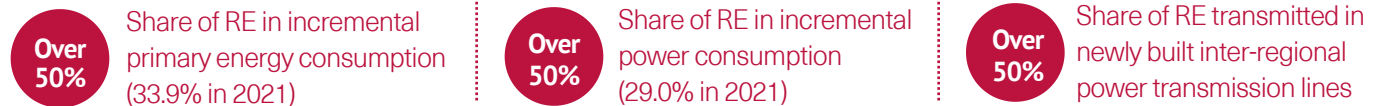


## Policy dynamics of the 14th Five-Year construction plan for large-scale wind power and solar PV bases in China

August 2022

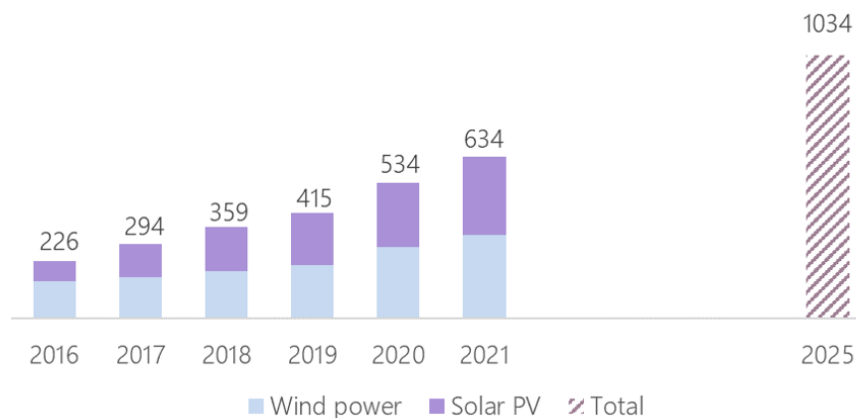
China has clearly put forward the energy transition target of achieving carbon neutrality and non-fossil energy accounting for more than 80% of primary energy consumption by 2060.<sup>1</sup> With renewable energy (hereafter refers to “RE”) as an important starting point, the 14th Five-Year Plan (2021-2025) period will enter a high-quality and leap development stage. In the *14th Five-Year Plan for Renewable Energy Development* released in June 2022, the energy authorities set three 50% targets for 2025:



China has advanced the target year of non-fossil fuel accounting for 20% of primary energy consumption from 2030 to 2025, compared with the development scale under the original target, the potential of increase in hydropower, nuclear power and biomass power generation is limited, therefore wind power and solar PV will be the main driving force for RE large-scale development during the 14th Five-Year Plan period. The government will adhere to the strategy of **simultaneous development of utility-scale and distributed projects**, and **onshore and offshore projects**, and aims to double the total amount of wind power and solar PV power generation by 2025.<sup>2</sup>

Based on the 50%-50%-50% targets in 2025, the Energy Research Institute of the National Development and Reform Commission (ERI of NDRC) calculates that during the 14th Five-Year Plan period, the newly installed capacity of wind power and solar PV needs to reach at least 500 GW, the cumulative installed capacity needs to reach over 1000 GW, and to at least maintain such pace of expansion until 2030.<sup>3</sup> We expect that the cumulative installed capacity of wind power and solar PV will greatly exceed the target of 1200 GW<sup>4</sup> in 2030, and the development of large-scale wind power and solar PV bases will play an important role.

2016-2021 Total installed capacity of wind power and solar PV and forecast in 2025



Source: National Energy Administration (NEA), Energy Research Institute of the National Development and Reform Commission (ERI of NDRC), accessed in July 2022

### Base planning and construction policy

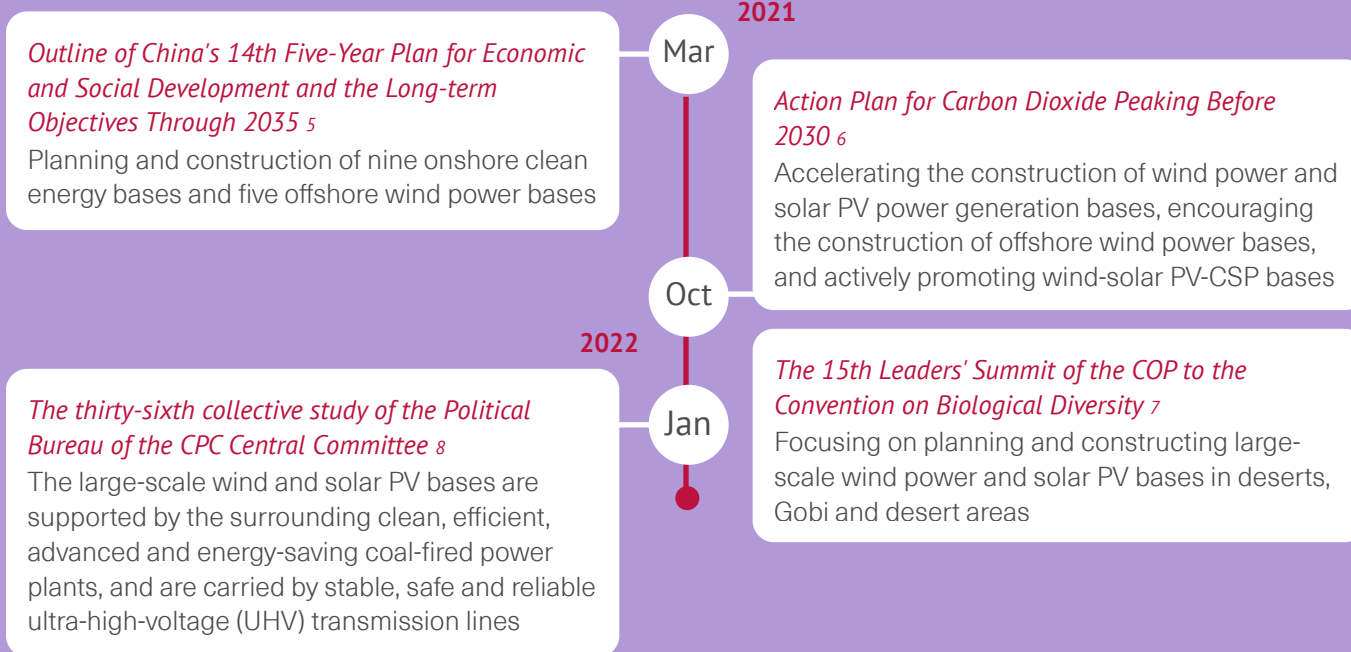
Entering the 14th Five-Year Plan period, the government, the State Council, the NDRC, and other departments have successively issued documents to gradually refine the wind power and solar PV development roadmap and clarify key tasks. In terms of accelerating large-scale development, the government has planned 14 comprehensive energy bases with large-scale wind power and solar PV power generation as the core, including nine onshore bases and five offshore bases, covering 19 provinces. Among which **the Three-North deserts and Gobi areas are the core tasks required by the government to accelerate the planning and construction of onshore large-scale wind power and solar PV bases** (hereinafter referred to as "the *base*"), while the Southwest will focus on the construction of wind-solar PV-hydro bases.

## The *bases* planned with different power generation technologies by region

|          |                  |   |
|----------|------------------|---|
| onshore  | Northeast China* | Wind-Solar PV   |
|          | North China*     | Wind-Solar PV, Wind-Solar PV-Thermal                                    |
|          | Northwest China* | Wind-Solar PV-Thermal, Wind-Solar PV-Hydro, Wind-Solar PV-Thermal-Hydro |
|          | Southwest China  | Wind-Solar PV-Hydro   |
| offshore | East China       | Offshore wind power   |

Notes: \* Northeast, North and Northwest are collectively referred to as the Three-North

## The *base* development policy timeline



## The *base* development progress

In November 2021, the NDRC released the first batch of *base* list, the details are shown in the table below. The list focuses on the construction of bases in desert and Gobi areas for the next two years (i.e. 2022-2023), covering a wide range of areas and a clear technical route.<sup>9</sup> Later in March 2022, the NDRC further announced a strategic base deployment plan with 450 GW of total installed capacity target towards 2030.<sup>9</sup> By July 2022, the construction of the first batch of *bases* has now been fully started, and it is planned to be fully operational by the end of 2023. Meanwhile, the energy authorities have announced the project list for the second batch of *bases* which are mainly distributed in desert and Gobi areas of Inner Mongolia, Ningxia, Xinjiang, Qinghai and Gansu. These provinces are now carrying out relevant preliminary work.

### The details of the first batch of *bases*

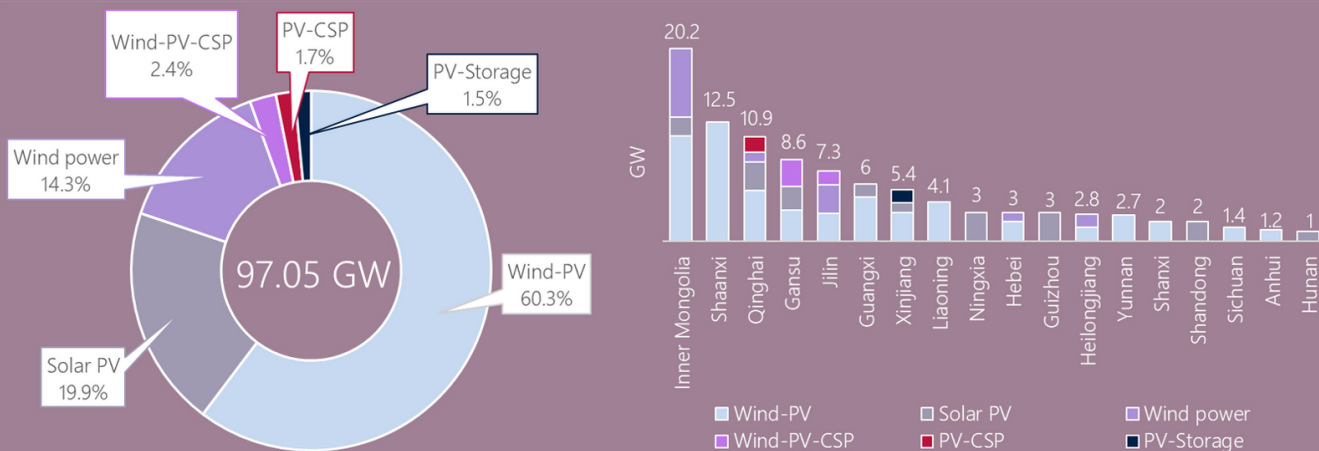
|                          |  |
|--------------------------|--|
| Total Installed Capacity | 97.05 GW   |
| Operation Time           | 45.71 (2022), 51.34 (2023)   |
| Regions Covered          | 19 Provinces - Inner Mongolia, Xinjiang, Qinghai, Gansu, Shaanxi, Ningxia, Xinjiang, Liaoning, Jilin, Heilongjiang, Hebei, Shanxi, Shandong, Sichuan, Yunnan, Guizhou, Guangxi, Anhui, Hunan |
| Type of bases            | Wind power, solar PV, wind-solar PV, wind-solar PV-CSP, solar PV-CSP, solar PV-energy storage  |

Source: National Development and Reform Commission (NDRC) and NEA, accessed in July 2022

Regarding the first batch of *bases*, from the perspective of technology classification, 85.7% are solar PV-related *bases*, 76.9% are wind power-related *bases* and 4.1% are CSP-related *bases*. From the perspective of geographical distribution, Inner Mongolia, Shaanxi, and Qinghai of the Three-North rank the top three in terms of total installed capacity, but the technology types are quite different. 90% of the *bases* in Inner Mongolia are related to wind power, all *bases* in Shaanxi are wind-solar PV, while the *bases* are more diversified in Qinghai, which implies that in addition to wind power and solar PV, Qinghai also has the only solar PV-CSP *base* among the first batch of *bases*.

It is worth noting that local governments have independently proposed a quantitative utilization target for local *bases*, that is, the target of power curtailment control. According to the document, the power curtailment rates should not be higher than 5% in most provinces, which refers to the national control target during the 13th Five-Year Plan (2016-2020) period, but with Qinghai and Gansu aiming at 16% and 16%-20% respectively. This is because Qinghai and Gansu have a relatively high proportion of wind power and solar PV installed capacity, but the supporting peak-shaving power source is insufficient, therefore provincial governments propose to appropriately release the requirements for curtailment control.

The total installed capacity of the first batch of *bases* is divided by technology (left) and by province (right)



Source: NDRC and NEA, November 2021



## Base-friendly supporting policy

The construction of RE projects in China should follow a fundamental regulation of not crossing the ecological red line. Based on that, the government requires the second batch of bases to focus on the implementation of consumption issues.

The NDRC, the National Energy Administration (NEA) and other departments have issued a series of relevant policies. The ecological red line refers to the prohibition of development activities in the areas demarcated by the national or provincial governments, such as the prohibition of constructing industrial and infrastructural projects that occupy the permanent basic farmland, general arable land, and nature reserves. Guarantee of Consumption mainly includes three measures: 1) **planning and construction of inter-provincial and inter-regional transmission lines**; 2) **measures to increase the flexibility of the power system**; 3) **promoting green power consumption**. Therefore, the planning and construction of the *base* should be coordinated with the surrounding peak-shaving power supply, and inter-provincial and inter-regional transmission lines.

## 01 | Building new inter-regional transmission channels

The bases in western regions need to rely on inter-regional UHV transmission lines to transmit power generated to the central and eastern load centers.



As of April 2022, China has built 34 UHV transmission lines<sup>11</sup>, greatly increasing the consumption capacity of wind and solar power in the west. Entering the 14th Five-Year Plan period, the State Grid and the China Southern Power Grid have planned a total of 12 new UHV lines, including nine DC lines and three AC lines. The NEA took the lead in carrying out relevant evaluations in January this year, and entrusted research institutions to make suggestions on the planning of lines and supporting peak-shaving power source in conjunction with the construction of the *base*.<sup>12</sup> In addition, the government requires that the proportion of RE for new inter-regional transmission lines should not be less than 50%<sup>13</sup> (about 46% on average in 2020<sup>14</sup>).

## 02 | Measures to increase the flexibility of the power system

The grid connection of the base will bring about the grid voltage and frequency fluctuation problem, which needs to be solved by introducing a certain percentage of peak-shaving capacity.



According to the government's plan, the surrounding coal power and hydropower (including pumped storage) will serve as the main peak-shaving power supply for the *base*, and the importance of pumped hydro storage will become more and more significant in the future. In September 2021, the NDRC promulgated the *Medium and Long-Term Development Plan for Pumped Storage (2021-2035)*, which plans to double the installed capacity of pumped hydro storage to 62 GW during the 14th Five-Year Plan period, then double it again to 120 GW during the 15th Five-year Plan period (2026-2030). The plan also proposes a project list of 726 GW, of which 421 GW has reached the approval requirements and will be promoted before 2035, and 305 GW will be reserved as projects that have not yet reached the standard.<sup>15</sup>

The new-type energy storage can be used as an independent main body or supporting facilities to provide peak-shaving services for the *base*. In 2021, the NEA incorporated the new-type energy storage into the main body category of grid connection, which means that it can independently participate in the ancillary service market. In the same year, new wind power and solar PV projects are also required to be equipped with energy storage capacity. New projects are divided into guaranteed projects<sup>16</sup> and market-oriented projects<sup>17</sup>.

- **Guaranteed RE projects** are required by provincial governments to be equipped with electrochemical energy storage facilities ranging from 5%~20%/1h~2h of rated power.<sup>18</sup>
- **Market-oriented RE projects** are required by the central government to be uniformly equipped with a minimum energy storage or peak-shaving capacity of 15%/4hr of rated power through self-built, co-built or purchased.<sup>19</sup>
- **RE-equipped energy storage facilities** with independent metering and control devices can also be converted into independent energy storage projects to participate into the ancillary service market.<sup>20</sup>

As a result, the new-type energy storage provides peak-shaving services that are more diversified, which greatly increases the enthusiasm for market investment. According to the *Guiding Opinions on Accelerating the Development of New-Type Energy Storage* released in July 2021, the national target for new-type energy storage installations is expected to reach more than 30 GW by 2025<sup>21</sup>, six times that of 2021<sup>22</sup>.

In addition, the pricing department of the NDRC has also improved the policies on the price of feed-in tariffs for pumped hydro storage<sup>23</sup> and time-of-use electricity prices<sup>24</sup>. The policies further clarified the cost recovery channels for pumped hydro storage and end-use new-type energy storage to participate in power markets in the future, in order to provide a guarantee for revenue.

### 03 | Promoting green power consumption

*The government creates conditions for the base to participate in various power markets and diversifies green power procurement channels.*



From 2021, all new wind power and solar PV projects except household solar PVs will no longer receive the central government's feed-in tariff subsidy<sup>25</sup>, which means that most *bases* will get the local coal power baseline tariff, or voluntarily participate in the electricity market to form prices. In order to promote market-oriented trading, the NDRC requires to establish a power market system suitable for RE, guide them to sign medium and long-term contracts of 20 years or more, and encourage to put 10% of the total electricity generation within a certain period on the grid through market-based trading.<sup>26</sup>

State Grid and China Southern Power Grid also launched a **green power trading pilot** in September 2021<sup>27</sup>, which is an independent medium-and long-term power transaction market specifically for wind power and solar PV projects. So far, all the participants are subsidy-free projects. The transaction volume can be obtained with corresponding retroactive green certificates, this effectively promoted the enthusiasm of users to purchase green electricity. The monthly transaction volume increased tenfold in half a year, and the average transaction price was 0.03~0.07 RMB/kWh higher than the local coal power baseline tariffs.<sup>28</sup> While reflecting the environmental premium of green power, it has added additional income to unsubsidized wind power and solar PV projects, which is good news for the operation of the *base* in the future. The government also encourages base developers to collaborate with local coal power enterprises to establish wind power-solar PV-coal power joint venture.<sup>29</sup>

The government stimulates green electricity consumption on the user-side through both incentives and binding policies. The State Council has clarified that the provincial incremental RE power consumption during the 14th Five-Year Plan period will not be accounted in the assessment of the total local energy consumption<sup>30</sup>, which is particularly helpful to increase the enthusiasm of large-scale production enterprises for green power purchases. At the same time, the government has formulated binding annual consumption targets for RE power and non-hydro RE power for each province.<sup>31</sup> The NDRC will increase this target year by year, gradually narrowing regional differences in targets, and aiming to achieve equal sharing of green power consumption responsibilities by 2030. This means that the power source-concentrated provinces in the Three-North need to improve the local consumption capacity. For example, the NDRC encourages the construction of data center clusters with non-real-time computing requirements in Guizhou, Inner Mongolia, Gansu and Ningxia<sup>32</sup>. The central and eastern load centers need to accelerate the development of distributed RE projects and increase the power imported from the Three-North.

For the next step, provincial governments are required to formulate implementation plans for the local *bases*, and the central government will organize and carry out special supervision on the base engineering construction, in order to make sure the *bases* are put into operation on schedule.



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