selects the sites, and conducts preliminary site investigations. This requires the government to possess a high level of technical expertise and willingness to absorb a large share of the development risk. Commonly, the seabed lease and support regime are awarded jointly. In a *decentralized* approach, the private entity conducts site selection, investigation, permitting, and sometimes grid development. Under this model, the private project developer bears most of the development risk and subsequently competes for award of a support regime (Akinci and Iyer, 2022).[29] Japan has largely implemented a decentralized model (section 2) with the support regime (i.e., the FIT) awarded to an independently developed project within a Promotion Area. In Europe, approaches differ with e.g., Germany, Denmark, Netherlands having adopted a centralized approach while e.g., the United Kingdom largely following a decentralized approach.

Governments tend to procure the energy produced by offshore wind facilities through a support regime. These typically award a fixed revenue stream, though the exact design and extent of (wholesale) price exposure varies by jurisdiction (Jansen et al. 2022). Common support regimes globally include Contract-for-differences, Feed-in premiums, FITs, or mandated Power Purchase Agreements (PPAs) (Beiter et al., 2021). FITs – as utilized in Japan's OWP tendering system - are often used for new technologies or renewables markets because they provide a fixed price for the delivered energy and thereby a relatively high level of revenue stabilisation (Kitzing, 2014). Support regimes are typically awarded competitively. The price at which a support regime is awarded is often reported as a nominal 'strike price' or levelized contract price. Comparing prices at this 'face value' across different jurisdictions or over time, however, can be misleading because they tend not to represent the entire revenue that is generated from a support regime (Beiter et al. 2021). This becomes evident through winning bides of 0 EUR/MWh in recent offshore wind auctions in Europe (e.g., Hollandse Kust Zuid in the Netherlands or Thor in Denmark) where the support payment of 0 EUR/MWh is complemented by revenues from wholesale power markets. Here, we follow the cashflow modelling approach introduced by Beiter et al. (2021) to calculate an 'all-in' *levelized revenue and value* (LRVE) for an equitable comparison between the first-round tender results in Japan and those obtained in other major OWP markets globally. While the FIT in Japan can be modelled relatively simply from a revenue perspective, several adjustments are needed for those projects globally that utilize a CfD, FIP, and additional revenue components (such as tax credits, accelerated depreciation benefits, and export system cable costs[30]). Further details on the methodology for calculating LRVE in Japan and elsewhere are included in *Appendix A*. A selection of major global offshore wind projects and their LRVE components is shown in Table 4, including the projects tendered between 2015-2021 in Japan.

Table 4. The components awarded in Japanese offshore wind tenders compared globally

[28] A seabed lease typically grants a private entity (i.e., an offshore wind developer) the rights for surveying, installation, and operation of a wind farm.

[29] Further, several types of hybrid approaches exist, which tend to feature some combination of a central and decentralized model, often allocating initial responsibility to the government, while the private project developer takes over in the latter more costly stages when technical know-how is needed (Akinci and Iyer 2022).

[30] An estimate of export system cable costs is added to those global projects, which have the financial obligation for any cabling from the offshore wind site to the onshore point of interconnection. In Japan, the expense for export system cable costs is the financial responsibility of the project developer and hence already captured by the bidding price established in the tender.

Country	Project	Project Size (MW)	Commercial Operation Date (COD)	Support Regime	LRVE components
JP	Akita Noshiro Port	139	2022	Awarded FIT	Support revenue from FIT (36,000 ¥en/MWh)
JP	Akita Noshiro-Mitane-Oga (NMO)	479	2028	Competitive FIT	Support revenue from FIT (13,260 ¥en/MWh)
JP	Akita Yurihonjo	819	2030	Competitive FIT	Support revenue from FIT (11,990 ¥en/MWh)
JP	Chiba Choshi	391	2028	Competitive FIT	Support revenue from FIT (16,490 ¥en/MWh)
JP	Future Tender (end of 2022)	356	n/a	n/a	n/a
UK	Doggerbank A	1,200	2024	Two-sided CfD	Energy market and support revenue
DK	Kriegers Flak	600	2022	Two-sided CfD	Energy market and support revenue; accelerated deprecation
DK	Horns Rev 3	407	2019	Two-sided CfD	Energy market and support revenue; accelerated deprecation
DK	Anholt	400	2013	Two-sided CfD	Energy market and support revenue; accelerated depreciation
UK	Beatrice	588	2019	Two-sided CfD	Energy market and support revenue
GER	Gode Wind 3+4	374	2023	One-sided CfD	Energy market and support revenue
US	Vineyard Wind I+II	800	2022/23	Mandated PPA	PPA price; capacity market revenue; tax credit; accelerated depreciation
US	Ocean Wind I	368	2024	Mandated OREC[31]	OREC price; capacity market revenue; tax credit; accelerated depreciation

Note: Only tenders for commercial-scale projects shown.

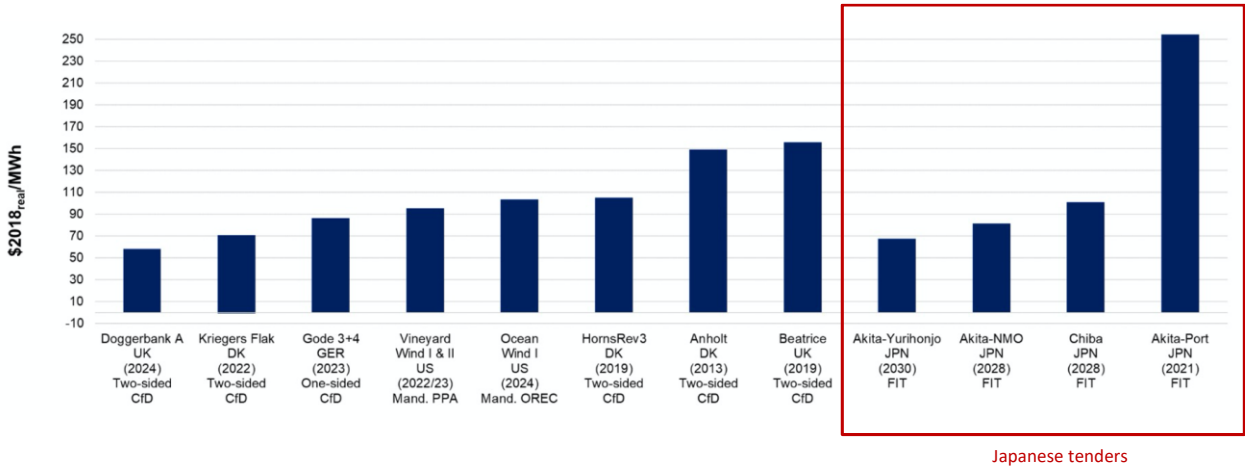
On an adjusted basis, the LRVE for the three Japanese projects tendered in 2021 ranges between $67-101/MWh with expected commercial operation dates between 2028-2030 (Figure 5). The Akita port project tendered in 2015 is estimated with $255/MWh for the FIT awarded in 2015. This compares to a range of $58-156/MWh for European and U.S. projects with CODs between 2019-2024.[32] Overall, the Japanese tenders fall within the broader range of European tender results and are even at the lower end. The Japanese projects tendered in 2021 have a COD in the late 2020s, several years later than the commencement of commercial operations of the European and U.S. projects shown in Figure 5. Projects with a later COD tend to feature a lower price, in part because they might be able to utilize the latest technology and logistical strategies available at that time (e.g., larger turbine ratings), which reduces generation costs. The price level of the 2021 tender in Japan has exceeded the expectations of many industry observers. The Japanese offshore wind market is at a nascent stage with relatively high business

[31] Offshore Renewable Energy Certificate (OREC).

[32] Currency denoted in $2018, unless indicated otherwise.

risks compared to more established markets. Some of these risks include the anticipated lack of port and vessel capabilities (including limited marshalling areas) currently, grid integration challenges, and very limited experience generally in OWP construction and operations (incl. vessel operations). This is not to say that these challenges could not be overcome but they typically reflect in a higher risk appraisal and tender prices. Potential reasons for these relatively low prices compared to other global markets (and the difference between the 2015 and 2022 tender award) is discussed in the following section.

Figure 5. Comparison of the levelized revenue and value (LRVE) of Japanese and select global offshore wind tenders



Source: Adapted from Beiter et al. (2021). LRVE components vary across project but are not shown here for simplicity.

4. The Price Drivers of Japan's Offshore Wind Tenders

Tender prices are determined by a multitude of factors, which are often challenging to verify and rank because of the confidentiality of bidding and corporate strategies, as well as a bidder's broader market assessment (e.g., expectations about future power prices). Research on auction design and press reporting suggests several reasons why prices have decreased between 2015-2022 and are now among some of the lowest priced offshore wind projects globally:

- The change from awarding a FIT at a pre-determined level (before 2022) to a FIT that is determined competitively (2021 and onwards)
- The increase in project sizes from single- or multiple turbine demonstration projects (before 2020) to commercial-scale projects (2020 and onwards) and growing confidence in the Japanese market
- An expected commercial operation date in the late 2020s of those projects that were tendered in late 2021, which permits the use of the latest turbine technology (e.g., the use of the highest-rated typhoon class turbine available to date, the GE-Haliade-X 12.4 MW) and installation & operational strategies
- Strategic positioning of the Mitsubishi consortia as sole winner could generate economies of scale and synergies (i.e., components and services can be procured at scale to support a total of three projects)
- Partnering with or even the acquisition of experienced offshore wind developers (e.g., the Mitsubishi consortium acquiring ENECO and partnering with VanOord)

- A relatively low cost of capital and general lack of investment opportunities with a FIT-like offtake in global infrastructure markets

While the results of this latest tender round have produced competitive results on par with European and U.S. tenders, several factors might pose a challenge in future tenders. These include the nascent stage of the Japanese OWP sector, particularly the limited port, vessel, and grid infrastructure; relatively high wages; the long duration to complete EIAs; and challenging environmental and geophysical characteristics offshore Japan.
Only four OWP base ports – Noshiro, Akita, Kashima and Kitakyushu – exist or are under development and risks associated with construction delays due to port congestion and availability remain a factor[33] that is ultimately borne by OWP developers.[34] Access to the transmission network remains challenging and Japan's regulations on curtailment pose additional risks.[35] Most importantly, unlike Europe, Japan and its labour force has limited experience with the installation and operation of OWP plants and maritime operations from decades of oil and gas project development. This lack of experience (if not compensated with training programs or partnering with experienced foreign companies) could contribute to cost overruns.

The EIA process in Japan has been perceived by many as a relatively lengthy and costly procedure. With an average duration of four to five years to complete an EIA, operators planning to partake in the tendering process often choose to initiate an EIA prior to submitting tender bids so that they can properly assess risk associated with the project and to ensure that the project does not fail to meet its announced COD.[36] This is largely a result from Japan's decentralized seabed award approach for site surveying (section 3) and effectively forces potential bidders to choose between higher pre-tender costs for site surveying (at the risk of not being able to compensate these expenses if the company is not among the winner) or facing unexpected costs due to a lack of understanding about the prevailing wind resource, soil conditions, and other site-specific parameters.[37]

Lastly, Japan also faces challenging weather and geotechnical conditions. For instance, Japan's water depths drop sharply from shoreline, limiting the area suitable for fixed-bottom installations. Although it is widely expected that Japan's long-term OWP development will require significant deployment of floating substructures, fixed-bottom installations at greater water depths will also likely be required – at least in the medium-term – potentially leading to higher costs due to need for specialised (and more expensive) installation vessels and equipment capable of operating in these depths and handling the more challenging oceanic conditions presented. In addition, natural conditions such as typhoons, tsunamis and earthquakes limit turbine and substructure installation periods and might require tailored engineering and risk management solutions.[38]

[33] Port infrastructure in Japan is, in particular, ill-equipped to hand pre-installation activities for next generation wind turbines (RWE Renewables Japan, 2021).
[34] Under the current legal framework, project owners can only request an extension to its scheduled COD in a limited number of cases and insufficient base port base access does not qualify as one of these extenuating circumstances (Ashurst, 2020; Ashurst, 2021).
[35] The government of Japan has been developing a "Power Grid Establishment Master Plan" that would alleviate this issue and reduce the associated risks. Utilities' curtailment of generated power onto the grid without compensation is permitted for a specified period annually (usually, a limited number of days or hours) and has occurred several times in the country's solar power generation (Ashurst, 2021).
[36] Ashurst, 2021
[37] At the same time, those opting to carry out their own surveys prior to the tender must compete for the limited number of surveying firms and may face constraints in carrying out these activities (RWE Renewables Japan, 2021).
[38] PwC, 2020

5. Recommendations

To ensure fair, transparent, and consumer-oriented tendering of OSW in going forward, we make a few recommendations on tendering design options. These have been informed by a review of tender designs around the world, press reporting on the Japanese OWP market, and a limited set of interviews with European offshore wind sector participants in the Japanese market:

Recommendation 1: Increase the transparency and objectivity applied in tender evaluation. While the GOJ has taken steps towards improving the transparency and objectivity of its tender evaluation process, industry stakeholders continue to express concerns related to the uncertainty in how certain non-price criteria are assessed. Towards achieving this goal, the GOJ could consider undertaking the following:

- **specify more precisely what is desired in the non-price criteria and how they are quantified**
- **improve the quantity and quality of feedback** provided on submitted bids and publicly release details on the key features of winning bids

Recommendation 2: Provide a clearer and more coordinated government vision of specific deployment goals and actions. The targets formulated under the *Vision for Offshore Wind Power Industry* can spur Japan's OWP development. To attract a greater number of market participants and investment for infrastructure, R&D and supply-chain formation, the GOJ could consider building on these targets in the following ways:

- **provide specific OWP deployment goals** for the targeted annual deployment of fixed-bottom and floating OWP over the next decade and beyond, together with a marine spatial planning effort that entails a more active facilitation role of the GOJ and prefectures in adressing concerns of local stakeholders
- **identify concrete government and stakeholder actions to address logistical and grid infrastructure challenges** – i.e., improve and expand the access to ports, marshalling areas and grid connections

Recommendation 3: Adopt a more centralised seabed planning approach that assigns a more active role to the government in pre-tendering stages. Under the current system, potential operators may face significant pre-tender costs and uncertainty from expenses related to surveying, EIAs and stakeholder consultations. These costs are commonly incurred prior to an area being opened to tender, leading to considerable risk for operators and a potential reduction in the interested number of tender participants. Potential limitations on the number of available surveying vessels may further constrain participation, while instances of stakeholder fatigue could undermine the effectiveness of local outreach efforts.

Under the current proposal by the Offshore Wind Promotion Group, OWP operators may face even greater pressure to undertake surveying and EIA activities prior to tender announcement since earlier commercial operation would be weighted more heavily. Disparities in access to site-specific data could, in turn, reduce the overall competitiveness of the tendering process, while the need to gather these data privately could lead to duplication of efforts among operators. To mitigate such developments, the government could consider assuming a more active role in pre-tender site development (e.g., surveying) and coordination activities with local communities. The GoJ has in fact started to consider several features of such a

centralised seabed planning approach in recent regulatory proceedings, which is referred to as 'Central Hooshiki' (METI and MLIT, 2022).

Recommendation 4: Provide stronger financial incentives to accelerate commercial operation dates. To accelerate commercial operation, the GOJ could consider providing stronger financial incentives for an earlier start. These could take the form of, e.g., 'option fees' (perhaps akin to the 2021 ScotWind tender rules from 2021), penalties, or provisions that would permit operators to sell electricity at a premium rate for those periods of operation that predate the targeted COD specified in the tender guidelines.

Recommendation 5: Encourage greater diversity in the OWP sector. During the first round of tenders, all three commercial-scale projects were awarded to a Consortium led by Mitsubishi. Reliance on a single developer can generate economies of scale, but it poses potential risks to the sector's development due to dependency on a sole provider. This could be alleviated by limiting the number of areas that can be awarded to a single bidder (if multiple areas are awarded in the same tender or during a certain period of time), which is currently under consideration by the Offshore Wind Promotion Group.

Recommendation 6: Revise the tender structure. Rather than assigning points to the criteria of 'business track-record' and 'regional coordination', the GOJ could consider introducing pre-selection criteria to ensure that participants possess the necessary technical and economic qualifications (e.g., as demonstrated through their business and project track-record) in combination with clear financial incentives (e.g., for local investments in accordance with Japan's obligations under the World Trade Organization and Economic Partnership Agreement or through down-payments, bid bonds, and bidding credit), regulations, and penalties for non-compliance. This might shift the focus from qualitative assessments (of the non-bidding criteria) to an incentive-driven system, which could guarantee a higher chance of meeting the GOJ's objectives on local investment and timely commercial operation.

Recommendation 7: Consider delaying application of a fixed FIP scheme to reduce the risk of price exposure. While still unclear in which form the FIP will be introduced, a transition to a fixed FIP scheme for OWP in Japan (top image in Figure 3) might perhaps be premature given the nascent stage of the Japanese OWP market. A FIP that resembles a CfD scheme more closely could mitigate some of the price risk exposure that a fixed FIP would entail with perhaps adverse impacts on bidder's participation levels in future OWP tenders.

6. Methodological Annex

LRVE was calculated following the approach in Beiter et al. (2021). In a first step, all relevant revenue (e.g., from the support regime and sales to the wholesale and capacity markets) and value components (e.g., tax credits, accelerated depreciation, and export system cable costs if not the financial burden of the tender participant) are identified for each of the assessed global offshore wind facilities. In a second step, these components are represented in a cashflow model together with the estimated energy production of the offshore wind facility. Both are then discounted to a present value as shown in Eq. 2:

Eq. 2:

$$L_{real} = \frac{\sum_{t=1}^{t=T}\left(\frac{R_t + V_t}{(1+d_{nom})^t}\right)}{\sum_{t=1}^{t=T}\left(\frac{Q_t}{(1+d_{real})^t}\right)}$$

where L is the discounted revenue and value components (in real denomination); Q_t is the production volume, R_t are the total nominal revenues, V_t is the total nominal (monetized) value in period t; and d is the discount rate. An graphical illustration of the discounting of future project revenue and value streams is shown in Figure A-1.

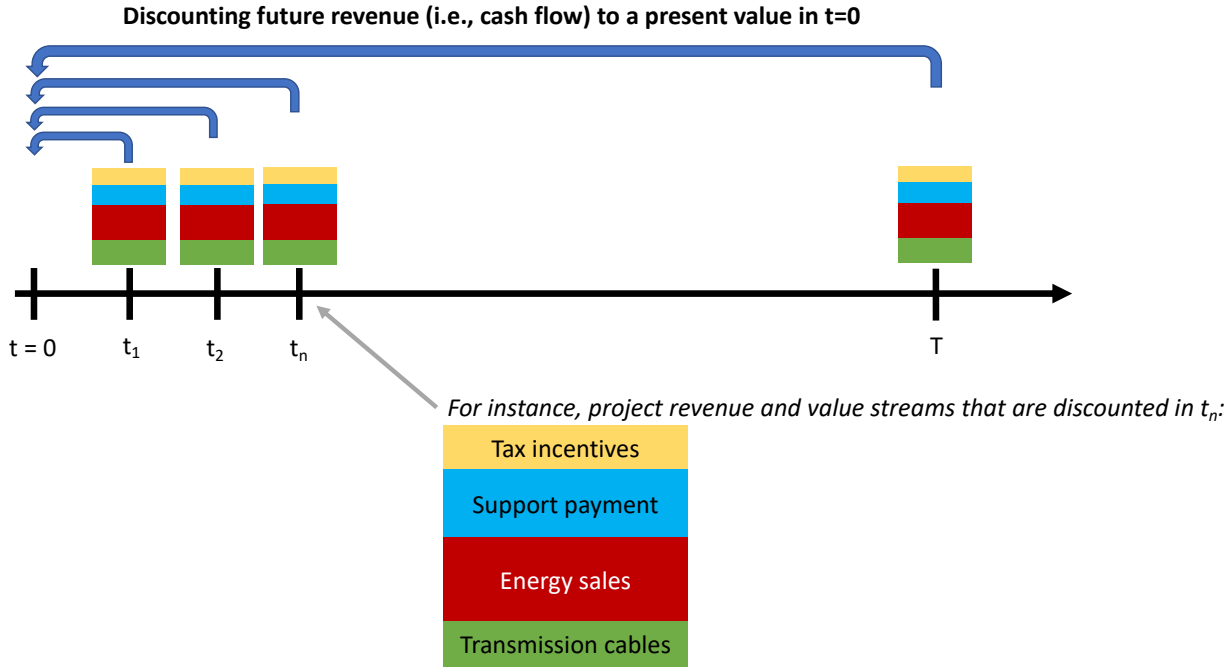


Figure A-1. Illustration of LRVE calculation method to make global projects comparable by discounting future project revenue and value streams to a present value at t=0.

The Japanese projects from the first tender round (awarded in 2021) and the Akita Noshira port project (awarded in 2015) utilize a FIT, for which revenue in each period t is calculated as: $R_t = Q_t \times P^{FIT} \times I_t$ with P^{FIT} competitively determined FIT levels and the $I_t = 1$ at all times because the P^{FIT} in Japan is specified in nominal terms throughout the support period. An average capacity factor of 35% was assumed for the three tender projects (roughly corresponding to wind speeds of approximately 7.5 m/s) and a discount rate of 5% (real) was utilized.

The LRVE for the global offshore wind projects assessed in this study are calculated using the assumptions specified in Beiter et al. (2021).

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