



WIND FARM IN CHINA (PHOTO CREDIT: CWEA)

CHINA

China continues to have the highest wind power capacity in the world. The wind power capacity growth presented a higher rate, and 54,427MW of new wind power capacity was installed, representing a 103.2% increase in growth from last year.

NIHE DEXIN, Du Guangping, and LYU BO, Chinese Wind Energy Association (CWEA), China

Accumulated capacity increased to 290,747MW. Grid-connected capacity increased to 281,000 MW with the addition of 71,670 MW installed in

2020. New wind power capacity accounted for 12.8% of installed power capacity nationwide.

Wind power remains the third largest generation source in China, following thermal and hydro-electricity sources. The average full-load-hour of wind power was 2,097 hours in 2020, an increase of 15 hours from 2019.

TABLE 1. KEY NATIONAL STATISTICS 2020: CHINA

Total (net) installed wind power capacity*	290.75GW
Total offshore capacity	10.87GW
New wind power capacity installed	54.43GW
Decommissioned capacity (in 2020)	0 GW
Total electrical energy output from wind	466.5 TWh
Wind-generated electricity as percent of national electricity demand	6.2%
Average national capacity factor**	22.5%
Target	210 GW by 2020
National wind energy R&D budget	600mil CNY; 75mil EUR; 92 mil USD

*Installed wind power capacity: Use nameplate power ratings of the installed wind turbines **Average National Capacity Calculation. Only include turbines in operation the whole year: (MWh production/8,760 hrs) / MW installed capacity MWh total electrical production from wind turbines operating January 1 through December 31 divided by 8,760 hrs divided by the total installed wind capacity (in MW) at the beginning of the year. [You can also use an estimate based on the average installed capacity during the year: (installed 1st Jan + installed 31st Dec)/2. But in that case, state that it is how the estimate is calculated.]

Wind-generated electricity totaled 466.65 TWh, increase 15% over the previous year. Wind-generated electricity accounted for 6.2% of the total electricity generation, an increase of 0.6% over 2019. The average wind curtailment rate was 3%, a decline of 1% compared to 2019.

In 2020, the Chinese government issued a series of policies and regulations to push the grid parity of the wind power project, reduce wind curtailment and promote the development of distributed wind power. In addition, Chinese companies made progress in R&D, including wind energy developments in low wind-speed areas and offshore wind energy generation.

development, and the mid-term and long-term targets for the development and utilization of renewable energy and targets for the proportion of renewable energy in primary energy consumption will be set. They shall be incorporated into the national economic and social development plan and the binding targets of the annual plan and distributed to all provinces for implementation.

In March 2020, the National Development and Reform Commission (NDRC) and NEA issued the Notice on the Outline of the Implementation Plan for Guarantee of Electricity Consumption from Renewable Energy Sources at the Provincial Level, to promote the development and consumption of renewable energy. Provincial Energy administrations

are responsible for setting up the lowest Renewable Portfolio Standard of the market main body within the administrative area, according to the country Renewable Portfolio Standard. The main performance means are to purchase or self-use renewable energy power, purchase the excess consumption amount or green power certificate of other market entities. In June 2020, NDRC and NEA jointly issued the Notice on the Renewable Portfolio Standard (RPS) of the Provincial Administrative Regions in 2020. The notice clarified the minimum value and incentive value of the total portfolio standard and non-hydropower portfolio standard of renewable energy consumption in 2020 for all provinces. It is estimated that in 2020, renewable energy electricity consumption will account for 28.2% and non-hydro renewable energy electricity consumption will account for 10.8%.

Progress and Operational Details

By the end of 2020, China installed 54.43GW of new wind power capacity (exclusive of Taiwan). This accounted for 56% of new global wind capacity for the year. The accumulated wind power capacity in China reached 290.747GW, accounting for 39% of wind power capacity worldwide, maintaining the highest wind power capacity in the world.

A total of 20,401 new wind turbines were installed in 2020, bringing the national total of operating turbines to 155,255. The average capacity of newly installed

DATA RESOURCE: CWEA

unit:MW

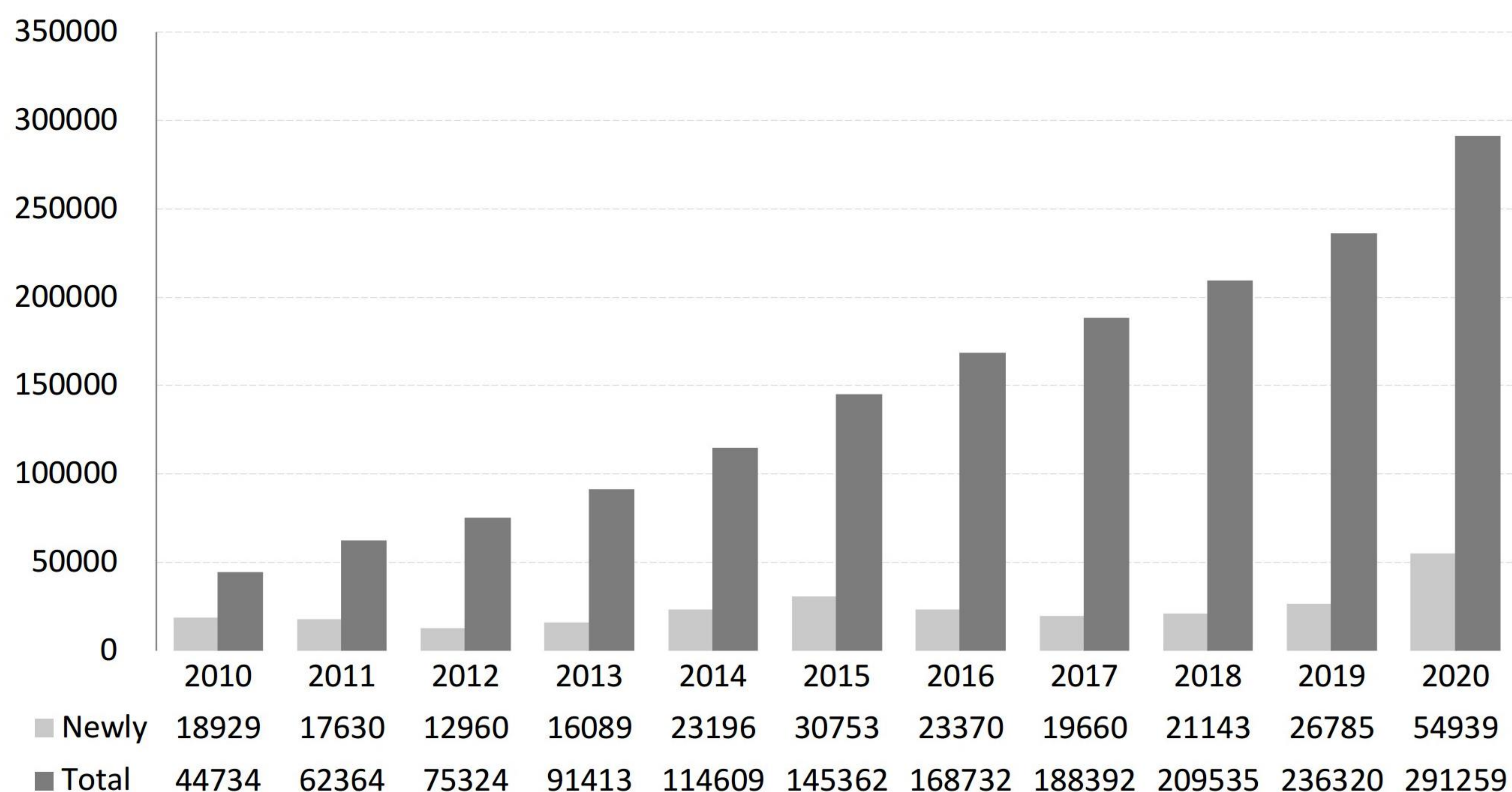


FIGURE 1 THE NEW INSTALLATIONS AND CUMULATIVE INSTALLATION FROM 2010 TO 2020.

wind turbines was above 2.67MW, an increase of 9% compared to 2019.

The top five provinces with the most new installed capacity were:

- Henan (5.8 GW)
- Inner Mongolia (5.5 GW)
- Shanxi (5 GW)
- Jiangsu (4.7 GW)
- Hebei (4 GW)

Together, these accounted for 46% of the new capacity nationwide. The middle, eastern, and southern regions of China account for 48% of new installations. The average weighted full-load-hour of operating wind farms was 2,097 hours, an increase of 15 hours as compared to 2019 for the lower annual average wind speed.

In 2020, a total of 878 offshore wind turbines were installed. The new installation is about 3.8GW, representing a 54.2% increase in growth from last year. The cumulative installation reached out to 11GW. Among the newly installed wind turbines, the turbines below 5MW and above 5MW (including 5MW) account 47% and 53% respectively. The new installation distributed in Jiangsu, Guangdong, Fujian, Liaoning, Zhejiang and Hebei. The installation in Jiangsu was 2GW, accounting 54.4% of the new capacity.

Matters Affecting Growth and Work to Remove Barriers

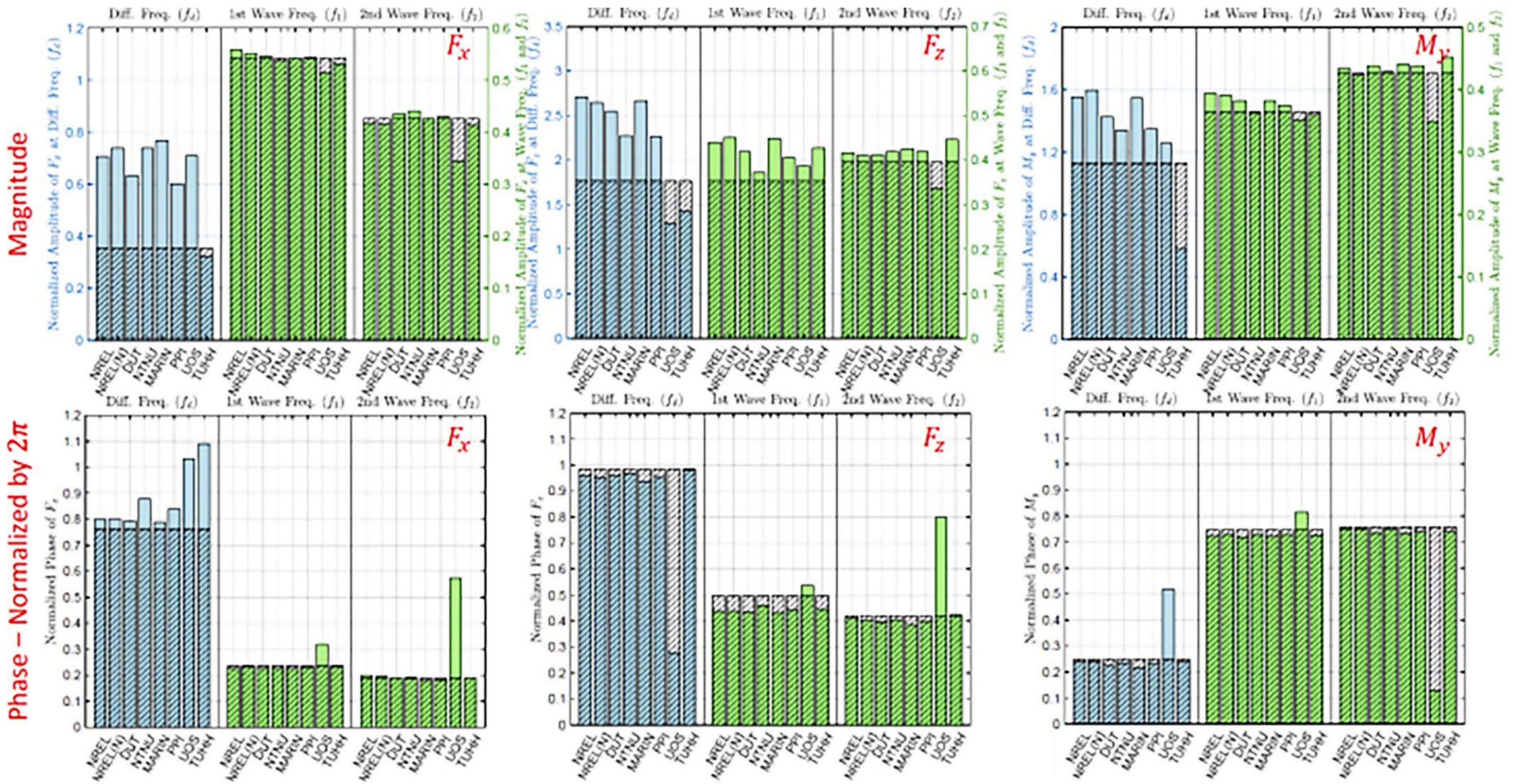
In 2020, the new installation is the most in the past ten years, and the power grid is under enormous strain. NEA issued some policies to emphasize the development of distributed wind power and improve the consumption of renewable energy power.

R,D&D Activities

National R,D&D Priorities and Budget

In 2020, the Ministry of Science and Technology of the People's Republic of China launched the National Key Research Program of renewable and hydrogen energy. The program, which includes 38 tasks, began implementation in 2020 and aims to improve the innovation capability of renewable and hydrogen energy in China. The total budget is above 606 million CNY (75.8 million EUR; 92.7 million USD), and the budget for wind power is about 60mil CNY(7.5mil EUR; 9.2 mil USD) . The researches of wind power including two directions of:

- "Key technology of new type high efficiency wind energy conversion device", research and develop innovative and efficient wind energy conversion devices of megawatt scale under different grid connection modes;
- Key techniques for aeroelastic design of large flexible blades, according to the design requirements of



COMPARISON OF TOTAL WAVE FORCES ACTING ON THE PLATFORM FOR CONDITION 3.5

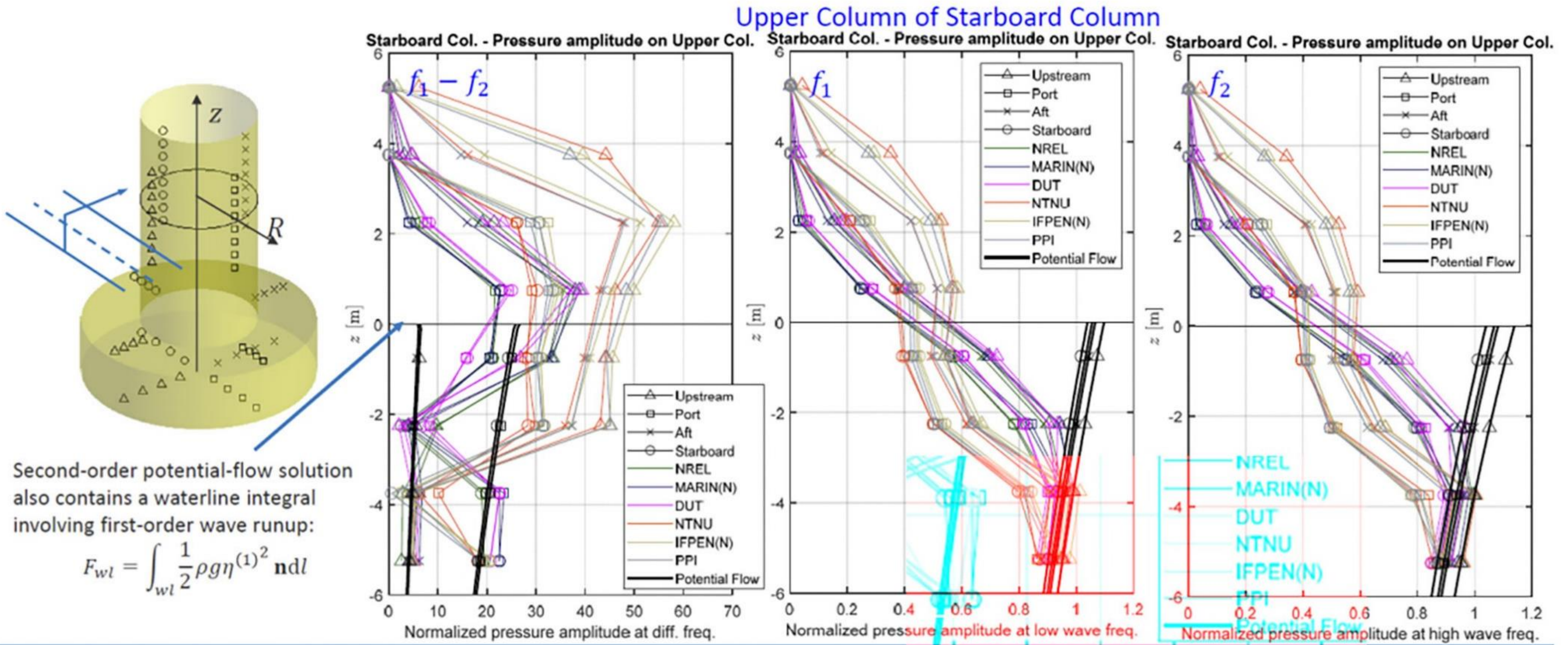
large wind turbine blades, the key technologies of aeroelastic design of large flexible blades were studied, and the dynamic simulation model and design method of large flexible blades were independently established.

National Research Initiatives and Results

In 2020, the first 10MW offshore wind turbine was successfully connected to the grid in the Fujian Xinghuawan offshore wind farm, and the largest 4.5MW permanent magnet direct drive onshore wind turbines were connected to the grid. The longest

blade of 91m, came off the assembly line in Dongfang Electric Corporation, which will be applied to the 7-10MW wind turbine.

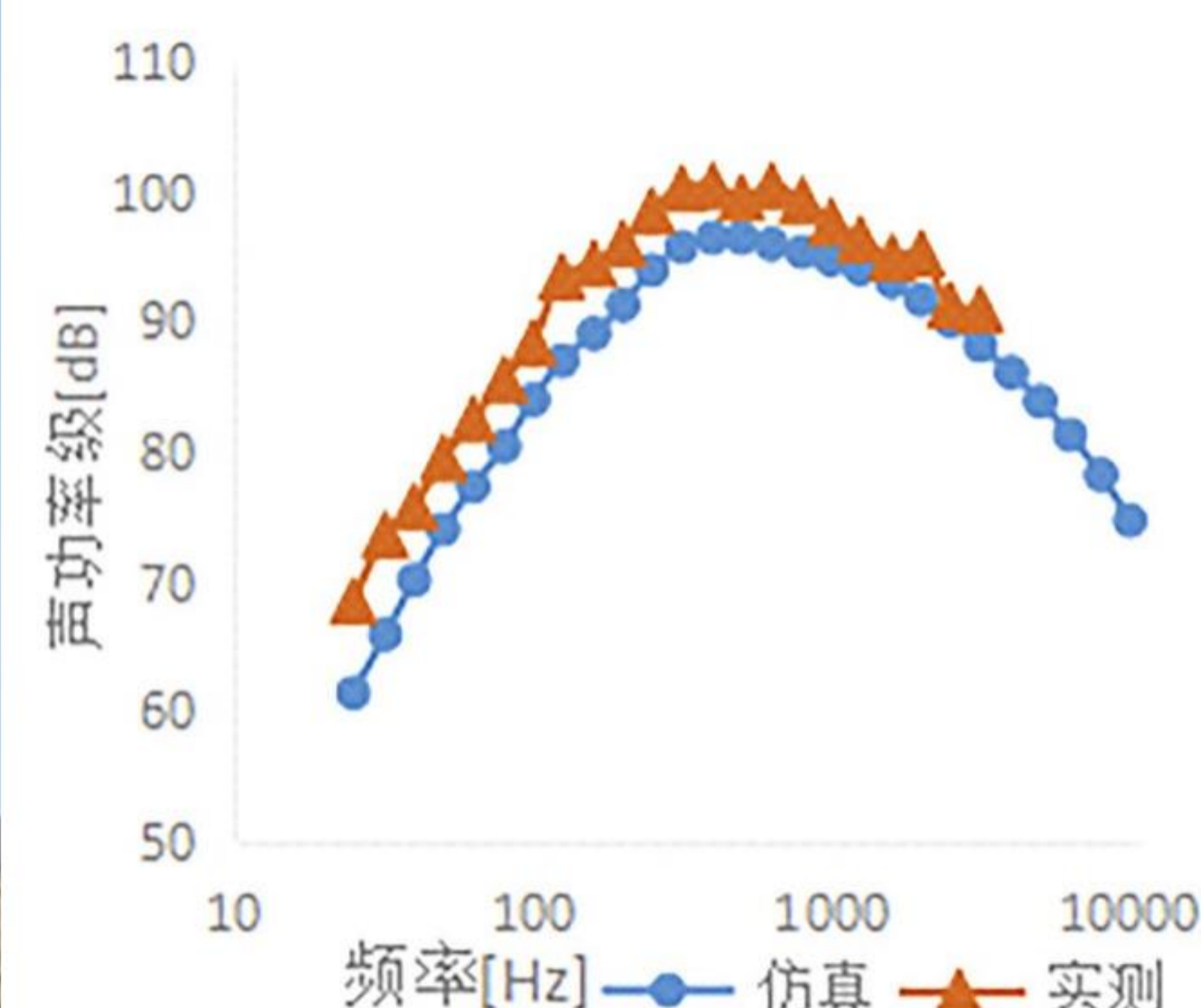
Dalian University of Technology took part in the Task 30 OC6, and finished the research of first and second stage, including nonlinear hydrodynamics based on computational fluid dynamics, nonlinear hydrodynamic comparison of engineering models and analysis of pile-soil action for 10 MW single pile offshore wind turbine.



PRESSURE CONTRAST AT DIFFERENT HEIGHTS ON THE STARBOARD SIDE OF THE PLATFORM FOR CONDITION 3.5



NOISE SIMULATION AND MEASUREMENT OF WIND TURBINE



Hangzhou University, Gold Wind, Chinawindecy, took part in the Task 39. The work include research and improvement of wind turbine aerodynamic noise source model, development of PE noise propagation models in complex terrain, research of coupling method of PE model and CFD in complex terrain and so on.

Test Facilities and Demonstration Projects

In 2020, the largest blade test bench of China was constructed in Yangjiang of Guangdong province, the largest testing blade can reach up to 150m.

Collaborative Research

By the end of 2020, the CWEA had arranged for 28 domestic wind power companies, research institutes, and universities to attend IEA Wind TCP Tasks:

- Task 11 Base Technology Information Exchange
- Task 19 Wind Energy in Cold Climates
- Task 25 Design and Operation of Power Systems with Large Amounts of Wind Power
- Task 27 Small Wind Turbines
- Task 29 Mexnext: Analysis of Wind Tunnel Measurements and Improvement of Aerodynamic Models
- Task 30 Offshore Code Comparison, Collaboration, Continued, with Correlation (OC5)

- Task 31 Benchmarking of Wind Farm Flow Models
- Task 32 Lidar Systems for Wind Energy Deployment
- Task 33 Reliability Data: Standardizing data Collection for Wind Turbines
- Task 35 Full-Size Ground Testing for Wind Turbines and Their Components
- Task 36 Forecasting for Wind Energy
- Task 37 Systems Engineering
- Task 39 Quiet Wind Turbine Technologies
- Task 41 Enabling Wind to Contribute to a Distributed Energy Future
- Task 42 Wind Turbine Lifetime Extension Assessment

Impact of Wind Energy

Environmental Impact

In 2020, wind-generated electricity totaled 466.65TWh, which saved about 166.4 million tons of standard coal per year, and reduced 406 million tons of CO₂, 1.39 million tons of SO₂, and 1.17 million tons of NO_x. It plays an important role in reducing air pollution and controlling greenhouse gas emissions.

Economic Benefits and Industry Development

During the 13th Five-Year Plan period, new installation capacity reach more than 145 GW, including more than 9.18GW of new capacity of offshore wind-power. With land-based wind power investment of 7,000 CNY/kW (875EUR/kW; 1,071 USD/kW) and offshore wind power investment of 15,000 CNY/kW (1,875 EUR/kW; 2,448 USD/kW), the total investment in wind energy during the plan period will reach more than 1,075 billion CNY (134 billion EUR; 164 billion USD).

The development of the wind energy industry will markedly enhance the development of related industries and increase employment. During the 13th Five-Year Plan period, about 15 jobs will be produced for every 1 MW of installed wind power capacity, and it is estimated that more than 795,000 people will be employed in the wind power industry through 2020.

Next Term

In 2020, the fourteenth Five-Year plan for energy development will be drawn up and the targets of wind

power installation will be set up. In addition, new research projects will be carried out to improve product quality and enhance wind farm construction capacities. CWEA will continue to do its best to organize national research efforts and related activities of IEA wind.

References

List any references used directly in the text of the chapter.

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- Use the following format for citation under the reference heading: [1] Author (year) Title of report or document. Download from (provide website link). 🌐