Auction Results and the Importance of a Stable FiT Regime for Offshore Wind in Taiwan

4th Asia Offshore Wind Day, Taipei, Taiwan

September 18, 2018

NPI.TO

Key Messages

1. 2018 FiT Price Created Auction Price

   競標價格是建立2018躉購費率基礎之上

2. Localization Requires Stable FiT Price

   實現在地化必須要有穩定的躉購費率

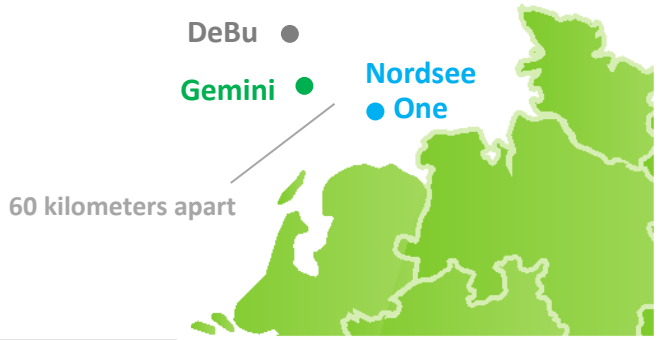
Intro to Northland Power Inc.

COD: April 2017
60% Interest

COD: Dec 2017
85% Interest

COD: End of 2019
100% Interest

Project Capital Costs: Over €5 Billion



As of December 2017, Northland Power was the world's fifth largest operator of offshore wind assets.

Hai Long 2 & 3 – Project Details

Project Characteristics	Hai Long 2(A)	Hai Long 2(B)	Hai Long 3
Rated Capacity 額定容量	300 MW	232 MW	512 MW
Distance to shore 離岸距離	50 km	50 km	60 km
Water depth 水深	35 - 50 m	35 - 50 m	35 - 50 m
Wind speed 風速	10 - 12 m/s	10 - 12 m/s	10 - 12 m/s
Foundation type 基座類型	Jacket	Jacket	Jacket
Grid Connection Date 併聯日期	Q4, 2024	Q4, 2025	Q4, 2025
PPA Rate (TWD / kWh) 購售電合約費率	5.8498[1]	2.2245	2.5025

The average weighted PPA Rate of Hai Long 2 (A+B) is: TWD 4.2688 TWD / kWh

海龍2(A+B)號 之平均加權購售電費率為：
新台幣4.2688 /度

The average weighted PPA Rate of Hai Long 2 and Hai Long 3 is: 3.4026 TWD / kWh

海龍2號與3號之平均加權購售電費率為：
新台幣3.4026 /度

[1]**Assumes 20-year PPA signed with 2018 FiT price**

2018 FiT Created Auction Price (I)

競標價格是建立2018躉購費率基礎之上(I)

Hai Long 2 & 3 were able to bid competitive auction prices for the below reasons:

海龍2號與3號能提出具競爭力標價的原因：

1. Auction is for 2025 Projects – The auction pricing is based on the presumption that by 2025, Taiwan will have used the FiT mechanism to build almost 4 GW of offshore wind projects, which will include significant investment into infrastructure, supply chain, project finance, and offshore wind personnel. An auction for projects in 2018 – 2024 would have led to higher auction pricing. Offshore wind in Taiwan cannot be built from the beginning at the 2025 auction prices.

1. 競標乃針對2025年之專案計畫 – 競標價格之擬訂乃預設於2025年前，台灣會用躉購費率機制來發展出近4GW的離岸風電計畫，包括對基礎建設、供應鏈、專案融資及離岸風電人才之大幅投資。如果是針對2018至2024年之計畫，則競標價格應該會比較高。台灣的離岸風電不可能自從一開始就以競標價格來興建。

2018 FiT Created Auction Price (II)

競標價格是建立2018躉購費率基礎之上(II)

Hai Long 2 & 3 were able to bid competitive auction prices for the below reasons:

海龍2號與3號能提出具競爭力標價的原因：

2. No Local Content – the auction did not include local content requirements, which allowed for lower capital costs in 2025 auction bids. Nonetheless, developers building in 2025 will want to source as much equipment as possible from Taiwan. A high FIT price should allow the supply chain to develop enough that for 2025 projects, Taiwan companies will be able to compete with global vendors for 2025 contracts.

2. 沒有在地產業關聯性要求 – 競標並未有在地產業關聯性的要求，因而2025年之競標案能有較低之資本成本。儘管如此，開發商於2025年建造時會盡量從台灣採購設備。高躉購費率價格能讓供應鏈得以發展，而使2025年計畫興建時，台灣公司能與世界各國的供應商來競爭2025年的合約。

2018 FiT Created Auction Price (III)
競標價格是建立2018躉購費率基礎之上(III)

Hai Long 2 & 3 were able to bid competitive auction prices for the below reasons:

海龍2號與3號能提出具競爭力標價的原因：

3. Advances in Technology - Offshore wind technology has improved significantly over the past ten years, with advances including larger turbines, improved fabrication methods, more effective installation vessels, and enhanced operations and maintenance procedures. This is expected to continue through to 2025.

3. 科技之進步 –離岸風力科技在過去十年大幅地進步，包含大型風機、製造工程的進步、更有效率的安裝船，以及運作與保養程序的進化。這樣的進步應會持續至2025年。

2018 FiT Created Auction Price (IV)
競標價格是建立2018躉購費率基礎之上(IV)

Hai Long 2 & 3 were able to bid competitive auction prices for the below reasons:

海龍2號與3號能提出具競爭力標價的原因

4. Shared Infrastructure in Hai Long 2 – In Apr 18, Hai Long 2(A) was awarded 300 MW of 20-year FiT price to connect in 2024. This left an additional 232 MW for Hai Long 2(B) to bid into the auction to connect in 2025. Although they have different PPA prices, Hai Long 2(A) and Hai Long 2(B) are one project and will share infrastructure, paid for in part by the FiT allocation awarded to Hai Long 2(A). This infrastructure includes: offshore substation, onshore electrical works, and onshore O&M facilities, among others. The FiT price for Hai Long 2(A) allowed a competitive auction price for Hai Long 2(B). The weighted average PPA rate for Hai Long 2 is 4.2688 TWD / kWh for 2024 / 2025.

4. 與海龍2號共享基礎建設 –於4月18日遴選中，海龍2(A)號獲配了於2024年進行併網的300MW容量，並得適用20年躉購費率。而使海龍2(B)號還有232MW的容量可以2025年併網計畫參與競標。儘管遴選與競標有不同的購售電價格，海龍2(A)號與海龍2(B)號可視爲“一個”專案計畫，因此會共享基礎設施；部分興建費用則會以海龍2(A)號所獲得的躉購費率來支應。這些基礎設施包含：離岸變電所、陸上電力工程，以及陸上營運管理設施…等。海龍2(A)號之躉購費率使海龍2(B)能提出具有競爭力之競標價格。海龍2號於2024/2025年之加權購售電價格為新台幣4.2688 / 度 。

2018 FiT Created Auction Price (V)

競標價格是建立2018躉購費率基礎之上(V)

Hai Long 2 & 3 were able to bid competitive auction prices for the below reasons:

海龍2號與3號能提出具競爭力標價的原因

5. Shared Procurement and Deployment in Hai Long 2 & 3 – Hai Long 2(A) has a connection date of 2024 and Hai Long 2(B) and Hai Long 3 have a connection date of 2025. This is close enough in time that Hai Long 2 and 3 can share a platform for equipment procurement, vessel mobilization, staffing and financing, among other shared costs. Hai Long 2 and 3 will be treated as a single 1,044 MW project, and that creates economies of scale, allowing a competitive bid for Hai Long 3. The weighted average PPA rate for Hai Long 2 & 3 is 3.4026 TWD / kWh for 2024 / 2025.

5. 海龍2號與3號共享採購與人力調度 – 海龍2(A)須於2024年併網、海龍2(B)與海龍3號則須於2025年併網。兩者時間接近因而海龍2號與3號可以共享設備採購、船舶動員、人員以及融資…等其他分攤成本。海龍2號與3號會被視為“一個”1,044MW的計畫，而創造了規模經濟，使海龍3號得提出有競爭力的標價，海龍2號與3號於2024/2025年之加權購售電價格為新台幣3.4026/ 度。

Localization Requires Stable FiT (I)

實現在地化必須要有穩定的躉購費率(I)

NORTHLAND POWER

- Taiwan has introduced ambitious local content obligations. These local content obligations grow each year from 2021 to 2024, with 2024 including the highest local content obligations. The intention of the local content obligations is to provide price support to develop an offshore wind supply chain in Taiwan, with benefit of stable prices flowing to Taiwanese companies.
- 台灣已經引進了相當有企圖心的在地產業關聯性義務。這些在地產業關聯性義務自2021年到2024年逐年增加，在2024年包含了最多的在地產業關聯性義務。這些產業關聯性義務的目的在於，藉由使台灣產業獲得穩定的收益，提供台灣發展離岸風電供應鏈的價格基礎。

- At present, Taiwan has an underdeveloped offshore wind supply chain, and very little of the equipment required under localization plans can be sourced by Taiwan. A stable FiT price is required to support capital investment into Taiwan's supply chain, in order to build new facilities and / or upgrade existing equipment.
- 目前台灣的離岸風電供應鏈仍開發中，在地產業關聯性計畫中所要求之設備僅有非常少數能由台灣採購。為建造新設施以及/或升級現存設備，以穩定的躉購費率來支持對台灣供應鏈之資本投資，有其必要性。

Localization Requires Stable FiT (II)

實現在地化必須要有穩定的躉購費率(II)

Timeline	2021	2022	2023	2024	2025
Stage	Lead time		Stage 1	Stage 2	
Categories and programme of offshore wind power industry development	• Tower • Electrical facility: The three items below are for onshore electrical equipment A. Transformer B. Switches C. Switchboard • Submarine foundation manufacturing • Vessels building: working vessels supply chain for newly build or via modification (1) Investigation vessels (2) Logistic supporting vessels (3) Collation vessels (4) Commuter vessels (5) Cable laying vessels	Same as for 2021	1. Nacelle assembly 2. Wind turbine components (1) Transformer (2) Switchboard (3) Uninterrupted power supply (4) Hub of wind turbine (5) Power cable (6) Hub casting parts (7) Fasteners 3. Marine cable manufacturing 4. Vessels building: working vessels supply chain for newly build or via 5. modification (1) Transport vessels (2) Installation vessels 6. Items of lead time for 2021 and 2022	1. Wind turbine components (1) Gear box (2) Electricity generator (3) Power conversion system (4) Blade and resin used (5) Nacelle cover (6) Cast items for nacelle base 2. Lead time items for 2021 and 2022 3. First stage items for 2023	Same as lead time of 2021, first stage of 2023 and second stage of 2024

Localization Requires Stable FiT (III)
實現在地化必須要有穩定的躉購費率(III)

NORTHLAND POWER

- Projects connecting in 2020 / 21 require a stable FiT to start the offshore wind industry in Taiwan and build infrastructure (particularly, ports & harbors). While early European projects could rely on offshore oil and gas experience in the North Sea, the 2020 / 21 projects are not able to draw on similar local marine engineering and construction experience, requiring the import of people and equipment.
- 2020和2021年實現完工並聯的計畫需要一個穩定的躉購費率來支持台灣離岸風電產業的發展。在歐洲，早期的離岸風電計畫可以依賴在北海的石油和天然氣工程中已經積累起來的離岸操作經驗，但是2020和2021的計畫並不能享有這些包括比如海上建造經驗在內的優勢。相反，台灣在此方面需要人才，設備和經驗的輸入。

- Local content escalates in 2023 / 24, with emphasis on sourcing turbine equipment from Taiwan. The 2023 / 24 projects represent only about one-third (1/3) of total awarded allocation capacity (1,342 MW out of 3,836 MW), but have the highest local content obligations. While some parts of supply chain will have lower costs by 2023 / 24, other parts will be more expensive. A stable FiT is required to ensure local content obligations are met.
- 2023和2024年實現完工並聯的計畫在在地產業關聯性的要求上比2021和2022的計畫要高很多，尤其是在風機零組件的要求上。2023和2024的計畫佔有總開發容量的三分之一（ 3,836 MW中之1,342 MW),但在地產業關聯性計畫的要求確卻是最高。儘管2023和2024的計畫可以享有之前已經發展起來的地方產業，但是在一些新的產業和設備上的造價反而會更高。因此，穩定的躉購費率才可以保證地方產業關聯的實施。

Localization Requires Stable FiT (IV)
實現在地化必須要有穩定的躉購費率(IV)

NORTHLAND POWER

- Capital investment into Taiwan will come from Taiwanese companies, but also from foreign equipment manufacturers that want to participate in Taiwan's offshore wind market. This investment will be very significant, and will create high-paying jobs in Taiwan.
- 對於台灣之資本投資需要來自台灣公司，也需要來自國外有意願參與台灣離岸風電市場的製造商。此項投資將會非常重大，且會在台灣創造高薪資之工作。

- For foreign manufacturers in particular, they require a long-term stable price structure that will allow them to deploy foreign direct investment into Taiwan. Many of the world's largest offshore wind equipment companies are interested in investing in Taiwan, but they require a stable FiT price to make that commitment. Businesses will not invest in Taiwan's supply chain without a stable FiT.
- 對國外製造商而言，他們需要長期穩定之價格結構使他們能安排國外直接對台灣投資。許多世界最大的離岸風電設備廠商都有興趣投資台灣，但他們需要一個穩定的躉購費率來使他們做出承諾。如果沒有穩定的躉購費率，廠商們不會投資台灣的供應鏈。

Localization Requires Stable FiT (V)

實現在地化必須要有穩定的躉購費率(V)

NORTHLAND POWER

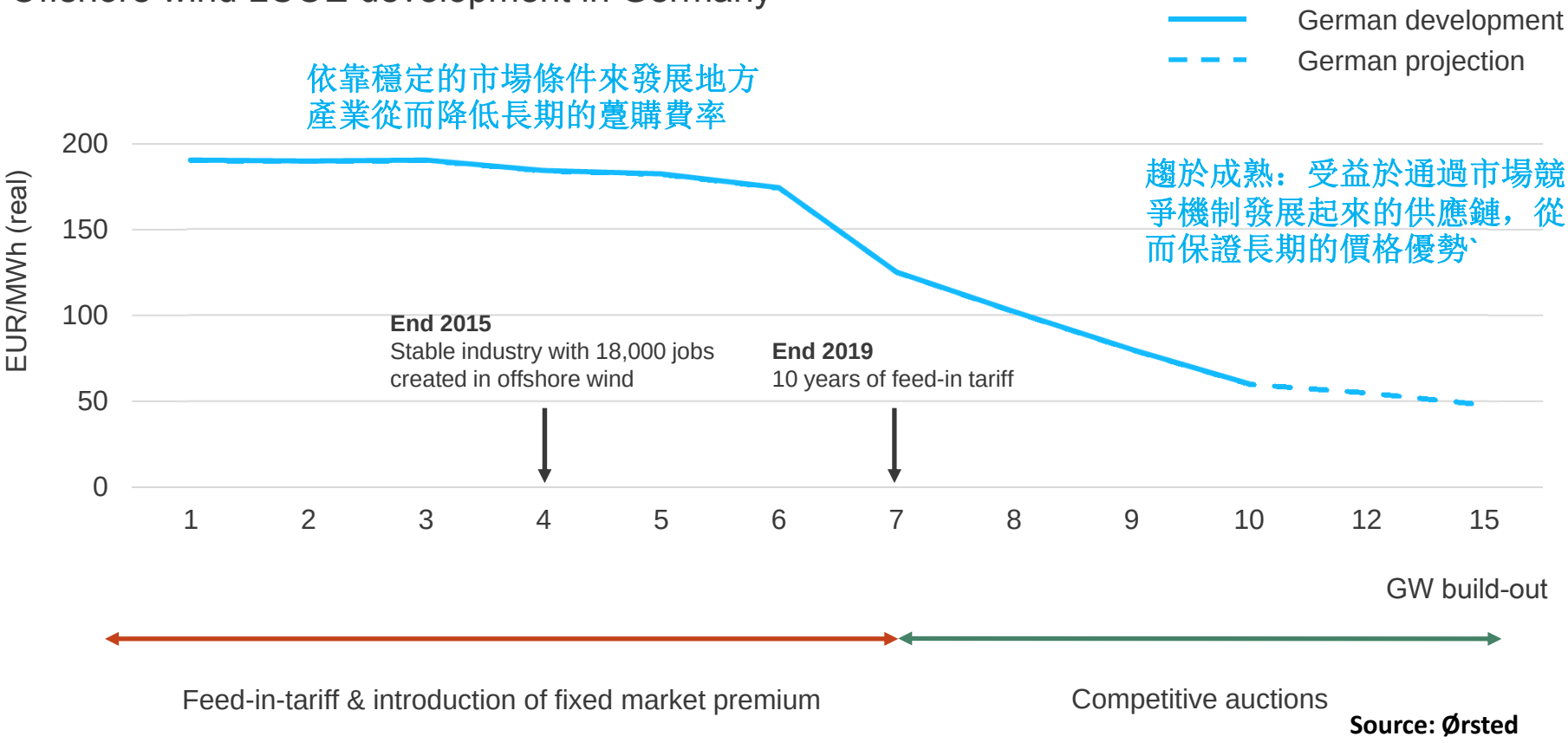
- As supply chain moves quickly down the cost curve, Taiwan will quickly position itself as a regional leader in offshore wind, with export opportunities to Korea, Japan and Vietnam, among others. Taiwan's earthquake experience is well-suited to work in Japan, while typhoon experience will assist in Japan and Vietnam. Taiwan is uniquely suited to build a regional supply chain, and FiT stability is the key.
- 隨著供應鏈成本曲線快速下降，台灣能迅速地成為區域離岸風電龍頭，而能對韓國、日本、越南以及其他國家輸出經驗。台灣的地震經驗能在日本發揮，而颱風經驗也能協助日本與越南。台灣有獨特地位而適合建構一個區域供應鏈，而躉購費率穩定性為其關鍵。

Localization Requires Stable FiT (VI)

實現在地化必須要有穩定的躉購費率(VI)

離岸風力躉購費率的發展-德國

Offshore wind LCOE development in Germany



Source: Ørsted

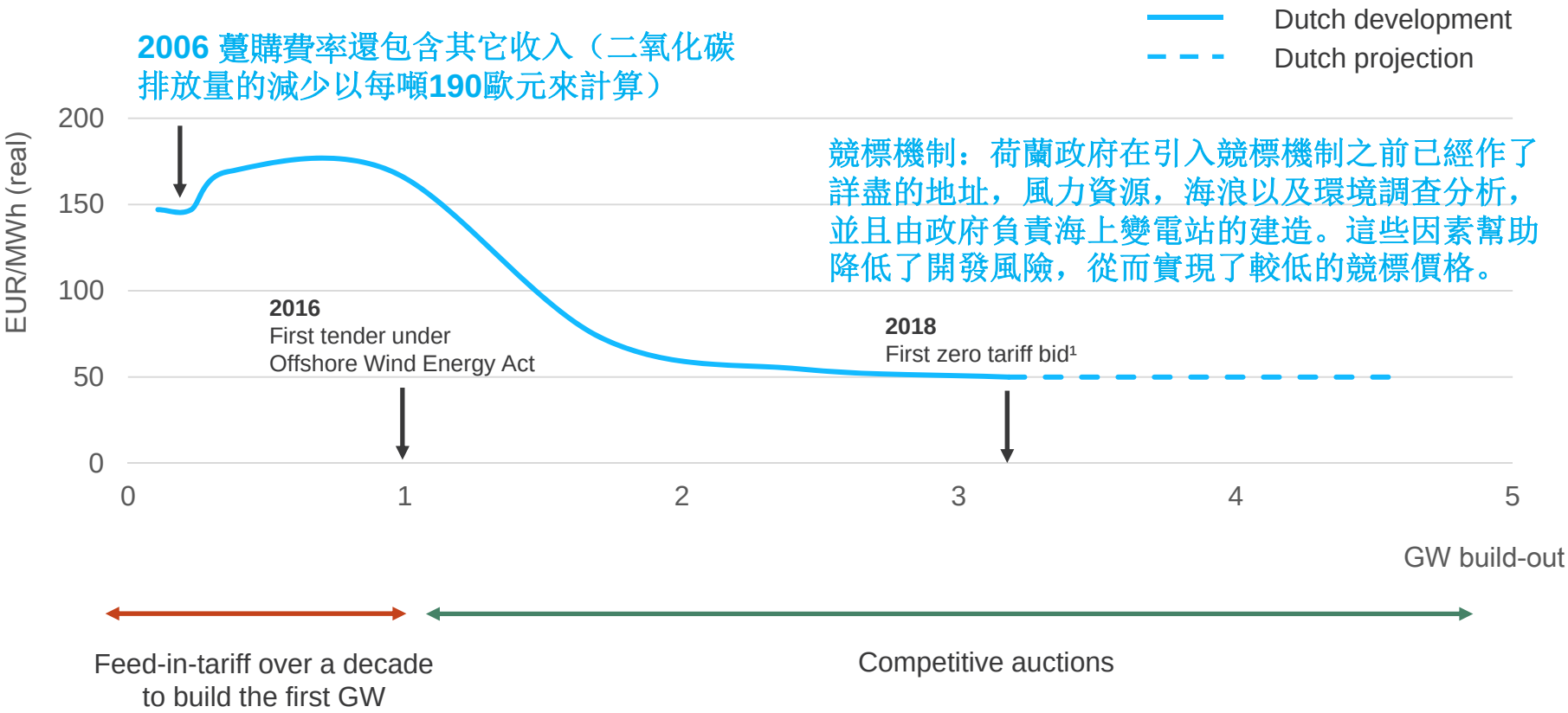
Germany enabled stable remuneration for a decade, setting the ground for drop in LCOE

德國通過十年的時間建立起了穩定的電業補償機制，從而為躉購費率的降低奠定了基礎

Localization Requires Stable FiT (VII)

實現在地化必須要有穩定的躉購費率(VII)

Offshore wind LCOE development in the Netherlands



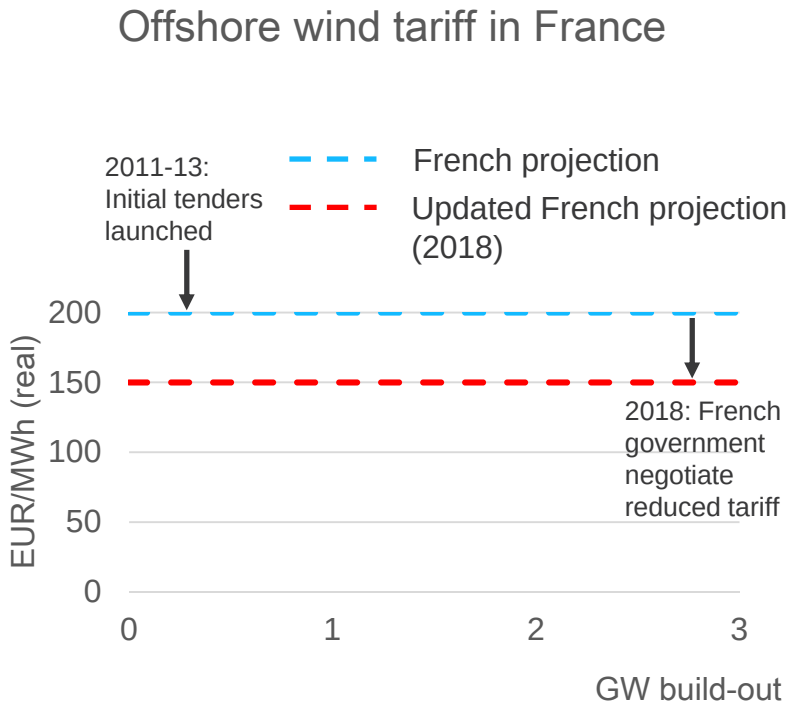
As for Germany, the Netherlands enabled stable remuneration for a decade, setting the ground for drop in LCOE

同德國一樣，荷蘭也是通過十年的時間才實現了從躉購到競標機制的逐步過渡。

Localization Requires Stable FiT (VIII)

實現在地化必須要有穩定的躉購費率(VIII)

- 法國政府在2011和2013年分別進行了兩次的離岸風力競標
- 在不存在現有的地方供應鏈的基礎上，這兩次的競標規則中都有地方產業關聯的要求
- 在此之前，法國也沒有任何商業級的離岸風力計畫
- 因此，開發商不得不承擔很高的風險，從而導致了很高的躉購費率
- 這些風險最終轉化為實際的包括法規界定的困難、地方供應鏈的受挫和一些額外的現場調查等大量的問題，進而導致了重大延誤
- **在距第一次競標開始之後的7年時間裡，法國已經完工的離岸風力計畫仍為0GW**
- 2018年，政府和開發商一致同意將躉購費率由190-210歐元/MHh降到140-160/MHh。相比於其他歐洲國家，這個費率仍然屬較高水平，但對於投資方和借款方而言仍具備著巨大的不確定性



Implementing tenders before having allowed for the supply chain to emerge, learning curve to take place as well as projects to be de-risked resulted in massive delays and no OW capacity built to date in France

法國的經驗告訴我們：在缺乏成熟的地方供應鏈，以及形成對於離岸風力發電行業整體的認知和理解之前就開始採取競標機制，將無法實現風險因素的規避，從而引發巨大的延誤。這是導致法國至今都沒有發展起離岸風力發電的真正原因。

Conclusion (I)

1. 2018 FiT Price Created Auction Price

Offshore wind in Taiwan cannot be built from the beginning at the auction prices. The auction prices were enabled by the FiT price. If the FiT price changes too much, it will undermine the ability of developers to deliver 2025 projects at the auction prices.

1. 競標價格是建立2018躉購費率基礎之上

台灣的離岸風力不可能一開始就依競標價格興建。會有這樣的競標價格乃歸因於躉購費率。如果躉購費率變動太大，會損及開發商以競標價格完成2025年計畫之能力。

Conclusion (II)

2. Localization Requires Stable FiT Price

The growth of a supply chain requires investment by Taiwan companies. A stable FiT price will give foreign and local manufacturers the certainty they require to invest in capital expenditures in Taiwan. If the FiT price changes too much, this investment may be delayed. A stable FiT is required to meet localization requirements.

2. 實現在地化必須要有穩定的躉購費率

供應鏈之成長需要台灣業者之投資。穩定的躉購費率能給國外與在地製造商所需要的確定性，來對台灣投入資本投資。如果躉購費率變動太大，這樣的投資可能會被推遲。在地產業關聯性要求需要穩定的躉購費率才能達成。

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