出國報告（出國類別：開會）

參加 APEC 永續能源轉型研討會
出國報告

服務機關：經濟部能源署
姓名職稱：鄭副組長如閔
派赴國家：越南
出國期間：112年11月22日至112年11月25日
報告日期：112年11月27日

內容摘要

本次出訪目的係參加「APEC 永續能源轉型研討會」，本次研討會為 APEC 和非 APEC 成員經濟體的利害關係人提供機會，分享能源向低碳經濟轉型的機會和挑戰。本次研討會議上報告我國淨零之能源轉型策略，包括我國能源現況、淨零轉型政策、能源轉型關鍵策略。

研討會同時請各經濟體與研究機構報告各經濟體於能源轉型現況、能源轉型可能遭遇困境及如何進行低碳轉型。

於會議期間與各經濟體代表交流 APEC 區域間能源現況、能源轉型推動策略與各經濟體未來規劃經驗可作為我國政策推動之參考依據。

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一、目的及行程紀要

(一) 目的

本出國行程係於 2023 年 1 月 23 日至 25 日赴越南河內參加「APEC 永續能源轉型研討會」，本次研討會為 APEC 和非 APEC 成員經濟體的利害關係人提供機會，分享能源向低碳經濟轉型的機會和挑戰，出國目的係擔任第一場能源轉型講者，分享我國能源現況、轉型當前狀況、淨零碳排路徑及關鍵策略。

同時透過會議瞭解各經濟體能源現況、能源轉型與再生能源最新政策發展與未來規劃，作為我國相關政策推動之參考依據，有助於我國能源轉型與淨零碳排目標達成。

(二) 行程紀要

本次出國行程如下：

日期	行程內容	地點
2023/11/22	去程（臺灣臺北→越南河內）	越南河內
2023/11/23~11/24	出席 APEC Workshop on Sustainable Energy Transition: Opportunities and Challenges	越南河內
2023/11/25	回程（越南河內→臺灣臺北）	—

二、過程(會議紀要及重點)

（一）會議時間：2023 年 11 月 23 日-11 月 24 日

（二）與會單位：各經濟體代表、經濟部能源署

1. 會議議程

Time	Content
Day 1 (Thursday, 23 November 2023)	
08.30 – 09.00	Registration
09.00 – 09.10	Opening Speech By Leader of Ministry of Industry and Trade, Viet Nam
09.10 – 10.00	**Session 1: Overview on Energy Transition** During this Session, speakers will share information on the current state-of-play of energy transition in economies and in the region. The participants will be encouraged to share their relevant knowledge and make floor interventions. Moderator: Ho Ngoc Linh, Deputy Director, KTP Investment & Trade Consulting Speakers: *- Ms Ju-Min Jheng, Deputy Director, Energy Administration, Ministry of Economic Affairs, Chinese Taipei;* *- Ms Letty G. Abella, OIC-Supervising Science Research Specialist, Energy Policy and Planning Bureau, Department of Energy, the Philippines.*
10.00 – 10.30	Discussion
10.30 – 10.45	Tea Break
10.45 – 12.00	**Session 2: Opportunities from Energy Transition** This Session will include presentations and discussions on opportunities from energy transitions towards a low carbon economy. Speakers may also make presentations on how economies swift into renewable energy which has carbon neutrality, on the way towards a climate-resilient future global economy and also a low carbon economy. Moderator: Ho Ngoc Linh, Deputy Director, KTP Investment & Trade Consulting Speakers:

	- Dr Terrence Surles, Consultant, Hawaii Natural Energy Institute, United States; *- Mr Joachim Monkelbaan, Global Trade and Sustainable Development Advisor.*
12.00 – 12.30	Discussion
12.30 – 14.00	Lunch
14.00 – 15.00	**Session 3: Obstacles in Energy Transition – Perspective of the Private Sector** This Session will provide participants with a wide range of experience and information from the private sector regarding obstacles (socio, economic, technical etc.) in energy transition. Speakers are encouraged to suggest recommendations on appropriate measures to tackle the obstacles through sound policies, technical assistances, etc. Speakers may also refer to gender issues that related to energy transition. Moderator: Ms Nguyen Tue Phuong, Lawyer, Viet Mind Law, Viet Nam Speaker: *- Mr Kang Taeil, Founder and CEO, One Energy Island Co. Ltd, Korea;* *- Mr Nguyen Van Vy, Deputy Chairman, Viet Nam Renewable Energy Association.*
15.00 – 15.30	Discussion
15.30 – 16.00	Tea Break
16.00 – 17.00	**Session 4: Obstacles in Energy Transition – Perspective of the Academic Sector and International Organizations** This Session will provide participants with a wide range of experience and information from the academic sector and international organizations regarding obstacles (socio, economic, technical etc.) in energy transition. Speakers are encouraged to suggest recommendations on appropriate measures to tackle the obstacles through sound policies, technical assistances, etc. Speakers may also refer to gender issues that related to energy transition. Moderator: Ms Nguyen Tue Phuong, Lawyer, Viet Mind Law, Viet Nam Speakers: *- Mr. Vu Quang Dang,Independent Energy Specialist*, Viet Nam *- Dr Terrence Surles, Consultant, Hawaii Natural Energy Institute, United States.*
17.00 – 17.30	Discussion and Wrap up of Day 1
End of Day 1	

Day 2 (Friday, 24 November 2023)	
09.00 – 10.00	**Session 5: Case Studies in some APEC Member Economies** This Session will be dedicated to hearing various case studies and detailed examination regarding energy transition in APEC member economies. Moderator: Dr Cao Thi Hong Vinh, Foreign Trade University, Viet Nam Speakers: *- Ms Letty G. Abella, OIC-Supervising Science Research Specialist, Energy Policy and Planning Bureau, Department of Energy, the Philippines;* *- Mr Thanatat Soponananchai, Development Director, HDF Energy, Thailand;* *- Mr Vu Quang Dang, Independent Energy Specialist, Viet Nam;*
10.00 – 10.30	Discussion (Questions and Answers)
10.30 – 10.45	Tea Break
10.45 – 12.00	**Session 6: Group Break-outs** Moderator: Dr Cao Thi Hong Vinh, Foreign Trade University, Viet Nam During this Session, participants will be divided to different groups to (i) share what they've achieved from Workshop sessions, (ii) brainstorm/ explore possible ways and suggest recommendations to APEC and member economies, (iii) application actions or requirement on necessary resources to implement such recommendations.
12.00 – 14.00	Lunch
14.00 – 15.45	**Session 7: Group Presentations and Panel Discussions** During this Session, group leaders will present outcomes of group break-outs. Panelists will also share their insights on (i) recommendations to APEC and member economies, (iii) application actions or requirement on necessary resources to implement such recommendations. Moderator: Dr Cao Thi Hong Vinh, Foreign Trade University, Viet Nam Speakers: *- Ms Ju-Min Jheng, Deputy Director, Energy Administration, Ministry of Economic Affairs, Chinese Taipei;* *- Dr Terrence Surles, Consultant, Hawaii Natural Energy Institute, United States;* *- Mr Thanatat Soponananchai, Development Director, HDF Energy, Thailand;* *- Mr Joachim Monkelbaan, Global Trade and Sustainable Development Advisor.*
15.45 – 16.00	**Wrap – up/ Conclusion** By Ms Pham Quynh Mai, Viet Nam's Senior Official to APEC
THE END.	

2. 會議內容摘要

本研討會邀請菲律賓能源部能源政策與規劃局、美國夏威夷自然能源研究所、韓國 One Energy Island 公司、越南再生能源協會、泰國 HDF Energy，分享經濟體能源轉型、公私部門與學術界對能源轉型遭遇困境看法、能源轉型案例，並於第 2 天進行分組提出對於能源轉型的建議，各場報告重點摘述如下：

■ 第一場能源轉型

(1)我國講者說明我國能源現況、淨零轉型策略與行動方案、能源轉型關鍵策略(附件)

(2)菲律賓能源部能源政策與規劃局 ***Ms Letty G. Abella***，分享菲律賓能源現況、未來規劃

✓ 菲律賓超過一半初級能源仰賴進口、2022 年電力結構煤占 44%、再生能源占 29%、油占 14%、天然氣占 13%

✓ 未來規劃提高再生能源在電力系統占比 2030 達 35%與 2040～2050 年達 50%、電動機車普及率於 2040 年達 50%、石油製品與電力消耗於 2040～2050 減少 10%、同步進行研究小型電網技術，並已規劃投入 1530 億美金於油氣探勘、再生能源、液化天然氣接收站與電力部門等來達成上述目標。

■ 第二場能源轉型的機會

(1)美國夏威夷自然能源研究所 ***Dr Terrence Surles***，分享美國能源現況與對政府部門建言

✓ 美國現況：化石燃料系統將於 2023 年陸續除役、公用事業太陽光電發電量將增加 54%、2022 年年底風電總裝置容量將達 144GW、太陽光電與風電售電價格與天然氣競爭甚或比煤還便宜、儲存系統變得更加普遍、政府基金須持續投入智慧電網技術與建設、政府能源基金持續增加投資能源

✓ 提出對美政府部門建議

● 制定區域層面的協作再生能源部署計劃

- 支援輸電網擴建
- 投資建築和工業能源效率和材料效率
- 加速車輛、電器和工業流程電氣化
- 支持能源系統教育網絡和技能建設項目的發展
- 向地方政府提供可靠、靈活資金，用於培訓和能力建設
- 持續資助技術創新，以實現 2030 年以後能源轉型

(2)全球貿易與永續發展顧問 *Mr Joachim Monkelbaan*，分享如何邁向低碳經濟

✓鼓勵 2030 年將全球可再生能源產能增加兩倍，建議經濟體向低排放和零排放交通轉型和投資。

✓建議先推動碳中和並已淨零碳排放為最終目標，並可以從相關路徑同時獲得經濟成長

- 發展再生能源：提供就業機會、技術進步並減少對化石燃料的依賴。
- 提高能源效率（工業、交通、建築和電器）：不僅可以減少溫室氣體排放，還可以降低企業和個人成本，創造經濟節約。
- 鼓勵清潔技術創新：包括能源儲存、智慧電網、電動車、碳捕獲和儲存及其他永續解決方案，可促進新興產業經濟成長和創造就業機會。
- 創造綠色就業與投資機會：在工程、製造、建築、新技術研究和開發等各個領域創造就業機會；清潔能源基礎設施、永續交通和其他低碳措施存在重大投資機會。

■ 第三場公私部門對能源轉型遭遇困境看法

(1)韓國 One Energy Island Co. Ltd 創辦人兼執行長 Kang Taeil，分享南韓能源轉型需求與挑戰，並對政策制定者跟公用事業提出下列三點建議

✓升級電力系統基礎設施：引領電網基礎設施升級進步，促進技術開發。

✓開放電力市場：建立競爭市場機制，請新參與者提供新的服務。

✓凝聚社會共識：協調利害關係人，事先建立共識

(2)越南再生能源協會副主席 Nguyen Van Vy 分享越南照明發展轉型，由傳統燈具轉為 LED(2025 年達 100%LED)，並建議越南應應制定城市照明發展規劃、允許 PPP（ESCO、EPC）協助城市照明推動、應該考慮推動智慧共桿。

■ 第四場學術界對能源轉型遭遇困境看法

美國夏威夷自然能源研究所 Dr Terrence Surles 提出大規模發展潔淨能源 4 點建議

- ✓突破制度、文化和社會：需要政府協助
- ✓健全電網：要確定再生能源開發計畫、並搭配新技術以解決變動性大的再生能源問題
- ✓資源：資源供應鏈可以在各經濟體間有效運作
- ✓財務：政府制定合理計劃，有利財務投入潔淨能源

■ 第五場能源轉型案例分享

(1)菲律賓能源部能源政策與規劃局 ***Ms Letty G. Abella***，分享菲律賓再生能源轉型

- ✓2022 年電力系統再生能源占比為 29%，規劃 2030 年達 35%與 2040～2050 年達 50%，2030 年主要增加太陽光電與風力，2040 年除上述兩項外也增加地熱與水力
- ✓透過增加市場機制（競價）、改變投資環境（全外資亦可參加當地能源事業）、求售電公司要採購一定比例綠電、推動基礎建設與再生能源技術研發等加速再生能源推動。

(2)泰國 HDF Energy 公司 Mr Thanatat Soponananchai，分享泰國目前電力市場現況，並介紹法屬圭亞那西部 CEOG 綠氫計畫，用 55MW 太陽光電搭配綠色氫能儲存發電廠，每年 860 噸的氫氣產量將由 16 兆瓦的電解平台產生，在壓力下儲存在儲氫罐中，然後透過高功率燃料電池在反向電解過程中提供安全且 24/7 可用的電力，同時建議泰國應儘速訂定有關氫能一般（非商用）儲存的規範並提供補助（如特別進口或較高 FIT 補助）

(3)越南再生能源協會副主席 Nguyen Van Vy 分享越南電力現況，2023 年力系統再生能源占比為 13%，為緩解再生能源併網和電網擁塞規畫於 2030 年前完成總計 300MW 儲能示範計畫。

■ 第六、七場分組討論與分享

(1)議題：從本次研討會得到什麼？想提供什麼建議給 APEC 跟各經濟體？這些建議需要何種行動或資源

(2)共同結論：

✓不同國家的 RE 潛力不同、想要實現轉型需要良好的政策、需要依據政策採取行動以獲得資金支持、再生能源系統的優點在於資源就地但有 成本變化和其他供應鏈延誤等挑戰、碳中和可能需要其他技術（例如核能）

✓能源轉型政府政策最重要，會引導技術發展、國際投資與民眾參予

三、心得與建議

此次我國與各經濟體、APEC 專家小組及相關組織就能源轉型專業領域交流，互相瞭解其能源轉型與再生能源政策與具體措施，有助於達成我國淨零能源轉型目標。

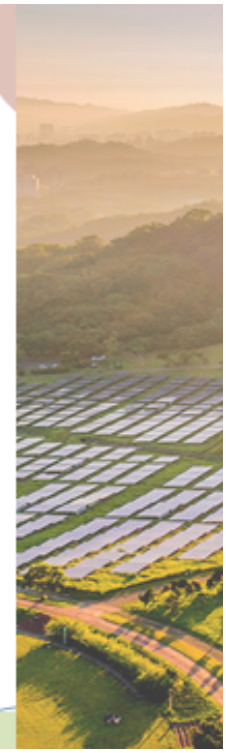
為協助 APEC 掌握 APEC 區域之能源資料蒐集、促進 APEC 達成淨零能源轉型目標，我國可持續向 APEC 分享我國淨零轉型與再生能源最新發展等資訊，以利該組織執行相關研究。

四、附件

Chinese Taipei's Energy Transition Toward Net Zero

Ju-Min Cheng,
Duty Director, Energy Administration, Ministry of Economic Affairs, Chinese Taipei

November 2023



Outline

01 / Energy Situation

02 / Net Zero Transition

03 / Key Strategies Highlights

04 / Conclusion

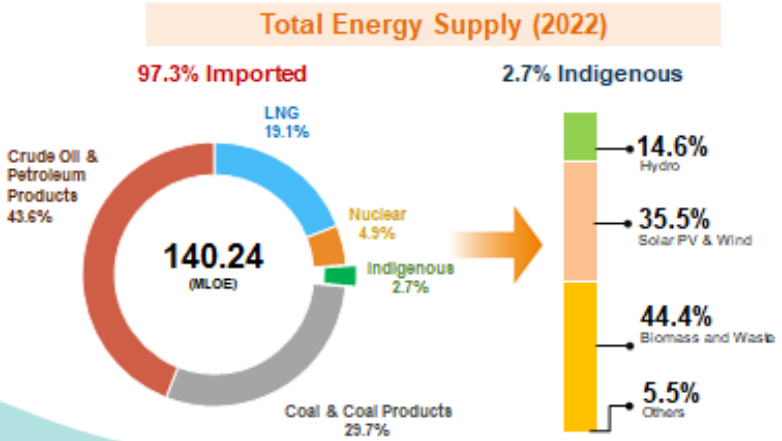
PART 01

Energy Situation

3

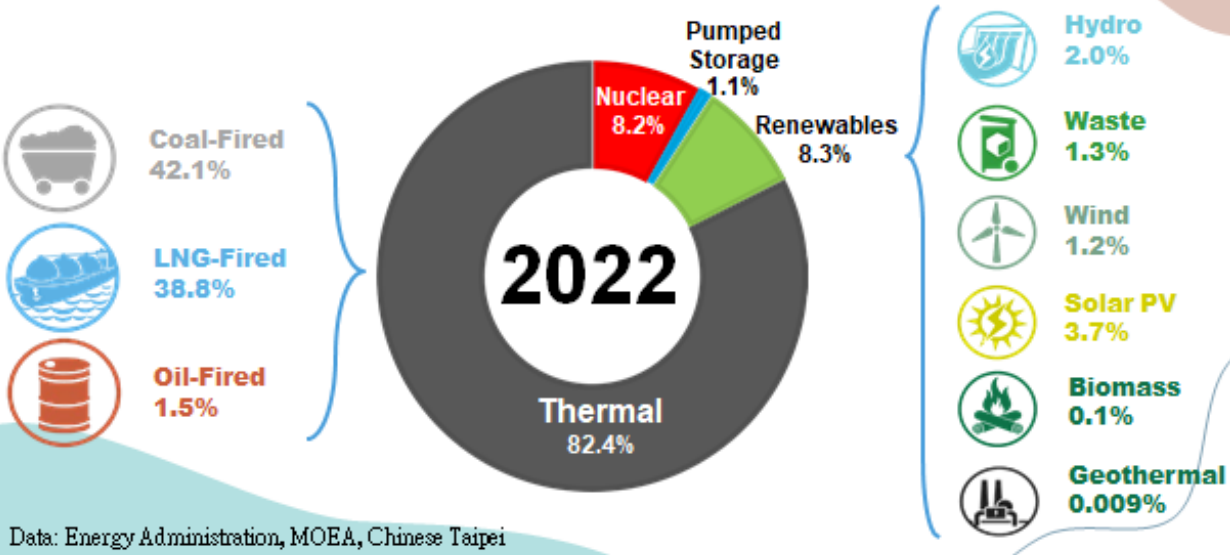
Energy Mix in Chinese Taipei

- In 2022, the imported energy accounted for 97.3%, and 92.4% of which were fossil fuels.
- Indigenous energy accounted for 2.7%, of which nearly half contributed from biomass and waste.



Data: Energy Administration (2023), MOEA, Chinese Taipei

Energy Sources in Power Production



Data: Energy Administration, MOEA, Chinese Taipei

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Energy Transition Pathway by 2025

■ Energy transition was announced in May 2016.

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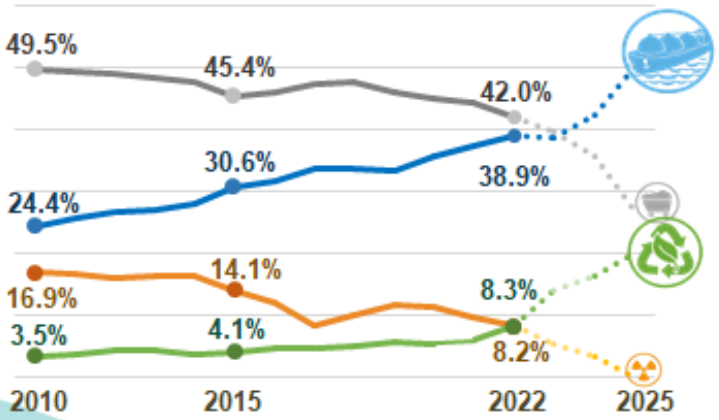
Energy Transition Pathway by 2025



- Increase LNG-fired
- Reduce Coal-fired
- Increase Renewables
- Achieve Nuclear-free

7

PART

02

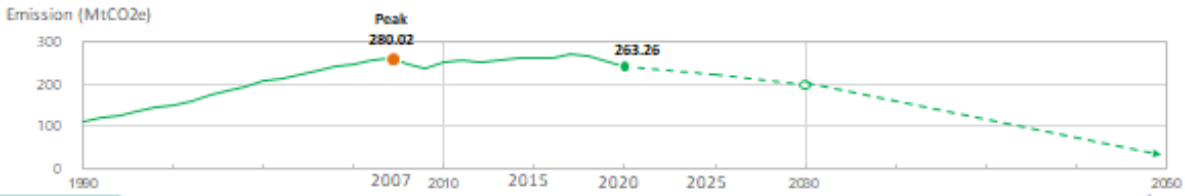
Net Zero Transition

8

Net Zero Transition

Achieving Net Zero by 2050 is the common goal for the world and Chinese Taipei.

Chinese Taipei is plotting the pathway to achieve net zero emissions by 2050!
We must seek out opportunities to cooperate with other economies and create mutually beneficial outcomes.



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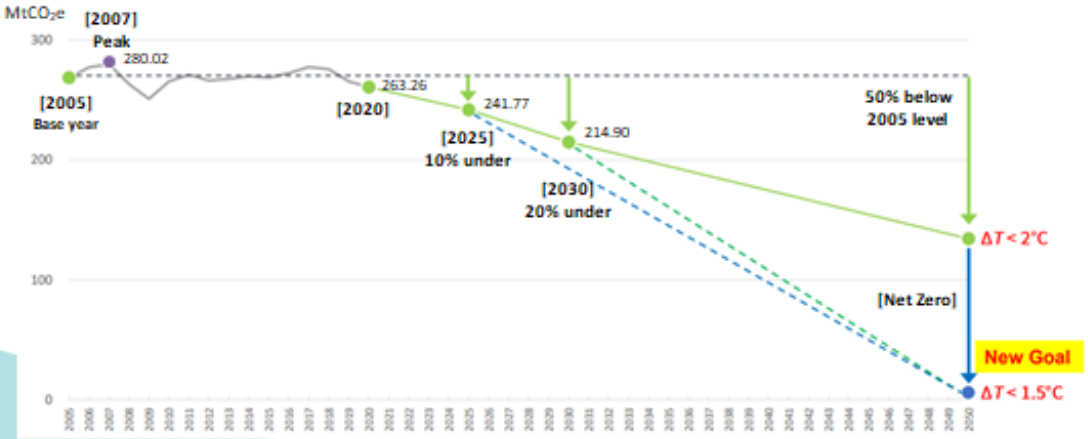
Net Zero Transition

1. In March 2022, Chinese Taipei officially launched the "Chinese Taipei 's Pathway to Net-Zero Emissions in 2050", which provides the action pathway and strategies to achieve "2050 Net-Zero Emissions".
2. Chinese Taipei is undergoing amendment of "The Greenhouse Gas Reduction and Management Act" , which set a more challenging reduction goal by 2050



Source：National Development Council (2022), Chinese Taipei 's Pathway to Net-Zero Emissions in 2050.

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Chinese Taipei's Net-Zero Transition Strategy

1. Chinese Taipei's Net-zero transition advocates fundamental change across all sectors of society, 12 key strategies are proposed to achieve the net zero goal.
2. **Energy transition** is at the central of Chinese Taipei's Net-zero transition, over half of the 12 key strategies are energy-related.
3. Energy-related funding accounted for 67% of the total budget.

Source：National Development Council (2022), Chinese Taipei's Pathway to Net-Zero Emissions in 2050.

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PART 03

Key Strategies Highlights

12

Acceleration of wind power

1. Two demonstration offshore wind project with total 237.2 MW are accomplished.
2. Goals is set at 5.6 GW by 2025, 20.6 GW by 2035 and 35~50 GW by 2050.
3. Primary strategies included:
   - Localization of the key components supply chain as well as the marine engineering.
   - Foster local workforce and expertise.
   - Explore the potential and feasibility of floating offshore wind technology.

Phase 1
237.2 MW
Demonstration

Phase 2
5.6 GW by 2025
Potential Site Selection

Phase 3
13.1 GW by 2030
20.6 GW by 2035
35~50 GW by 2050
Zonal Development

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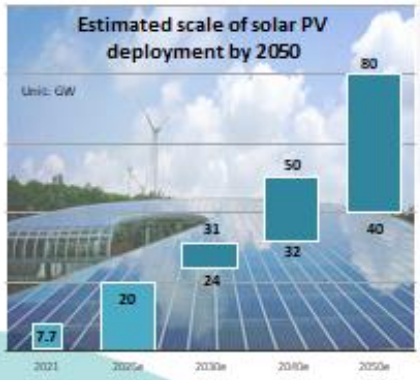
Rapid Expansion of Solar PV

1. Based on a domestic-wide inventory of land area and technology forecast, solar energy potential in 2050 is estimated between 40-80 GW, depend on the technology progress (i.e. module efficiency).
2. Solar PV pathway focus on high-tech battery technology R&D, grid integration and recycling.



Technology improvement

- **R&D on advanced battery technology:** (Silicon-based tandem cell with efficiency>30%)
- **Grid integration**: includes solar panel, energy storage, smart grid.

Solar panel recycling/ re-use

- Increase cycling rate and lowering the recycle cost.
- Design a tailor-made mechanism for solar waste.

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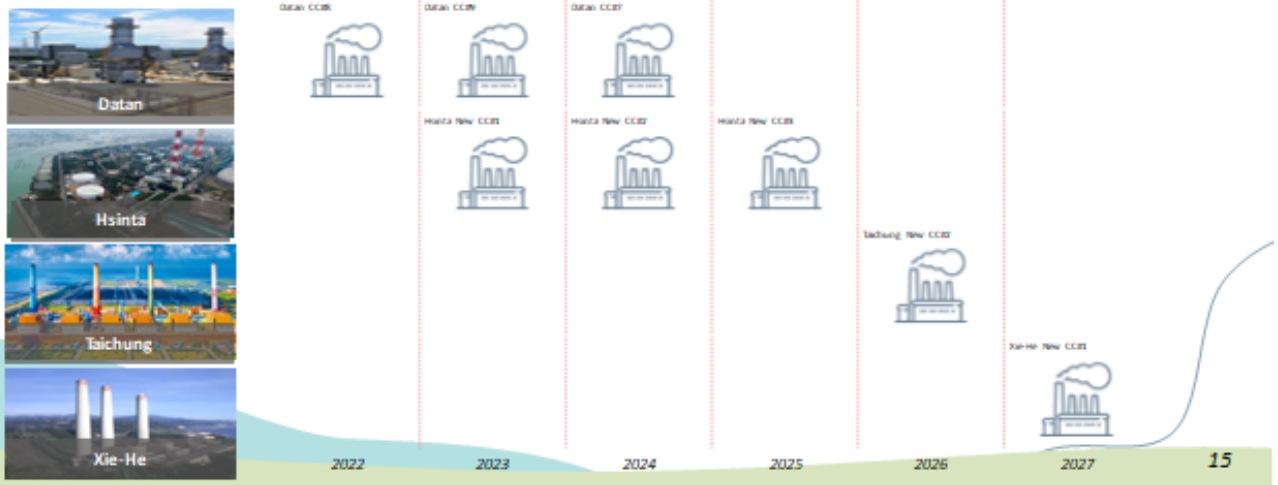
Increase Natural Gas

Newly built or expanded natural gas power plants are being installed with high-efficiency combine-cycle turbines. Meanwhile, LNG receiving, storage and transmission facilities will be built or expanded.

New build gas-fired units



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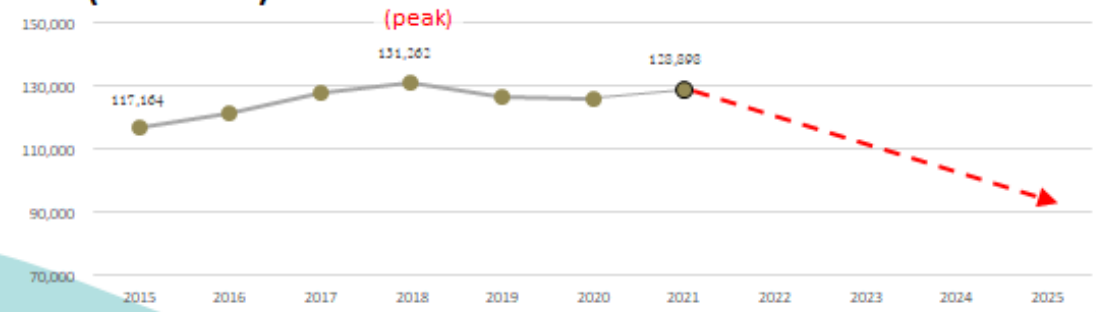
Reduce Coal Use

1. No new coal-fired units will be built before 2025 .
2. The existing coal-fired units will be replaced by gas-fired units after decommission.
3. Coal-fired generation peak at 2018 and decrease gradually since then, electricity generation from coal-fired in 2021 reduced 1.8% compared to 2018.

Chinese Taipei's Coal-fired generation (2015-2021)



Source：BOE (2022), Monthly Energy Statistics.

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Achieve Nuclear-Free

1. Achieve "Nuclear-Free homeland" after the third nuclear power plant is decommissioned as scheduled in 2025.
2. Power supply would be sufficient without nuclear as energy transition planned.

Shutdown date
Unit #1: 2018.12.05
Unit#2: 2019.07.15

Unit #1: Early retirement (2021.7.1)
Unit #2: In operation (license expire at 2023.03.14)

Unit #1: In operation (license expire at 2024.07.26)
Unit #2: In operation (license expire at 2023.05.17)

Unit #1: Remain sealed
Unit #2: Remain sealed

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Hydrogen Energy Development

Short-term
Middle-term
Long-term

Resource Side

Blue H_2 / Green H_2 Import

Self-Produced Green H_2
With sufficient renewable energy

Infrastructure Side

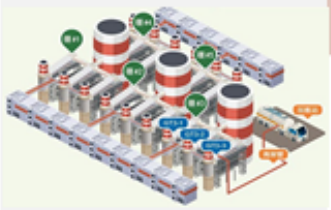
- Infrastructure evaluation
- Demonstration site

Large Scale Storage Infrastructure

Storage Tank

- Infrastructure construction (LH_2 receiving station)

Application Side



Demonstration projects of hydrogen co-fired power generation

Cogeneration of hydrogen and chemicals by CSC & CPC

Industrial application

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PART 04

Conclusion

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Conclusion

- Confronting with the highly dependence on import energy, a net zero transition plan help boosts energy independence.
- Energy transition is at the central of Net-zero transition, zero carbon strategies will focus on development of renewables and innovative energy technologies (e.g. hydrogen).
- We look forward to sharing experiences and cooperating with international partners in the APEC region on energy transition to create mutual benefits.

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