China Energy Policy Newsletter: March 2019

1. China energy transition updates

China's energy consumption continues to transform

China has seen progress in its efforts to transition away from coal, which includes scaling up other energy sources as well as restricting coal use in key regions. According to China's National Bureau of Statistics, in 2018 China had total primary energy consumption of 4.64 billion tons of coal equivalent (tce), equal to roughly 135.98 PJ, representing annual growth of 3.3%.[1] Although raw coal production increased by 4.5%, the country for the first time saw coal's share of total primary energy consumption fall below 60%, versus 60.4% in 2017.[2] Meanwhile, 2018 consumption of crude oil rose 6.5% and natural gas consumption grew 17.7%. China imported 460 million tonnes of crude oil, or 70.9% of consumption (versus 69% in 2017). The country also imported 125.4 billion m^3 of natural gas, or 45.3% of consumption, in 2018 (versus 40% in 2017), making China the largest gas importing country of the world.

China's carbon dioxide emissions intensity (CO_2 emission per RMB 10,000 of GDP) fell by 4.0% and energy intensity (energy consumption per RMB 10,000 of GDP) decreased by 3.1% in 2018. China's thermal power plants—the largest domestic coal consuming sector and an important carbon emitter—generated 6.7% more electricity and contributed 71.3% of total power generation in 2018. Electricity-intensive industries also showed growing consumption trends: secondary industry's energy consumption grew 7.6%. Secondary industry represented 40.7% of total GDP in 2018 and secondary industry investment grew 6.2%. Growing secondary industry energy consumption could pressure China's policies on coal caps and carbon reductions.

Electricity consumption continued to increase

China's total electricity consumption in 2018 reached 6846 TWh, an 8.5% annual increase, the highest annual growth since 2012. Secondary industry contributed five percentage points of this growth, led by high technology and equipment manufacturing industries, whose electricity consumption grew 9.5%. Tertiary industry consumption also increased sharply, led by telecom, software, and information technology. As the trends of urbanization, electrification of heating, and rising living standards continue, residential electricity consumption as also continued to show strong growth.[3]

2018 Electricity consumption and increase rate by industries [4]

	Electricity consumption (TWh)	Year on year increase
Total	6846	8.5%
Primary industry	73	9.8%
Secondary industry	4,724	7.2%
Tertiary industry	1,080	12.7%
Residential	969	10.4%

[1] "2018 年国民经济和社会发展统计公报," National Bureau of Statistics, 28 February 2019, accessed at http://www.stats.gov.cn/tjsj/zxfb/201902/t20190228_1651265.html.
[2] "2018 年中国煤炭占一次能源消费比例首次低于 60%," China News Service Website, 21 January 2019, accessed at http://www.chinanews.com/cj/2019/01-21/8735183.shtml.
[3] "中电联发布《2018-2019 年度全国电力供需形势分析预测报告》," China Electricity Council, 29 January 2019, accessed at http://www.cec.org.cn/yaowenkuaidi/2019-01-29/188578.html.
[4] "国家能源局发布 2018 年全国电力工业统计数据," National Energy Administration, 18 January 2019, accessed at http://www.nea.gov.cn/2019-01/18/c_137754977.htm.

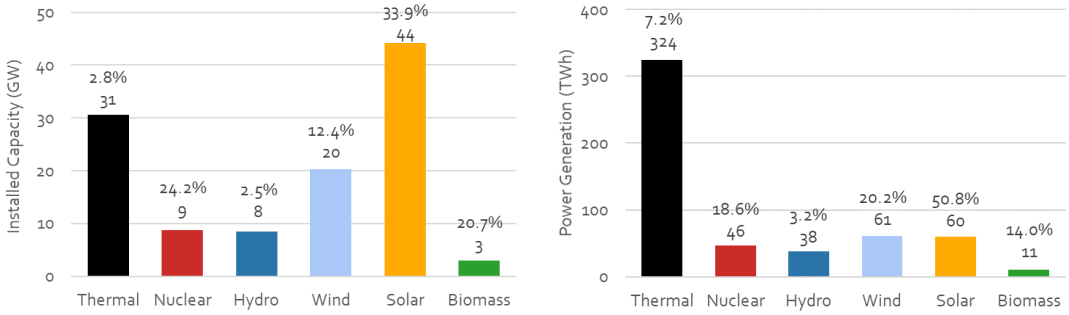
Non-fossil energy resources contributing to power generation

By the end of 2018, China had a total power generation capacity of 1,900 GW. In 2018, China added 120 GW of new capacity, 6.05 GW less than 2017. Non-fossil energy resources took up 73% of this newly added capacity. In 2018, the power sector in China generated 6,990 TWh, 30.9% of which was from non-fossil energy sources.[5]

2018 Power installed capacity and power generation by fuels [6]

	Total installed capacity (GW)	Year on year increase	Power generation (TWh)	Year on year increase
Total	1,900	6.5%	6,994	8.4%
Thermal	1,126	2.8%	4,833	7.8%
Nuclear	45	24.2%	294	18.6%
Hydro	352	2.5%	1,233	3.2%
Wind	184	12.4%	366	20.2%
Solar	175	33.9%	178	50.8%
Biomass	18	20.7%	91	14.0%

2018 Incremental installed capacity (GW); 2018 Incremental power generation (TWh)



Notice: Thermal power = thermal in CEC datasheet – biomass in NEA datasheet. Source: Biomass data - China National Energy Administration, January 2019; the rest date - China Electricity Council, January 2019

Renewable energy grew strongly

By the end of 2018, China had installed 728 GW of renewable energy capacity. Renewable energy produced 26.7% of total electricity generated in 2018. Compared to 2017, China's renewable power capacity has grown by 12%, while power generation increased by 10%. In 2018, China installed 8.54 GW of additional hydro power capacity. Provinces with the largest newly added hydro capacity were Yunnan (3.92 GW), Sichuan (1.55 GW), and Guangdong (0.9 GW). Newly installed wind capacity reached 20.59 GW, with 47% located in West Central and southern areas, diversifying wind power development across more of the country.[7] As the 531 (May 31) solar policy document led to a dip in solar PV capacity additions, 2018 saw incremental PV capacity installations (46 GW) 16.2% below that of 2017. Newly added solar capacity in West China rose by 7.8% in 2018 due to implementation of the poverty alleviation policy.[8]

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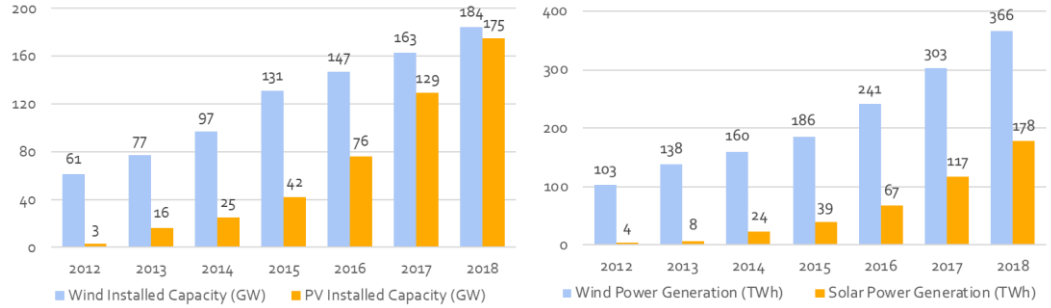
[5] "中电联发布《2018-2019 年度全国电力供需形势分析预测报告》," China Electricity Council, 29 January 2019, accessed at http://www.cec.org.cn/yaowenkuaidi/2019-01-29/188578.html.

[6] "中电联发布《2018-2019 年度全国电力供需形势分析预测报告》," China Electricity Council, 29 January 2019, accessed at http://www.cec.org.cn/yaowenkuaidi/2019-01-29/188578.html; "2018 年可再生能源并网运行情况介绍," National Energy Administration, 28 January 2019, accessed at http://www.nea.gov.cn/2019-01/28/c_137780519.htm?from=groupmessage&isappinstalled=.

[7] "2018 年可再生能源并网运行情况介绍," National Energy Administration, 28 January 2019, accessed at http://www.nea.gov.cn/2019-01/28/c_137780519.htm?from=groupmessage&isappinstalled=0.

[8] "中电联发布《2018-2019 年度全国电力供需形势分析预测报告》," China Electricity Council, 29 January 2019, accessed at http://www.cec.org.cn/yaowenkuaidi/2019-01-29/188578.html.

China 2018 wind and solar installed capacity (left) and power generation (right)



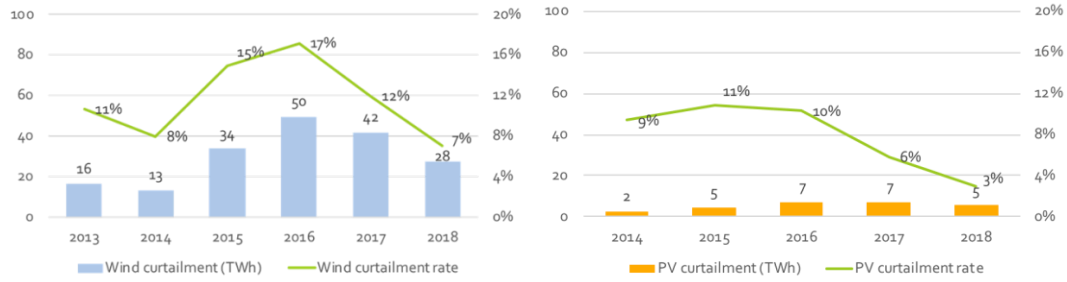
Source: China Electricity Council, January 2019

Renewable energy curtailment decreasing

In 2018, China experienced wind power curtailment of 27.7 TWh, or 7%. This represents a five-percentage point improvement versus 2017. The majority of severe curtailment regions have improved: wind curtailment rates in Jilin and Gansu decreased more than 14 percentage points in 2018, while Inner Mongolia, Liaoning, Heilongjiang and Xinjiang experienced a reduction of more than five percentage points. Major wind and solar curtailment problems were located in Xinjiang, Gansu and Inner Mongolia, where curtailment is most common during the heating season and at night.

In 2018, China saw solar power curtailment of 5.49 TWh,or 3%, 2.8 percentage points less than in 2017. Xinjiang and Gansu saw the most improvement: solar curtailment rate decreased by 6 percentage points and 10 percentage points.[9] Officials cited high renewable energy capacity, large scale thermal power plants and lack of transmission capacity as the main causes of high curtailment. The amount of hydro power curtailment was 69.1 TWh in 2018, 34.2% higher than 2017, while Sichuan and Yunnan suffered the highest hydro curtailment rates. [10] Utilization of hydro depends on large scale trans-provincial power transmission agreements.

China 2018 curtailment of wind (left) and solar PV (right)



Source: China National Energy Administration, February 2019

Solar market oversaturation in West China

According to China's National Energy Administration (NEA), Gansu, Xinjiang and Tibet were marked red in the 2018 solar market monitoring results. 14 provinces or areas including Ningxia, Qinghai and Inner Mongolia were marked orange, while most provinces in Northeast and South were marked green.

[9] "2018 年风电并网运行情况," National Energy Administration, 28 January 2019, accessed at http://www.nea.gov.cn/2019-01/28/c_137780779.htm.
[10] "国家能源局：2018 年新能源弃电超 300 亿度," China Energy Newspaper, 17 January 2019, accessed at http://news.bjx.com.cn/html/20190117/957343.shtml.

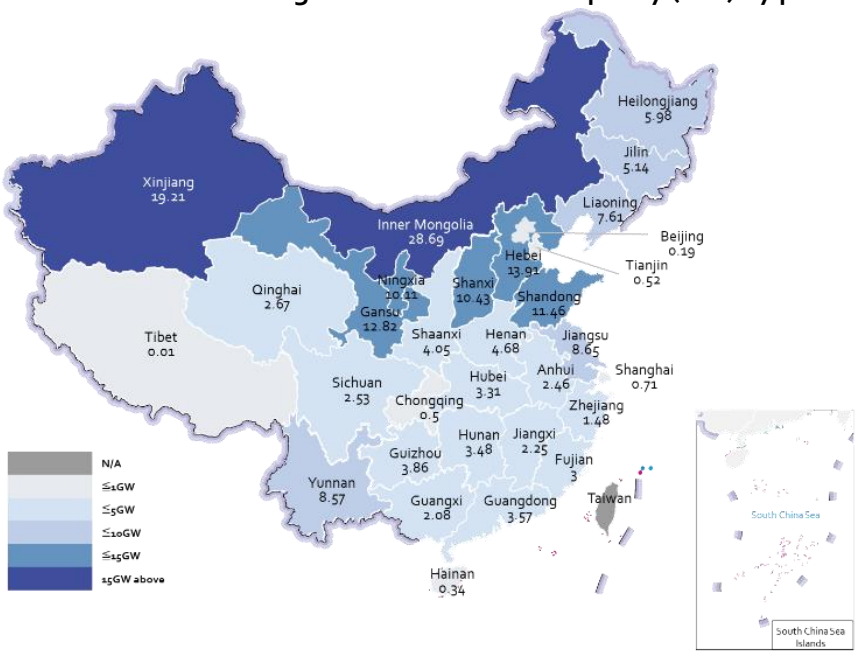
NEA 2018 solar market monitoring results by province

Source: China National Energy Administration, February 2019

Grid-connected wind power provincial development

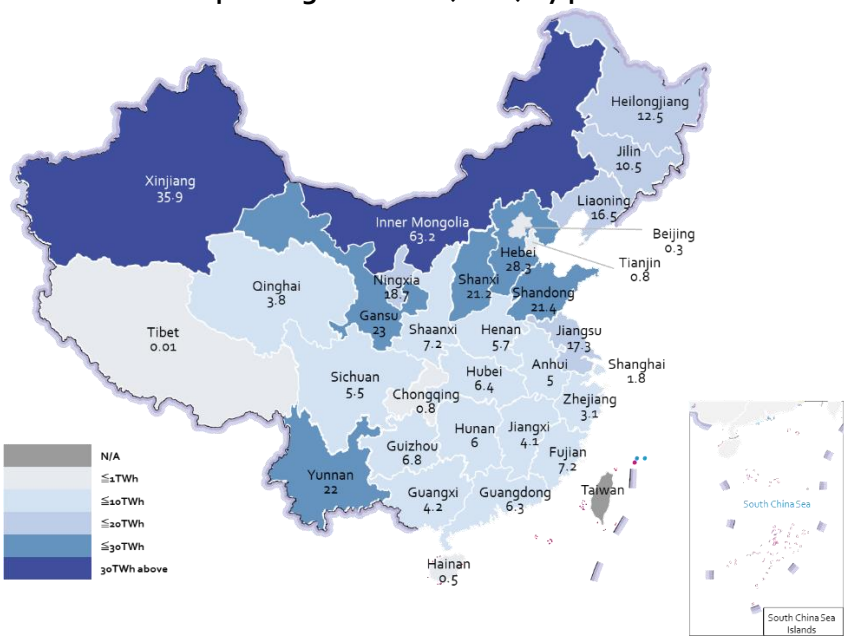
In 2018, China installed 20.6 GW grid-connected wind power capacity and had 184 GW cumulative installed capacity at year end. Grid-connected wind generated 366 TWh of electricity in 2018, or 5.2% of total electricity produced. The national average wind power utilization in 2018 was 2,095 hours (24%). Hebei, Shanxi, Inner Mongolia, Gansu and Liaoning achieved goals set for 2018 curtailment reductions. Gansu, Inner Mongolia, and Xinjiang continued to suffer wind curtailment rates in double digits.

China 2018 cumulative grid-connected wind capacity (GW) by province



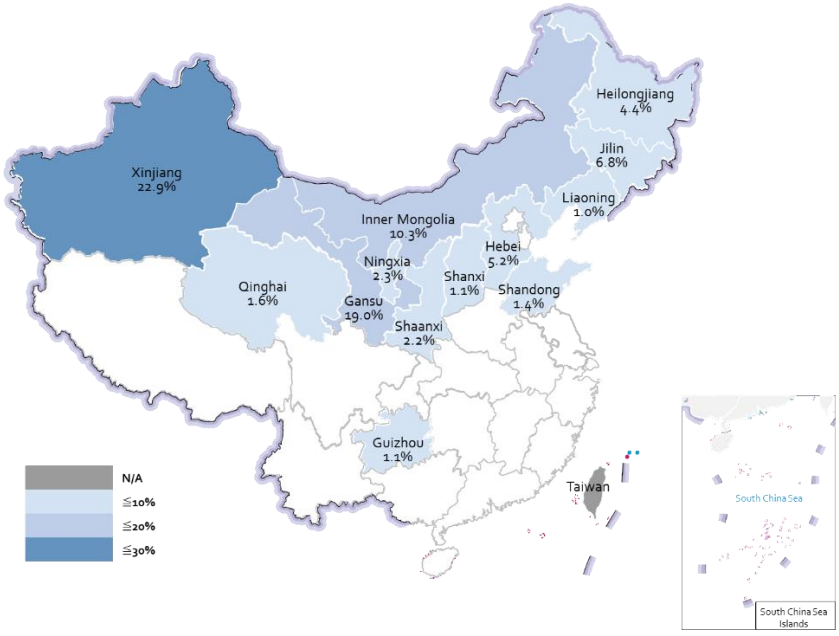
Source: China National Energy Administration, January 2019

China 2018 wind power generation (TWh) by province



Source: China National Energy Administration, January 2019

China 2018 wind curtailment (%) by province



Source: China National Energy Administration, January 2019

2. Expert interview

Hans-Arild Bredesen

Board Member and CEO, Nord Pool Consulting

Mr. Hans-Arild Bredesen has been involved in the electricity deregulation process since 1992. Based on experience from the Nordic market with international insights, he provides assistance to market operators, regulatory authorities and system operators on how to implement a power market based on sound economics and also considering local conditions.

QUESTION 1

Which challenges do countries face when implementing the spot power market?

First, countries need to secure transparent data access for all market participants, to enable participants to forecast the market development. Necessary data includes, for instance, consumption and generation forecasts, wind and solar prognoses, hydro reservoir data, and status of the power system, such as information about lines and/or generation/large consumption units out for maintenance. Secondly, it is important to create a level playing field, based on common and clear rules. That means that no companies can enjoy a privileged access to data or get other advantages. Thirdly, countries need a strong and independent regulator with sufficient market monitoring and surveillance functions, acting as the market's police officer, ensuring that rules are enforced.

QUESTION 2

Are any of the Nordic experiences, especially important to highlight in countries with high wind and solar curtailment?

To prevent wind and solar curtailment due to uneven distribution of renewable resources, it is important to establish cross-border trading. However, this is challenging if different regions implement different market models. The Nordic market shows that even with different market models, it is not impossible.

What is important is to establish some basic harmonization. That means that the provinces should agree on how they will manage cross-border trading, the rules should ideally be the same on both sides of the border. Moreover, the provinces need to agree on how market participants should pay for transmission and distribution. This includes agreeing on the methodology on how to pay for transmission and distribution. There are many different implementations for this; by a fixed point-of-connection tariff in addition to the electricity price or a transmission tariff depend on the transmission distance, often called wheeling charge.

QUESTION 3

How long does it take to implement a spot power market?

In my experience, implementation of a spot power market can take from one year to more than 10 years. It is highly dependent on the political support for implementation. China has high ambitions on the pace of the implementation of their spot power market, whether or not China's policy-makers will succeed depends especially on the political willingness and support from relevant authorities.

对话译文

问题一

各国在开展电力现货市场的过程中都面临了哪些挑战？

第一，各国需要确保所有市场参与者都可访问公开透明的数据，并能使市场参与者预测市场发展态势。举例来说，这些数据包括用电量和发电量预测、风能和光伏发电预测、水库数据和电力系统的状态，例如系统中线路或大型发电、用电设施检修和维护的信息。第二，基于公开和明确的规则，建立一个公平的竞争环境至关重要。此项规则意味着任何企业都不能享受数据访问的特权或者其他特权。第三，各国需要一个强大且独立、具有充分的市场监督职能的监管机构，来充当市场“警察”，保证规则得以执行。

问题二

北欧有没有相关经验是特别可以供弃风、弃光较为严重的国家借鉴的？

为防止因资源分配不均而导致的弃风和弃光现象，建立跨境交易非常重要。然而，若不同地区采用不同的市场模式，跨境交易将会面临挑战。北欧市场表明，即使不同国家有不同的市场模式，跨境交易也并非不可能实现。

建立基础的协调性规则尤为关键，这意味着各省应就如何管理跨境交易达成一致。在理想情况下，跨境两边的市场规则应相同。此外，还需要商定市场参与者应如何支付输配电费用，这包括就支付方式达成一致。这有很多种方法可以实现；例如在电价以外收取一笔固定的“并网费用”（根据并网点），或基于传输长度的输电费，通常称之为“过网费”。

问题三

完全实施电力现货市场需要多长时间？

根据我的经验，电力现货市场的完全实施在一到十年以上不等。成功与否高度依赖于政策支持。中国对实施电力现货市场具有很高的抱负，所以中国是否能够成功推进电力现货市场的建设与运行，尤其取决于有关部门的政治意愿与政策支持。

Regulation of priority power generation and purchases for wind and solar

Notice on Regulating the Management of the Prior Power Generation Plan and Prior Power Purchase Plan, NDRC Operation [2019] No.144

2019-01-22

http://www.ndrc.gov.cn/zcfb/zcfbtz/201901/t20190129_926682.html

Grid companies should integrate all electricity generated by wind and solar projects in areas capable of consuming all renewable electricity. In areas with limited consumption capability, grid companies should acquire electricity based on the *full guarantee of minimum purchase* policy. The on-grid tariff of electricity scheduled in the *Prior Power Generation Plan* uses two different pricing schemes: guaranteed quantity and price (government-regulated pricing) and guaranteed quantity without fixed price (market-formed pricing). The policy requires grid companies and power generators to transfer the previous planned operating hours quotas for coal power generation first to clean energy power generators, and then to higher-efficiency and lower-emissions thermal power units. The policy permits power trading institutions to trade planned operating hours quotas within the province or across provinces and regions.

NDRC and NEA set new rules for incremental power distribution pilots

Notice on Actively Promoting Subsidy-Free Wind and Solar Pilots, NDRC Economy and Institution [2019] No.19

2019-01-05

http://www.ndrc.gov.cn/zcfb/zcfbtz/201901/t20190116_925666.html

After implementing three batches of pilots starting in 2016, the National Development and Reform Commission and NEA have issued new rules to refine regulation of incremental power distribution—meaning grid investments in newly added distribution infrastructure.[11] This notice clarifies that local governments cannot assign proprietors for incremental power distribution pilot projects, nor can companies (such as state-owned grid companies) force pilots to admit them as shareholders. Provincial power grid planners shall include distribution pilots in their grid planning. The government encourages distributed power generators to connect to distribution pilot systems. The government also encourages pilot facilities to adopt flexible power distribution pricing strategies, provided the result is lower average customer prices versus the government regulated price.

China's Environment Impact Assessment Law amended a second time

The Second Amendment for China's Environment Impact Assessment Law

2018-12-29

http://www.ndrc.gov.cn/zcfb/zcfbtz/201901/t20190116_925666.html

The second amendment to China's Environment Impact Assessment Law eliminates earlier requirements for institutions performing EISs to receive government approval of their qualifications. The amendment allows all assessment institutions to compete equally in the market, and also clarifies that construction units are the main entities with legal responsibility regarding EIS reporting for each project. This new regulation is intended to stimulate a more competitive market for performing EISs, improve EIS audits and punishment of EIS violations, and increase deterrence for both personnel and construction units.

[11] "国家发展改革委 国家能源局关于规范开展增量配电业务改革试点的通知, 发改经体〔2016〕2480 号," National Development and Reform Commission, 27 November 2016, accessed at http://www.ndrc.gov.cn/zcfb/zcfbtz/201612/t20161201_828814.html.