SEPTEMBER 2021

CHINA ENERGY POLICY NEWSLETTER

Boosting Renewable Energy as Part of China's Energy Revolution

1. China energy transition updates

Provinces failed to meet the energy intensity standards stop developing energy-intensive projects

May 2021 was the first time for the National Development and Reform Commission (NDRC) to issue quarterly early warning results of the dual control of provincial total energy consumption and energy intensity decline. The results are divided into three levels, represented by red, yellow, and green. However, specific follow up measures were not defined. In August, the NDRC once again issued early warning results for the first half of 2021, particularly stating that in provinces with energy intensity results marked with red, the energy-saving examination of energy-intensive and emission-intensive projects will be suspended in 2021. The absence of an energy-saving evaluation report means that the province is not allowed to approve, start or run new energy-intensive and emission-intensive projects, and projects that have stopped production for energy-saving retrofit cannot resume production. Nine provinces are marked in red this time, including Qinghai, Ningxia, Guangxi, Guangdong, Fujian, Xinjiang, Yunnan, Shaanxi and Jiangsu.[1]

NEA determines the pumped storage development targets towards 2035

By 2025, the cumulative operating capacity of pumped storage aims to be doubled, reaching 62 GW compared to 2020 - to be further increased to about 120 GW by 2030. Before the end of 2035, the pumped storage industry should be able to support the development of high-share new energy power system and to establish batches of leading enterprises. In addition, the government makes a mid-to-long term pumped storage project list consisting of key projects and reserve projects. Of which 421 GW are key projects with mature construction conditions and qualify for ecological red-line requirements, the other 305 GW of reserve projects are yet to be qualify for the ecological red-line requirements, but with potential to breakthrough the environmental constraints in the future.[2]

[1] "关于印发《2021年上半年各地区能耗双控目标完成情况晴雨表》的通知,发改办环资〔2021〕629号," National Development and Reform Commission, 17 August 2021, accessed at **https://www.ndrc.gov.cn/xwdt/tzgg/202108/t20210817_1293836.html?state=123&code=&state=123**.

[2] "《抽水蓄能中长期发展规划（2021-2035年）》印发实施," National Energy Administration, 9 September 2021, accessed at http://www.nea.gov.cn/2021-09/09/c_1310177087.htm; "能核尽核、能开尽开！国家能源局发布4.21亿千瓦抽水蓄能进入中长期发展规划," National Energy Administration, 9 September 2021, accessed at **https://m.thepaper.cn/baijiahao_14438771**.

If you would like to subscribe to the newsletter, please send your full name, organization and title to ***china@ens.dk***

Danish Energy Agency

可再生能源推动能源革命研究
Boosting Renewable Energy
As part of China's energy revolution

国家发展和改革委员会
能源研究所
Energy Research institute, NDRC, P.R.C

China launches two green power trading pilots

On September 7, 2021, Beijing Power Exchange Center and Guangzhou Power Exchange Center officially launched green power trading pilots. This is an independent trading system for green power established under the mid-to long-term power trading framework. In the past, power trading in China was mainly open to conventional power sources such as thermal power, whereas renewable power was mainly purchased by grid companies on a guarantee basis. Now, electricity purchasers can independently choose to buy thermal power or green power. When purchasing green power, they obtain corresponding retroactive green certificates, reflecting the environmental premium of renewable energy. The green power trading pilots under the State Grid and China Southern Power Grid business regions rely on Beijing Power Exchange Center and Guangzhou Power Exchange Center respectively, and green power can enjoy preferential implementation and settlement rights in transaction and dispatching sections.

Currently, mid- to long-term transactions of green power primarily refers to intra-provincial and inter-provincial transactions within the State Grid region and Southern Power Grid region respectively, and with the minimum contract unit of a month. Power purchase agreements (PPAs) over 5 years is encouraged. The transaction price is determined by market subjects through negotiation, public listing and centralized matching. In the initial stage of pilot operation, sellers of green power covers wind power and solar PV generators only, while consumers, power sales enterprises and power grid enterprises are defined as buyers. With the continuous improvement of the market, the Power Trading Center will in the future introduce other renewable energy trading entities such as hydropower in due time. The green power trading will give top priority to market-oriented projects, i.e. providing a larger market for projects that do not enjoy central financial feed-in tariff subsidies and guaranteed grid connection. Earlier in July, the government required the market-oriented project to equip or purchase 15% of the energy storage/peak shaving capacity as a preliminary condition for the grid connection, it also laid the foundation for the actual dispatch of traded green power generated by market-oriented projects.

There are 259 market entities in 17 provinces participating on the first day of the pilot trading, with the trading volume reaching 7.9 TWh, equivalent to reducing 6 million tons of carbon dioxide. The transaction price is RMB 0.03~0.05/kWh higher than the average transaction price of renewable power before the green power trading pilot launched, which adds additional profits to the subsidy-free wind power and solar PV projects. The regional *Green Power Trading Pilot Program Plan* developed by the two power grid enterprises have both been approved by the NDRC. Next step is for the the energy administrative department to link green power trading and green certificate market and carbon market in order to avoid duplicated calculation of green certificate or repetitive sales of green power's environmental premium in the carbon market in the form of CCER.[3]

[3] "今天：全国绿色电力交易试点正式开市 上海成功摘得首单," National Development and Reform Commission, 7 September 2021, accessed at **https://shoudian.bjx.com.cn/html/20210907/1175412.shtml**; "两部委批准绿电交易试点方案，绿电交易试点正式启动，首次交易近80亿度电," Eknower, 8 September 2021, accessed at **https://www.sohu.com/a/488449353_314909**; "我国启动绿色电力交易试点 首批交易电量近80亿千瓦时," China National Radio, 8 September 2021, accessed at **https://baijiahao.baidu.com/s?id=1710300880868181485&wfr=spider&for=pc**; "当日成交9.1亿千瓦时，南方区域绿色电力交易试点正式启动！," China Southern Power Grid, 8 September 2021, accessed at **https://www.163.com/dy/article/GJCKISPT05149I18.html**.

NDRC clarifies subsidy plan for new biomass power generation projects in 2021

The Ministry of Finance (MoF) will allocate a total of RMB 2.5 billion in central financial subsidies for biomass power generation projects in 2021, covering agriculture and forestry biomass, waste incineration and biogas power generation projects. Of this, RMB 2 billion is assigned to projects approved before 2021, and those that have already started or completed the construction, and RMB 500 million assigned to projects approved and start construction in 2021. For biomass power generation projects with full capacity connected to the grid after September 11, 2020, the subsidies of each project are divided between the central government and local government.[4]

Regulations on central government subsidies for biomass power projects in 2021

Targeted projects	Subsidy budget	Requirement of qualification
• Achieve full capacity grid connection from 20 January 2020 to 31 December 2020 but yet to receive 2020 subsidy qualification • Start construction prior 2021 and achieve full capacity grid connection by 2021	• RMB 2 billion	• **Receive by ranking the grid connection dates** • CHP units and small-scale units have priority, provided that grid connection dates are the same • Subsidy qualification will be cancelled if the project exceeds the grid connection deadline

• Approved and start construction in 2021	• RMB 500 million
	  • RMB 300 million for agricultural and forestry biomass and biogas
	  • RMB 2 million for waste incineration
		• **Receive by participating tenders**
		• Achieve full capacity grid connection by 2023
		• Subsidy reduces by RMB 0.03/kWh for each quarter of grid connection delay

Source: National Development and Reform Commission (NDRC), August 2021

The proportion of central government subsidies for biomass power projects that achieve full-capacity grid connection after 11 September 2020

	West-and-Northeast Region	Central Region	East Region
Agriculture and forestry biomass	80%	60%	40%
Waste incineration	60%	40%	20%
Biogas	80%	60%	40%

Source: NDRC, August 2021

[4] "关于印发《2021年生物质发电项目建设工作方案》的通知,发改能源〔2021〕1190号," National Development and Reform Commission, 11 August 2021, accessed at https://www.ndrc.gov.cn/xxgk/zcfb/tz/202108/t20210819_1294018_ext.html.

NEA considers allowing energy storage and dispatchable loads to be independently connected to the grid and participate in ancillary services

The National Energy Administration (NEA) recently issued two policy drafts to solicit public opinions, aiming at the requirements for grid-connected main entities[5] to participate in power dispatch and ancillary services.[6] The new regulations will replace the *2006 Version* formulated by the former State Electricity Regulatory Commission, in addition to which all regions will formulate detailed rules. In the *2006 Version*, the main entities connected to the grid only referred to thermal and hydropower plants, while the new regulations add nuclear, wind, solar PV, and pumped storage power generation projects, as well as new-type energy storage and dispatchable loads including independent users, aggregators and virtual power plants (VPPs).

This means that new-type energy storage projects can connect to the grid independently and participate in ancillary services, rather than being parred with a power plant. The load side also has more business models to provide ancillary services such as participating via aggregators and VPPs. The new regulations divide ancillary services into three categories: active power balance, reactive power balance and emergency services, and adds many new services such as rotational inertia, ramp-up, and rapid load interruption. The new regulations also clarify that all grid-connected entities will participate in the provision of ancillary services and the allocation of compensation costs, creating more possibilities for the ancillary service market in the future.

Classification and specific products of ancillary services (daft for comments)

Classification	Products
Active Balance	Primary frequency control, secondary frequency control, peak shaving, reserve, rotational inertia, ramp-up
Reactive Balance	Automatic voltage control, phase shift
Emergency and Recovery Services	Generator interruption for system stability control, rapid load interruption, black startup

Source: National Energy Administration (NEA), August 2021

[5] Grid-connected main entities refer to those suitable for direct dispatch by power dispatch centers at the provincial and above level, as well as those that can be indirectly dispatched through power dispatch centers of municipal-level and below with conditional participation.

[6] "国家能源局综合司关于公开征求对《并网主体并网运行管理规定（征求意见稿）》《电力系统辅助服务管理办法（征求意见稿）》意见的公告," National Energy Administration, 31 August 2021, accessed at http://www.nea.gov.cn/2021-08/31/c_1310159654.htm.

2. Development and role of flexibility in the Danish power system

Solutions for integrating 50% wind and solar, and potential, future solutions for the remaining 50%

Denmark has high ambitions of reaching zero emissions in its electricity sector by 2030. Today, more than half of electricity demand is covered by wind and solar power. This makes Denmark the country with the world´s highest share of variable renewable energy in its electricity system. Danish experiences in integrating these technologies show how it has succeeded in leading on variable renewable energy share in the electricity system while meeting the Danish electricity demand with affordable electricity prices and a world-class security of supply.

These experiences on the role and development of flexibility in the Danish electricity system over the last 20 years have been gathered in the latest report by the Danish Energy Agency (DEA), in collaboration with the Danish TSO, Energinet. The report was launched online earlier in June at the conference of International Dialogue on Energy Transitions in Suzhou, China. Please download the full English and Chinese report here.

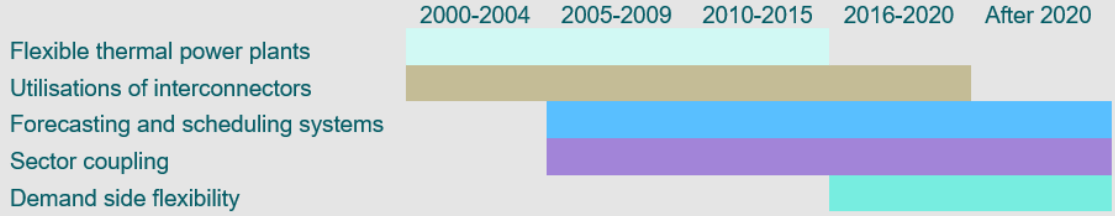
Electricity market as the key driver for flexibility

The development of flexibility in the Danish case is closely linked to the opening of the electricity market in 2000 and the unbundling of the previously vertically integrated energy utilities. In the Danish case, the market design, such as an intra-day market and hourly electricity prices, therefore, plays a key role in cost-effectively unlocking flexibility. Historically, key market players have been power plant operators who, through price signals, have been incentivised to be active in the power market and increase flexibility in their operation in order to maximise profits under varying electricity prices.

Lessons from a chronological review of flexibility solutions 2000-2020

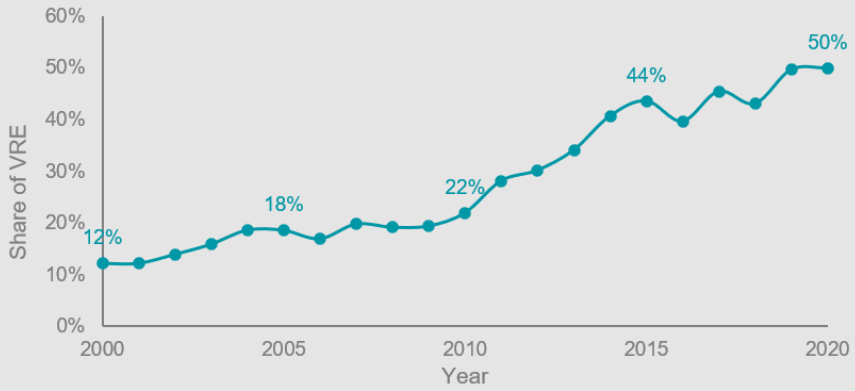
As the VRE share has changed significantly over the past 20 years, so has the need for flexibility. Hence, chronologically reviewing the technical and institutional flexibility solutions not only provides insight into its stepwise development but also illustrates which flexibility level was needed for different VRE shares. Flexibility can be achieved through the generation side, demand side, interconnectors or storage. In general, the less expensive and simpler measures were implemented first, such as flexibilisation of power plants, interconnector related measures and continuous method development of forecasting of renewable generation. But these measures alone will not economically nor technically be sufficient for Denmark to integrate increasingly larger amounts of VRE in the future. Instead, sector coupling, demand-side flexibility and other sources of flexibility are brought into play.

Illustration of periods in which particularly categories of flexibility generally had the most significant impact on power system flexibility and thereby variable renewable integration.



Additionally, the focus and primary sources of flexibility within each category have also changed over time. For instance, sector coupling initially was about a closer coupling power and heating generation to use excess heat from power generation in district heating. Yet, the focus in later years has been on technologies that make use of surplus electricity in times of high renewable generation such as the promotion of heat pumps and electric boilers. Likewise, in these years PtX is a popular topic for future sector coupling for decarbonising sectors that are difficult to electrify and the possible flexibility of these technologies.

Development in the share of VRE produced in the Danish power system in relation to power demand. Fluctuations between years are mainly owed to differences in annual wind generation due to varying wind speeds.



1 2000-2009 (VRE shares <20%): the market incentivised better use of interconnectors and more flexible operation of existing power plants with only little investment in flexibility

The review reveals that at low VRE shares only relatively few investments in flexibility were needed. By 2009, with VRE below 20%, the primary, but not exclusive, sources of flexibility were flexible thermal power plants, utilisation of interconnectors, forecasting and scheduling systems. Flexible operation of combined heat and power (CHP) plants was promoted by exposing them to price fluctuations in the electricity market with hourly price formations as opposed to a previous three-part tariff scheme. In 2009, negative spot prices were introduced which created incentives to significantly reduce power production during high VRE production through enhanced flexibility in thermal power plants. CHP units also allowed for using the sector coupling of heat and power to vary electricity output by for example changing the power-to-heat generation ratio.

2 2010-2015 (VRE shares 20-44%): higher VRE share required larger investments in flexibility measures in existing technologies and new ways of operating power plants and the grid

In 2010-2015, the VRE share grew to 44% necessitating larger investments in flexibility across most of the power sector value chain. This included technical solutions such as complete turbine bypass and electric boilers or heat pumps to decouple heat and electricity production altogether.

While Denmark historically has been highly interconnected to neighbouring countries' power systems, the utilisation was improved when the entire interconnector capacity was made available on the market. Joining the Nordic power exchange Nord Pool in 2000 facilitated cross-border trading with neighbouring countries providing an important source of flexibility, both in terms of up and down regulation of power. Around 2015, a European harmonised day-ahead market was implemented providing access to a wider balancing area and cheaper sources of flexibility. Furthermore, the ability for VRE to self-balance intraday deviations in production was improved with the European cross border intraday market launched in 2018 as the large number of buyers and sellers promoted competition and increased the liquidity of the market making intraday trading more efficient across Europe.

Besides the production and transmission side, the operation of the Danish power system also underwent a transition so that by 2017 central thermal power plants were no longer required to run. Studies provided insights into the fact that components in both the system backbone such as AC interconnectors or synchronous generators were providing sufficient properties required to maintain system stability in the Danish power system. As a consequence, the Danish power system started to run several hours per year and extended periods without central thermal plants.

3 2016-2020 (VRE shares 44-50%) and beyond 50%: focus has shifted towards increased sector coupling and demand-side flexibility

Demand-side flexibility started to be promoted through for example aggregators to actively participate in the balancing of the system as part of a transition from passive to active consumers. The "low hanging fruits" of flexibility have already been implemented and the solutions which have enabled integration of the first 50% of VRE in Denmark will not be able to meet future demand of flexibility. The focus is generally shifting towards increased sector coupling and demand-side flexibility through new technologies, innovative use of existing technologies, digitalisation and data-driven business models. The market is expected to remain the main driver of flexibility and its design will continuously be developed to promote increased levels of flexibility to enable a 100% renewable Danish power system by 2030.

3. Policy monitoring

2021-09-08
http://www.gov.cn/zhengce/zhengceku/2021-09/15/content_5637323.htm

NEA publishes the list of county-wide roof-top PV pilot projects

Notice on Issuing the List of County-wide (city and district) Roof-top Distributed PV Pilot Projects, NEA Comprehensive New Energy [2021] No.84

Earlier in June 2021, the NEA requires local governments to voluntarily initiate the county-wide (city and district) rooftop solar PV pilot. This requires the county (city and district) government to lead projects and corporate with power grid companies and project developers in determining construction scale, operation mode, income distribution and policy support plans of the rooftop solar PV system. Later in September, the NEA published the list consisting of 676 roof-top PV pilot projects.

2021-08-10
http://www.nea.gov.cn/2021-08/10/c_1310119336.htm

NEA intends to carry out systematic statistics on the data of solar PV power plants

Notice on the Measures for the Administration of Solar PV Power Consumption Monitoring Statistics (Draft for Comments)

In order to improve the solar PV consumption monitoring system and information publication mechanism, the NEA requires grid-connected utility-scale solar PV projects to provide monthly power station basic data and real-time operating data that meets quality- and accuracy requirements. Basic data includes installed capacity and parameters of equipment, while real-time data includes output profile, actual power at the grid connection point, and the collection frequency <5 minutes. Distributed and other solar PV projects may implement these optionally by reference. Provincial power grid companies are to summarize power station data monthly, calculate provincial power generation, curtailment rate, and utilization rate, and report the results to the National New Energy Consumption Monitoring and Early Warning Center. The Center is to carry out further data statistics, verification and analysis. The NEA will conduct spot checks on the results on a regular basis.

2021-07-29
http://www.nea.gov.cn/2021-08/05/c_1310108966.htm

NEA establishes a monthly supervision mechanism on renewable power project development

Notice on the Monthly Dispatch of the Development and Construction of Renewable Power Generation Projects

Starting from August 2021, provincial energy authorities and major state-owned power enterprises should report monthly on the development of their renewable power projects to the NEA. Projects include hydropower, wind power, solar PV, biomass power, county-wide roof-top solar PV, and generation-grid-load-storage integrated projects. Data includes newly approved capacity, newly started construction capacity, cumulative capacity under construction, cumulative grid-connected capacity, and estimated grid-connected capacity at the end of the year. Grid enterprises should also report the status of grid connection and commissioning of renewable energy projects in their operating areas on a monthly basis.