

1. PPA issues and grid connection
2. Localisation regulations
3. Onshore wind energy
4. Promoting the long-term development of offshore wind power in Asia

Introduction

With its first commercial offshore wind project (Formosa 1) in commercial operation, 5.5 gigawatts (GW) of projects awarded and under development and another 10GW announced by 2035, the prospects for the offshore wind industry in Taiwan are looking promising, thanks to the firm support of various government agencies and the efforts of suppliers and developers from the industry. Consequently, Taiwan is in a unique position to achieve regional leadership in wind energy, if it maintains a long-term focus, and continues to promote the creation of a world-class local industry, in line with international standards. To accomplish that goal, members of the committee offer the following recommendations.

The issues raised in last year's paper under the heading "Green energy market" have not been raised again because they are no longer a priority.

1. PPA issues and grid connection

As noted in last year's paper, the power purchase agreement (PPA) between Taiwan Power Company (Taipower) and developers does not currently provide compensation for curtailment in excess of a reasonable and realistic cure period during grid related safety dispatch, or suspension of services or planned and unplanned maintenance. A stable grid for the transmission of electricity together with a mechanism providing reasonable compensation for curtailment and for force majeure events affecting the grid is important for stable offshore wind farm revenue and essential for developers and financiers.

Recommendations

- **Introduce compensation for curtailment in excess of a reasonable and realistic aggregate period per year in the form of an extension to the feed-in-tariff (FIT) period.**

- **Introduce a mechanism to extend the FIT period for wind farms in the event of interruptions to Taipower's grid operations due to force majeure events.**

2. Localisation regulations

This issue was raised in last year's paper. The development of Taiwan's offshore wind supply chain was forcefully kicked off by the government in the previous rounds of project awards. As a result, local suppliers that have shown high potential are now better positioned to start developing focused competitive export capabilities for the international market.

More mature European wind supply chain markets do not maintain comprehensive local content requirements similar to Taiwan's Industrial Relevance Implementation Programme. This is true both in large markets, such as Germany and the UK, as well as markets about the size of Taiwan, such as Belgium, Denmark and the Netherlands. In general, it is understood that such inflexible and broad local content requirements can lead to a non-competitive and ultimately underutilised local supply chain.

1. 風力發電離岸系統電能購售契約及併網問題
2. 本地產業關聯規定
3. 陸域風電
4. 推動亞洲太平洋地區離岸風力能源的長期開發

前言

隨著第一個商轉的離岸風場（海洋風電）開始運作、已獲選並正在開發中的 5.5GW 以及另外宣布要在 2035 年達到的 10GW，均顯示出在各政府機關的全力支持，以及該產業供應商和開發商的努力下，台灣離岸風力能源的產業前景正在蓬勃發展。因此，若台灣能夠保持長期的關注、持續以國際標準推動世界級的本國產業，便能以獨特的地位，取得風電產業的領導地位。為了達到此目的，本委員會提出以下建議。

1. 風力發電離岸系統電能購售契約及併網問題

去年建議書中曾提及此議題。目前風電開發商與台灣電力股份有限公司（「台電」）簽訂之「風力發電

離岸系統電能購售契約」（「電能購售契約」）並未針對在與併網相關的安全調度期間中，超過合理及實際改正期間的降載，或服務之中斷、預期內或非預期性的維修，訂有任何賠償機制。透過穩定的輸電電網以及合理的機制，來對降載或會影響電網之不可抗力事件進行賠償，對於穩定離岸風力電場收入及其開發商和提供融資之業者非常重要。

建議

- **藉由延長躉購費率期間的方式，引進針對各年度所累積超過合理範圍之降載期間的賠償機制。**
- **對於因不可抗力情事而影響台電電網營運的情形，引進延長風場躉購費率期間的機**

2. 本地產業關聯規定

在先前的開發案中，政府大力啟動台灣離岸風電供應鏈的發展。因此現在有高度潛力的本地供應商能以更好的地位，開始開發對國際市場具有競爭力的出口能力。

歐洲許多較成熟的風能供應鏈市場，沒有像台灣這樣的產業關聯執行方案，要求廣泛的在地化。這不但在德國和英國等大型市場，或是比利時、丹麥和荷蘭等和台灣規模相似的市場中都是如此。通常這種缺乏彈性和廣泛的在地化要求，可能會導致本地供應鏈缺乏競爭力，並最終無法充分利用。

目前台灣這種以產業發展項目為主的在地化政策的風險是為這些項目創造一個單獨且競爭力較弱的台灣市場，而不能培養具有全球競爭力之供應者。隨著台灣即將進入離岸風電發展的下一階段，必須要制定政策以強化國內新興供應鏈的國際競爭力，並充分利用其在亞太

Taiwan’s current item-based local content policy risks creating a separate, less competitive Taiwan market for these items rather than building its suppliers into successful global competitors. As Taiwan is about to enter its next phase of offshore wind development, it is critical to set forth a policy that will strengthen the international competitiveness of its nascent domestic supply chain and capitalise on its leading position in the Asia Pacific region. Such an approach will nurture the following developments:

Let the market select and bring the most competitive suppliers into the global offshore wind supply chain

The previous rounds of project awards have brought international offshore wind expertise and experience to Taiwan. By introducing flexibility in the local content policy, developers and other tier-one suppliers will be able to select and groom the suppliers that are the most capable and best-prepared for global market competition.

Further drive cost reductions in the supply chain that will in return benefit Taiwan as a whole

Cost reductions in the offshore wind industry would ultimately translate into lower electricity prices for the Taiwan’s consumers and domestic industries, supporting the

competitiveness of these industries and stimulating their purchase of large scale affordable renewable energy to fulfil local and global environmental commitments. Like the price auction regime, the local content policy should encourage competition and drive down costs.

Embrace and support technological progress to prepare the local supply chain for the future global offshore wind market

Developers worldwide are preparing for the next generation of offshore wind technologies, with different foundation types that can be deployed in deeper seas and bigger turbines for better efficiency. It is crucial for Taiwanese suppliers to embrace these trends and contribute to the next generation of offshore wind projects.

Recommendation

- **Introduce a flexible and reasonable percentage-based local content regulation, adapted from the UK model, as an appropriate and effective policy to bring Taiwan’s local offshore wind suppliers into the global offshore wind supply chain and ensure their contribution to the next generation of offshore wind**

technologies and to drive cost reduction in the domestic supply chain.

3. Onshore wind energy

3.1. Extending onshore wind locations and repowering old turbines

This issue was raised in last year’s paper. Onshore wind is one of the least expensive sources of renewable energy, with the potential to play a larger role in Taiwan’s renewable energy supply.

However, Taiwan is densely populated and locations for the development of onshore wind turbines in Taiwan are limited. Land scarcity is also an issue in other densely populated countries such as the Netherlands. Taiwan may wish to draw on their experience with this challenge.

Recommendations

- **Government agencies, especially the Bureau of Energy (BOE), the Industrial Development Bureau (IDB), the Taiwan International Ports Corporation (TIPC) and the Ministry of Transportation and Communications (MOTC) should promote and develop onshore wind along highways, railways, industrial parks and in harbours, as various**

地區的領先地位，來促進以下的發展：

由市場來選擇，並將最具競爭力的供應商引入全球離岸風電供應鏈

先前的開發案已將國際離岸風電的專業知識和經驗帶進了台灣。透過彈性得引進在地化政策，開發商和其他第一級供應商將能夠選擇和培養最有能力，並且已做好充分準備，面對全球市場競爭力的供應商。

進一步降低供應鏈中的成本，並使台灣整體受益

離岸風電產業成本的降低，最終將轉化使台灣消費者和國內業者所負擔的電價下降；提升這些產業的競爭力，並刺激他們購買大規模、可負擔得起的再生能源，以履行本地和對全球環境的承諾。就像競價制度一樣，在地化政策應鼓勵競爭並降低成本。

順應並支持技術的進步，為未來全球離岸風電市場的在地化供應鏈做好準備

全世界的開發商正在為未來的離岸風電技術做準備，它們具有不同的基礎類型，可以建造在更深的海域和打造更大的風機以提高效率。台灣供應商必須順應此一趨勢，為未來的離岸風電開發努力。

建議

- **引進以英國模式為背景，以百分比為基礎、靈活且合理的在地化法規，作為適當且有效的政策，將台灣離岸風電的在地化供應商納入全球離岸風電供應鏈，並確保其對下一世代的離岸風電技術做出貢獻，並降低國內供應鏈的成本。**

3. 陸域風電

3.1. 擴大陸域風電的範圍並重啟舊有風機

陸域風電為最便宜的再生能源之一，有潛力可在台灣的再生能源供應鏈中，扮演更重要的角色。

然而，台灣人口密度高，能發展陸域風電風機的空間有限。同樣的問題也發生在荷蘭等其他人口密度高的國家中。面臨此一挑戰，台灣不妨借鑒他們的經驗。

建議

- **仿效歐洲各國，鼓勵（經濟部、工業局、台灣港務公司和交通部）沿著公路、鐵路、工業園區和港口發展陸域風電，並依其情形設定具體目標。**
- **修訂（內政部）海岸保育計劃，特別允許在海灘、河口和潮間帶**

<p>European countries have done, and set specific targets accordingly.</p> <ul style="list-style-type: none">• The Ministry of Interior (MOI) should revise the coastal protection plan to specifically allow the installation of onshore wind turbines along beaches, estuaries and intertidal zones.• Support and promote the re-powering of old wind turbines, including a programme of simplified and expedited permitting process that skips an Environmental Impact Assessment (EIA) if already done or not necessary for the initial windfarm.• Encourage the replacement of existing turbines with larger, more powerful and more efficient turbines.	<p>energy by making it more expensive for them than for newcomers to take advantage of the new open market for energy sales. The early efforts of these operators helped pave the way for the development of this market. They should not be penalised for their efforts.</p> <p>Recommendation</p> <ul style="list-style-type: none">• Drop the requirement to pay a fee to Taipower when an onshore wind operator wants to end its participation in an FIT scheme and sell its power on the open market instead. <p>3.3. A coordinated approach to the recycling of wind turbine blades</p> <p>This is a new issue. Although most of the material in wind turbines can be recycled, there is no good recycling solution for the rotor blades. Within the next seven years, we expect that over 1,900 tonnes of glass fibre reinforced epoxy resin has to be disposed of, as developers disassemble their 20-year-old wind turbines. Future demand will be higher as hundreds of turbines are</p>	<p>planned to be installed offshore. Currently there is no legal way in Taiwan to dispose of this material in such quantities. Furthermore, there is no method available to recycle these; whereas there are methods available for their disposal including: landfill, incineration or mixing with cement to make concrete products.</p> <p>Recommendation</p> <ul style="list-style-type: none">• Facilitate cooperation between wind turbine manufacturers, the local recycling industry and research institutes to come up with new environmentally-friendly ways of recycling wind turbine blades. <p>4. Promoting the long-term development of offshore wind power in Asia</p> <p>Issues in this section build on issues raised in last year's paper under the heading "Zonal development".</p> <p>4.1. Enhancing the predictability of Taiwan's offshore wind developments</p> <p>This is a new issue. Phase 3 of Taiwan's offshore wind programme has generated great excitement and interest among wind farm</p>
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<p>安裝陸域風電的風機。</p> <ul style="list-style-type: none">• 支持和促進舊有風機的重新供電，例如若風場最初已完成環評或沒有必要再進行環評，則應省略環評程序，以此簡化並加快許可程序。並且應鼓勵以更大型、提高功率及效率更高的風機替換現有風機。	<p>該市場的道路，他們不應因其努力而受到懲罰。</p> <p>建議</p> <ul style="list-style-type: none">• 於陸域風電業者欲中止躉購計畫，並改為在公開市場上出售電力時，無需向台電支付費用。 <p>3.3. 參與並安排回收風機扇葉</p> <p>儘管風機中的大多數材料都可以回收，但目前缺乏對於扇葉回收良好解決方案。在未來的 7 年內，因為開發商將拆除已使用 20 年的風機，我們預計將有超過 1900 噸的玻璃纖維增強環氧樹脂被棄置，且隨著離岸安裝近百台風機的計畫，未來的需求將會更高，而台灣目前沒有合法方式棄置這麼大量的此種材質。此外，針對風機扇葉並沒有可回收的方法。然而對於其棄置已有</p>	<p>多種處理方法，包括垃圾掩埋、焚化或與水泥混合製成混凝土產品。</p> <p>建議</p> <ul style="list-style-type: none">• 促進風機廠商與本地回收業者和研究機構之間的合作，以提出新的環保方法來回收風機扇葉。 <p>4. 促進亞太離岸風電的長期發展</p> <p>4.1. 強化台灣離岸風電發展的可預測性</p> <p>台灣離岸風電計劃的第三階段吸引了全球風場開發商、供應商和金融業著的極大興趣。台灣應持續保持此一趨勢，並繼續建立其離岸風電的供應鏈，維持其持續作為大規模能源投資的可靠目的地的名聲。</p> <p>建議</p> <ul style="list-style-type: none">• 遵循離岸風電發展之相關法規所制定的事前通知，及聽取建議程
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developers, suppliers and financiers around the world. Taiwan should maintain this momentum and continue to build both its offshore wind supply chain and its reputation as a reliable destination for large-scale energy investments.

Recommendations

- Follow established notice-and-comment procedures for all regulations affecting offshore wind development and allow sufficient time for interested parties, including foreign parties, to provide timely suggestions and comments.
- Announce timetables and hold auctions as promptly as possible and avoid unnecessary delays and rescheduling. Predictability in the award process increases efficiency and reduces costs, encouraging more competitors to participate. If possible, hold the next round of auctions before the end of 2021.

4.2. Increasing capacity of awarded projects

This is a new issue. Technological innovations and competitive market mechanisms reduce renewable energy costs, but economies of

scale also play a key role. Larger projects optimise development costs and translate into larger orders and greater certainty for developing the local supply chain. As the local supply chain grows, Taiwan's suppliers can become more competitive in other Asia-Pacific markets. Larger projects also encourage the deployment of larger, more efficient, state-of-the-art wind turbines, reducing the cost of renewable energy.

Recommendation

- Award larger capacity projects in each auction cycle. Larger projects will reduce domestic energy prices and make the Taiwan supply chain more competitive, both in Taiwan and abroad.

4.3. Planning ahead for key supporting infrastructure

This is a new issue. Practical and comprehensive planning for key public infrastructure such as the reinforcement of the electricity transmission grid is critical for the development of offshore wind. Access to grid capacity is the most decisive confirmation needed to assess project feasibility for both existing and new projects. We believe that the grid planning should be based on a long-term and practical

perspective, meaning what is in the plan needs to reflect solutions for the current outstanding projects and potential new project areas.

Recommendation

- Involve offshore wind developers in the planning of improvements to Taipower's grid and key supporting infrastructure.

4.4. Support for floating offshore wind technology

This is a new issue. Taiwan set the goal of a further 10GW of offshore wind from 2026-2035. Floating offshore wind projects, deployed in deeper water, may contribute to meeting this objective, as well as reinforce Taiwan's regional leadership in offshore wind as a whole.

Because floating offshore technologies are relatively new, with no clear market leaders, Taiwan has an opportunity to sponsor this market segment and develop the intellectual property, as well as the supply chain of this technology class. By enabling scale and the industrialisation of the floating offshore market segment, Taiwan can become an international hub, with opportunities to export skills and equipment worldwide.

Recommendations

- The BOE and IDB should create a "less-established

序，並允許國內外的相關單位，能夠有充足的時間提出建議。

- 公佈時間表並盡速舉行競價程序，避免不必要的延誤或重新安排時間。該程序的可預測性可提高了效率並降低成本，從而鼓勵了更多的競爭者得以參與。可能的話，請在明年年底前舉行下一階段的競價。

4.2. 增加獲選風場的容量

技術的創新和競爭性的市場機制，降低了再生能源的成本，但規模經濟也發揮了關鍵作用。較大規模的開發案可以優化開發的成本，並為發展中的在地供應商，帶來更多訂單以及更大的確定性。隨著在地供應鏈的發展，台灣的供應商在其他亞太市場中可變得更具競爭力。

較大規模的開發案可帶動布置更大、更高效率且最先進的風機，從而降

低了再生能源的成本。

建議

- 在競價程序中給予更大容量的開發案。較大的開發案將得以降低國內能源價格，並使台灣供應鏈在國內外均更具競爭力。

4.3. 提前規劃重要的基礎設施

要發展離岸風電，對重要的公共基礎設施，例如加強輸電網絡，進行實際且全面性的規劃十分重要。要評估現有和新開發案的可行性，具有決定性的確認方式在於併入電網容量的取得。本委員會認為電網併聯的規劃應，從長期和實用性的觀點出發，也就是說，規劃中的內容需要能替現行仍未完成以及潛在之新開發案，提出解決方案。

建議

- 讓離岸風電開發商得參與台電電網和關鍵基礎設施的改善計劃。

4.4. 納入浮動式離岸風電技術

台灣訂下了目標，預計離岸風電要在 2026 年至 2030 年達到 10GW 的發電量。

設置在更深水域的浮動式離岸風電計畫，可以對實現此目標作出貢獻，並鞏固台灣在整個離岸風電領域的領導地位。

由於浮動式離岸技術是相對而言較新，沒有明確的市場領導者，因此台灣有機會贊助該領域的市場，並開發智慧財產權及該技術類別的供應鏈。透過擴大規模和浮動式離岸市場的工業化，台灣得以成為國際樞紐，並有機會向全球出口技術和設備。

建議

- 為補充涵蓋陸上風電和離岸風電固定式結構的「既有技術類

<p>technologies category" to include offshore wind floating foundations, to complement an "established technologies category" that includes onshore wind and offshore wind fixed-bottom foundations.</p> <ul style="list-style-type: none">• Develop a policy for floating offshore wind within the next twelve months, including adequate financial support and a framework allowing economies of scale for the first projects, hence helping industrialisation and cost reductions.		
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<p>別」，應（由經濟部、工業局）</p> <p>建立「新興技術類別」，用以涵蓋離岸風電浮動式結構。</p> <ul style="list-style-type: none">• 在接下來十二個月內，訂定浮動式離岸風電的政策，包含充足的資金支援及制度框架，來實現第一個開發案的規模經濟，從而有助於工業化和降低成本。		
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