Taiwan Grid Development Plan and Challenges on Grid Integration

Global offshore Wind Summit – TAIWAN

Peter Yuinhong Liu
Taiwan Power Company
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Outline

I  Grid Development
II  Challenges
III  Smart Grid
IV  Conclusion
I.1 Offshore Wind Farm Connection in Taiwan

◆ Taiwan Power Company (TPC) Power Grid Construction Plan for Offshore Wind Connection

➢ Existing Capacity : 3.51GW

➢ Capacity Under construction : 7.14GW
  • investment amount: 2 billion USD
  • construction period: 8 years (January 2018 ~ December 2025)

➢ Total Grid connection capacity : **10.65 GW** in 2025.
1.2 Offshore Wind Farm Connection in Taiwan

**Taiwan Power Company (TPC) Power Grid Construction Plan for Offshore Wind Connection**

- Provides additional grid-connected capacity as:
  - **Changhua 6.5GW**
    - The Changhua area is expected to add 1GW, ChangoneA, in 2021
    - 1.5GW, ChangoneB, in 2024
    - 2GW, Changgong, in 2025
    - 2GW, Youngxing, in 2025
  - **Taoyuan 0.64GW**, in 2025
  - **161kV New Lines**
  - **345kV Lines upgrade**
1.3 Offshore Wind Installed Capacity

◆ Offshore Wind Installed Capacity in Taiwan from 2020 to 2025

Offshore Wind Installed Capacity in Taiwan from 2020 to 2025

- Installed Capacity (GW)
- Accumulation Installed Capacity (GW)

![Graph showing Offshore Wind Installed Capacity in Taiwan from 2020 to 2025](image)

Location of Offshore wind Farm

- 大彰化西南 #14 337.1MW
- 大彰化西北 #12 582.9MW
- 大彰化東南 #15 605.2MW
- 大彰化西南 #14 294.8MW
- 海鷗二號 #19 300 MW
- 西島 48 MW
- 彰芳 #27 552 MW
- 台電 #26 300 MW
- 中能 #29 300 MW
- 允能 708 MW
- 海鷗三號 #18 512MW
- 海鷗二號 #19 232MW

Offshore Wind Installed Capacity in Taiwan from 2020 to 2025

<table>
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<tr>
<th>Year</th>
<th>Installed Capacity (GW)</th>
<th>Accumulation Installed Capacity (GW)</th>
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<td>2025</td>
<td>5.5</td>
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II.1 Challenges on grid integration for Renewable Energy Connection

- Due to a large amount of renewable energy is expected to be connected to the grid, the impact of climate/temperature is greatly increased.

Affected by the climate of Taiwan, wind power has a higher power generation output in autumn and winter.
II.2 Challenges on grid integration for Renewable Energy Connection

**Requirement for Wind Generator**

- Voltage Ride Through
- Frequency Ride Through
- Power ramping rate
- Voltage Support
- Frequency Support
- Forecast

![Diagram showing LVRT and HVRT requirements for wind turbines.](image-url)
II.3 Ancillary Service (Operating/Spinning Reserve)

- Government’s Renewable Energy installed capacity target 26.7GW on 2025
  - PV 20GW
  - Onshore Wind 1.2GW
  - Offshore Wind 5.5GW

- Estimation of Operating/Spinning Reserve
  - Need additional Operating Reserve/Spinning Capacity 5.87GW
II.4 Diversified Strategy for Operating Reserve

- Installations of combined cycle (CC) generator 24.14GW
- Change operating mode of Pumped-storage hydroelectricity (PSH) 2.5GW
- Other Hydroelectric Generator
- Automated Demand Response (ADR)
- Installations of Energy Storage (ES) 0.59GW
- Total 5.87GW
III.1 Smart Grid in Taiwan

Six major subjects of grid system integration

1) Smart Generation and Dispatch
   - Generation (including IPPs)
   - dispatching Center

2) Power Grids Management
   - Power Grids Management

3) Energy Storage System
   - Energy Storage Equipment
   - Charging Station

4) Demand side management
   - Time of Use Rates
   - Demand Response
   - E/S and electric vehicle

5) Information and communication infrastructure

6) Regulations and human resources
   - T&D Automation
   - Big data Analysis

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IV. Conclusion

◆ Grid connection capacity of 10.65 GW will be provided for offshore wind power from 2020 to 2025.

◆ Revise related Grid connection code of Renewable-energy.

◆ Operating/Spinning Reserve Capacity 5.87GW will be provided in 2025.

◆ Smart Grid sustainable development.