

面向碳达峰的双重使命：中国煤炭产区如何保障能源安全 并引领低碳转型

**The dual mission towards carbon peak: how can China's
coal-producing areas ensure energy security And lead the
low-carbon transformation**

Han Wenke, Chinese Academy of Macroeconomics Research
November 6, 2025

中国目前的煤炭产量接近48亿吨，占全球的50%多一点

China's current coal production is close to 4.8 billion tons, accounting for just over 50% of the global total

表4 2024年主要能源产品产量及其增长速度

According to data from the National Bureau of Statistics of China, China's coal production in 2024 was 4.78 billion tons, an increase of 1.2% over the previous year.

产品名称	单位	产量	比上年增长（%）
原煤	亿吨	47.8	1.2
原油	万吨	21289.1	1.8
天然气	亿立方米	2464.5	6.0
发电量	亿千瓦时	100868.8	6.7
其中：火电 ^[26]	亿千瓦时	63742.6	1.7
水电	亿千瓦时	14256.8	10.9
核电	亿千瓦时	4508.5	3.7
风电	亿千瓦时	9970.4	12.5
太阳能发电	亿千瓦时	8390.4	43.6

同时，中国煤炭进口量超过5亿吨，占全球煤炭贸易量的1/3多

Meanwhile, China's coal imports exceed 500 million tons, accounting for more than one-third of the global coal trade volume

表12 2024年主要商品进口数量、金额及其增长速度

According to data from the General Administration of Customs, in 2024, China's coal imports reached 540 million tons, marking a year-on-year increase of 14.4%.

商品名称	单位	数量	比上年增长 (%)	金额 (亿元)	比上年增长 (%)
大豆	万吨	10503	6.5	3751	-9.8
食用植物油	万吨	716	-26.8	528	-27.9
铁矿砂及其精矿	万吨	123655	4.9	9406	-1.4
煤及褐煤	万吨	54270	14.4	3705	-0.7
原油	万吨	55342	-1.9	23108	-2.7
成品油	万吨	4823	1.0	2083	5.7
天然气	万吨	13169	9.9	4637	2.5
初级形状的塑料	万吨	2898	-2.1	3117	-2.0
纸浆	万吨	3435	-6.3	1593	-4.3
钢材	万吨	681	-10.9	819	-8.1
未锻轧铜及铜材	万吨	568	3.4	3848	14.7
集成电路	亿个	5492	14.6	27445	11.7
汽车（包括底盘）	万辆	71	-11.7	2785	-16.1

中国的煤炭生产分布及其变化

Distribution and changes of coal production in China

- ◆ “十四五”以来，西部地区原煤产量由23.2亿吨增至30.4亿吨，占全国总产量比重上升4.2个百分点；中部地区由13.1亿吨增至15.0亿吨，比重下降2.2个百分点；东部地区比重下降1.5个百分点。

Since the 14th Five-Year Plan, the raw coal production in China's western region has increased from 2.32 billion tons to 3.04 billion tons, with its proportion in the national total output rising by 4.2 percentage points; that in the central region has increased from 1.31 billion tons to 1.50 billion tons, with its proportion declining by 2.2 percentage points; and that in the eastern region has declined by 1.5 percentage points.

- ◆ 2024年，8个亿吨级省（区）原煤产量43.6亿吨，占全国91.3%，较2020年增加8.6亿吨，占比提高1.6个百分点。

In 2024, the raw coal production of eight provinces (or autonomous regions) with an annual output of over 800 million tons reached 4.36 billion tons, accounting for 91.3% of the national total. This figure represents an increase of 860 million tons compared to 2020, with the proportion rising by 1.6 percentage points.

晋陕蒙新四省（区）为中国煤炭生产集中度最高的主产区

The four provinces (or autonomous regions) of Shanxi, Shaanxi, Inner Mongolia, and Xinjiang have become the main production areas with the highest concentration of coal production

- ◆ 近年来，新疆加快大型煤炭基地建设，2024年产量达5.4亿吨，较2020年增加2.7亿吨，“疆煤外运”突破1.3亿吨，成为全国煤炭生产新高地。

In recent years, Xinjiang has accelerated the construction of large coal bases, with production reaching 540 million tons in 2024, making it a new highland for coal production nationwide..

- ◆ 山西、蒙西、蒙东、陕北及新疆五大供应保障基地建设提速，重塑煤炭东中西梯级开发格局。2024年，**晋陕蒙新**四省（区）产量39亿吨，占全国的81.6%，较2020年增加8.5亿吨、占比提高3.4个百分点。

The construction of five major supply and guarantee bases in Shanxi, West Inner Mongolia, East Inner Mongolia, North Shaanxi, and Xinjiang has accelerated, reshaping the cascade development pattern of coal from east to west. In 2024, the output of the four provinces (or autonomous regions) of Shanxi, Shaanxi, Inner Mongolia, and Xinjiang reached 3.9 billion tons, accounting for 81.6% of the national total, an increase of 850 million tons compared to 2020.

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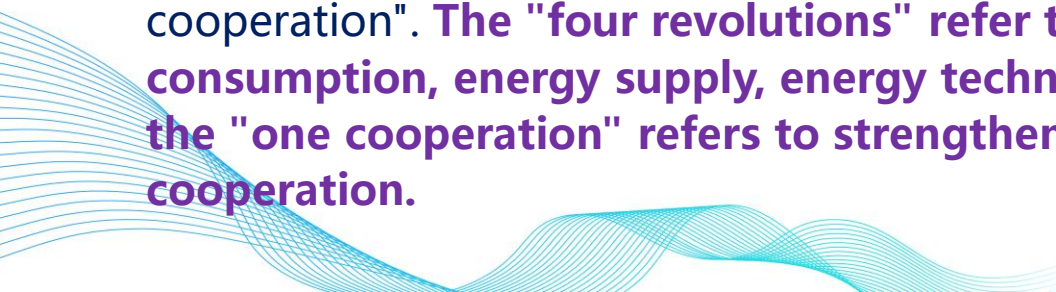


2014年习近平主席提出中国国家能源安全新战略

In 2014, Xi Jinping proposed a new national energy security strategy for China

习近平指出：面对能源供应格局新变化、国际能源发展新趋势，保障国家能源安全，必须推动能源生产和消费革命。这是我国能源发展的国策，基本要求可以概括为“四个革命”、“一个合作”。“四个革命”就是能源消费革命、能源供给革命、能源技术革命、能源体制革命，“一个合作”就是加强全方位国际合作。

Xi Jinping pointed out that in the face of new changes in the energy supply pattern and new trends in international energy development, to ensure national energy security, we must promote a revolution in energy production and consumption. This is the national policy for China's energy development, and its basic requirements can be summarized as "four revolutions" and "one cooperation". **The "four revolutions" refer to the revolution in energy consumption, energy supply, energy technology, and energy system, while the "one cooperation" refers to strengthening all-round international cooperation.**



中国最新的国家自主贡献承诺

President Xi announced China's new NDCs

2025年9月24日，习近平在在联合国气候变化峰会上宣布中国新一轮国家自主贡献

到2035年，中国全经济范围温室气体净排放量比峰值下降7%~10%，力争做得更好。非化石能源消费占能源消费总量的比重达到30%以上，风电和太阳能发电总装机容量达到2020年的6倍以上、力争达到36亿千瓦，森林蓄积量达到240亿立方米以上，新能源汽车成为新销售车辆的主流，全国碳排放权交易市场覆盖主要高排放行业，气候适应型社会基本建成。

China will, by 2035, reduce economy-wide net greenhouse gas emissions by 7% to 10% from peak levels, striving to do better; increase the share of non-fossil fuels in total energy consumption to over 30%; expand the installed capacity of wind and solar power to over six times the 2020 levels, striving to bring the total to 3,600 gigawatts; scale up the total forest stock volume to over 24 billion cubic meters; make new energy vehicles the mainstream in the sales of new vehicles; expand the National Carbon Emissions Trading Market to cover major high-emission sectors; and basically establish a climate adaptive society.

国家能源安全新战略和双碳背景下的中国能源安全观

China's energy security perspective under the new national energy security strategy and the dual-carbon background

1. 加快建设能源强国，为中国式现代化建设提供安全可靠的能源保障

2. 立足我国能源资源禀赋，积极稳妥推进碳达峰碳中和

3. 聚焦为民便民安民，确保民生用能安全稳定供应

4. 推动能源消费革命，加快形成能源节约型社会

5. 推动能源供给革命，加快建设新型能源体系

6. 推动能源技术革命，把现代能源经济这篇文章做好

7. 推动能源体制革命，打通能源发展快车道

8. 全方位加强国际合作，实现开放条件下能源安全

1. Accelerate the construction of a strong energy nation, providing safe and reliable energy security for the Chinese path to modernization

2. Based on China's endowment of energy resources, actively and steadily promote carbon peaking and carbon neutrality

3. Focusing on facilitating and ensuring the safety and stability of energy supply for people's livelihood

4. Promote a revolution in energy consumption and accelerate the formation of an energy-saving society

5. Promote the revolution in energy supply and accelerate the construction of a new energy system

6. Promote the revolution in energy technology and make a success of the modern energy economy

7. Promote the revolution of the energy system and open up the fast lane for energy development

8. Strengthen international cooperation in all aspects to achieve energy security under open conditions

煤炭资源产区保障能源安全的责任

The responsibility of coal resource production areas in ensuring energy security

- ◆ 山西、蒙西、蒙东、陕北、新疆五大煤炭供应保障基地，为全国煤炭煤电兜底保障基础，承担重点保障任务。

The five major coal supply and guarantee bases in Shanxi, western Inner Mongolia, eastern Inner Mongolia, northern Shaanxi, and Xinjiang serve as the fundamental support for coal and coal-fired power generation nationwide, undertaking key guarantee tasks.

- ◆ 在这些地区建设资源条件好、竞争能力强、安全保障程度高的大型现代化煤矿，同时推动落后产能、无效产能和安全生产条件较差的煤矿关闭退出；建立健全相应的煤炭储备设施体系。

Build large-scale modern coal mines with good resource conditions, strong competitiveness, and high levels of safety and security in these areas, while promoting the closure and withdrawal of coal mines with backward production capacity, ineffective production capacity, and those that do not meet safe production conditions; establish and improve a corresponding coal reserve facility system.

为什么要发挥煤炭煤电的兜底保障作用？

Why should we leverage the role of coal and coal-fired power as a fundamental guarantee?

- ◆ 2014年习近平提出中国国家能源安全新战略后，着力建设“煤、油、气、核、新能源、可再生能源”多轮驱动的多元能源供应体系，同时同步加强能源输配网络和储备设施建设。

Since 2014, China has been vigorously constructing a diversified energy supply system driven by multiple sources, including coal, oil, gas, nuclear energy, new energy, and renewable energy. At the same time, it has also been strengthening the construction of energy transmission and distribution networks as well as reserve facilities.

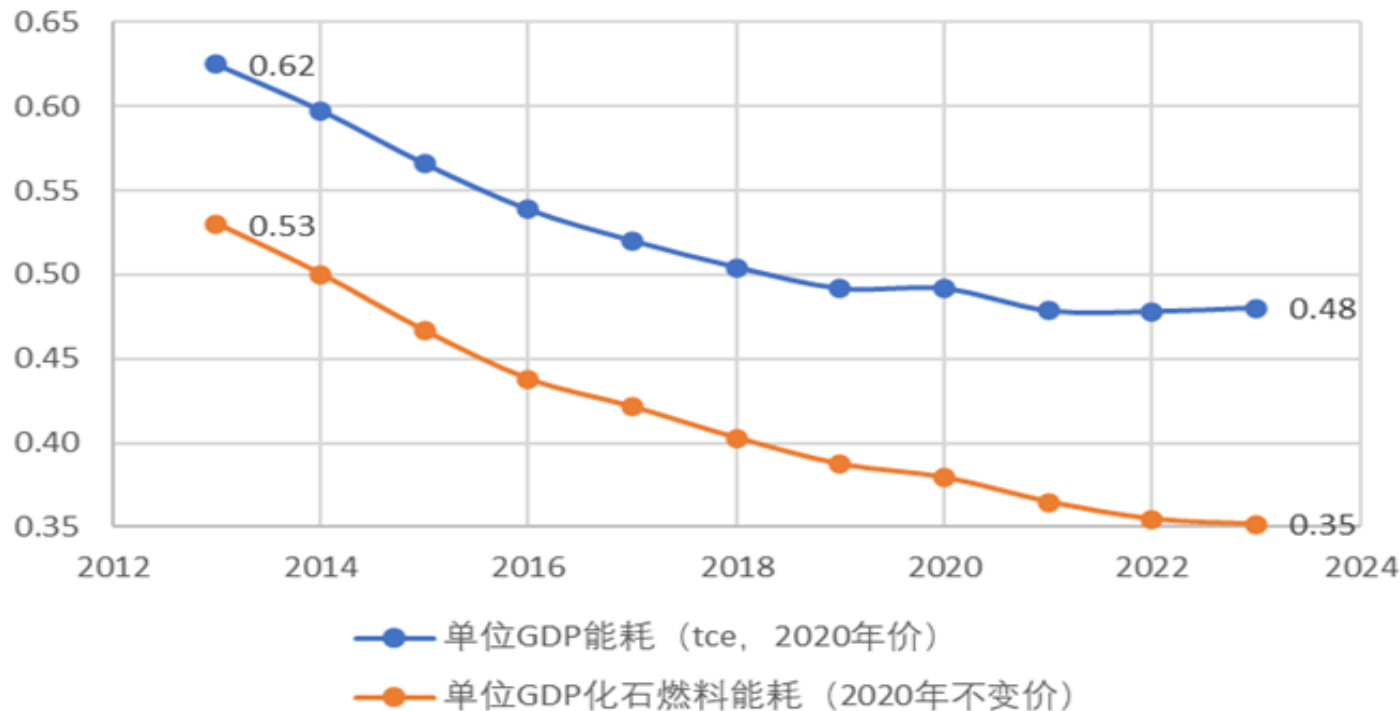
- ◆ “十四五”以来，中国又开始规划和建设新型能源体系和新型电力系统，新型能源体系和新型电力系统都是以新能源为主体的，在多元体系和新型体系的转化过渡期，以中国的国情和新的能源安全观，必须发挥好煤炭的煤炭煤电的兜底保障作用，除此别无他法。

Since the implementation of the 14th Five-Year Plan, China has begun planning and constructing a new energy system and a new power system. During the transition period from a diversified system to a new system, based on China's national conditions and energy security perspective, it is imperative to fully leverage coal's role as the fundamental guarantee for coal-fired power generation. There is no alternative approach.

经济发展对化石燃料消费的依赖程度持续降低

2014-2023中国GDP增长了78.5%，化石能源消耗只增长了37.2%

From 2014 to 2023, China's GDP grew by 78.5%, while fossil energy consumption only increased by 37.2% The dependence of China's economic development on fossil fuel consumption continues to decrease



2025年1-3季度我国生态环境质量总体持续改善

From the first quarter to the third quarter of 2025, China's ecological environment quality has continued to improve overall

- ◆ **环境空气质量**： 339个地级及以上城市PM2.5平均浓度为26.0微克/立方米，同比下降5.1%；PM10平均浓度为45微克/立方米，同比下降4.3%。平均空气质量优良天数比例为87.6%，同比上升1.8个百分点；平均重度及以上污染天数比例为1.1%，同比持平。

The average PM2.5 concentration in 339 cities at the prefecture level and above was 26.0 micrograms per cubic meter, down 5.1% year on year; the proportion of days with excellent air quality averaged 87.6%, up 1.8 percentage points year on year

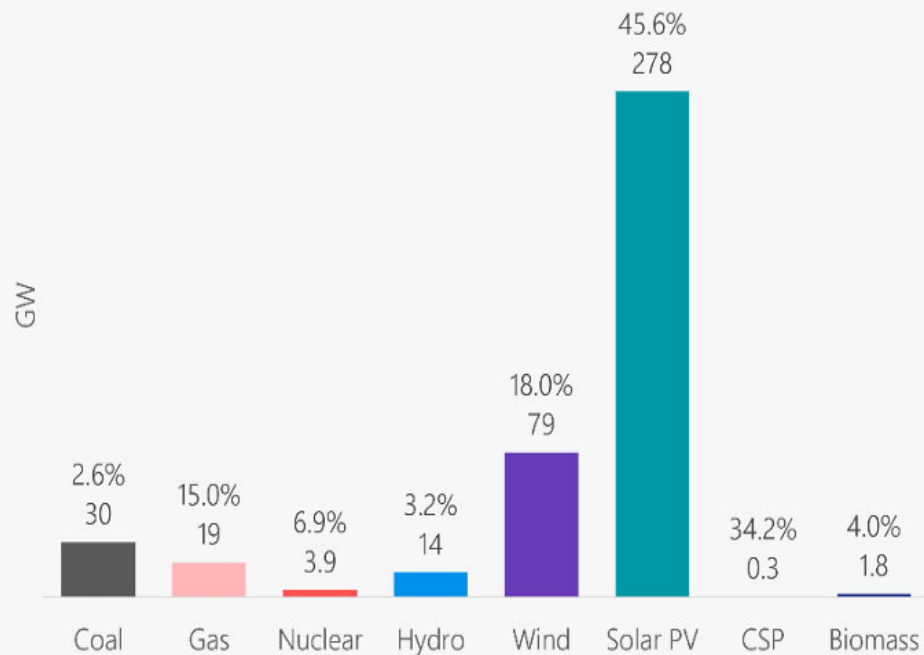
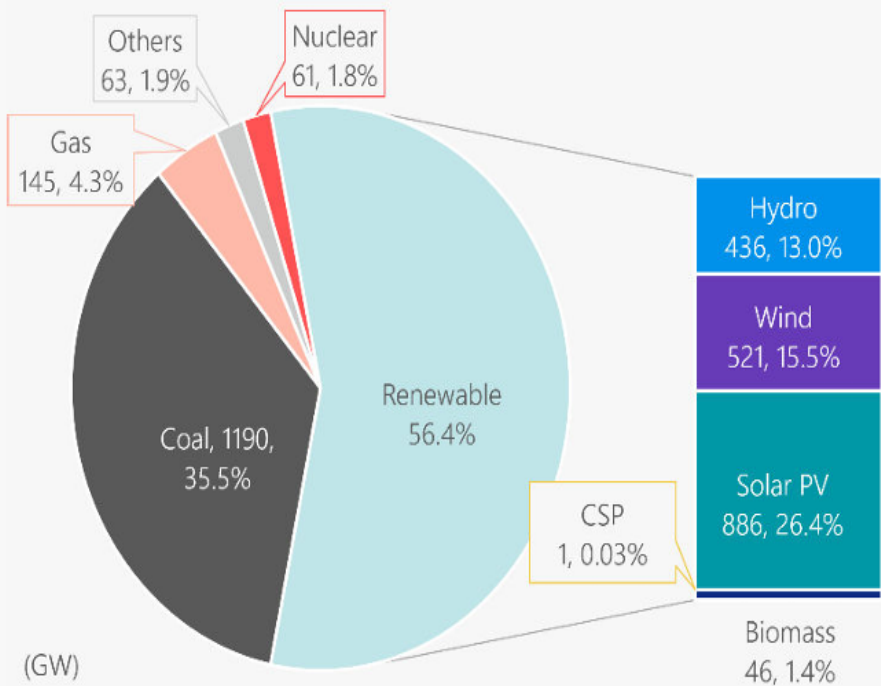
- ◆ **重点区域**： 京津冀及周边 2+36城市PM2.5平均浓度为33.0微克/立方米，同比下降15.6%；平均优良天数比例为73.5%，同比上升8.5个百分点。长三角地区31个城市PM2.5平均浓度为29.6微克/立方米，同比下降6.3%；平均优良天数比例为81.6%，同比上升2.4个百分点。汾渭平原13个城市PM2.5平均浓度为30.9微克/立方米，同比下降16.5%；平均优良天数比例为75.3%，同比上升9.4个百分点。
- ◆ The average PM2.5 concentration in the 2+36 cities in Beijing-Tianjin-Hebei and surrounding areas was 33.0 micrograms per cubic meter, down 15.6% year on year; the average proportion of days with good air quality was 73.5%, up 8.5 percentage points year on year. The average PM2.5 concentration in the 31 cities in the Yangtze River Delta region decreased by 6.3% year on year. The average PM2.5 concentration in the 13 cities in the Weihe Plain decreased by 16.5% year on year.

2024年可再生能源占新增发电装机容量的86%

2024年底的总发电装机容量中，煤电占比下降到35.5%（右），可再生能源上升到56.4%（左）

2024 Installed power generation capacity structure (left);

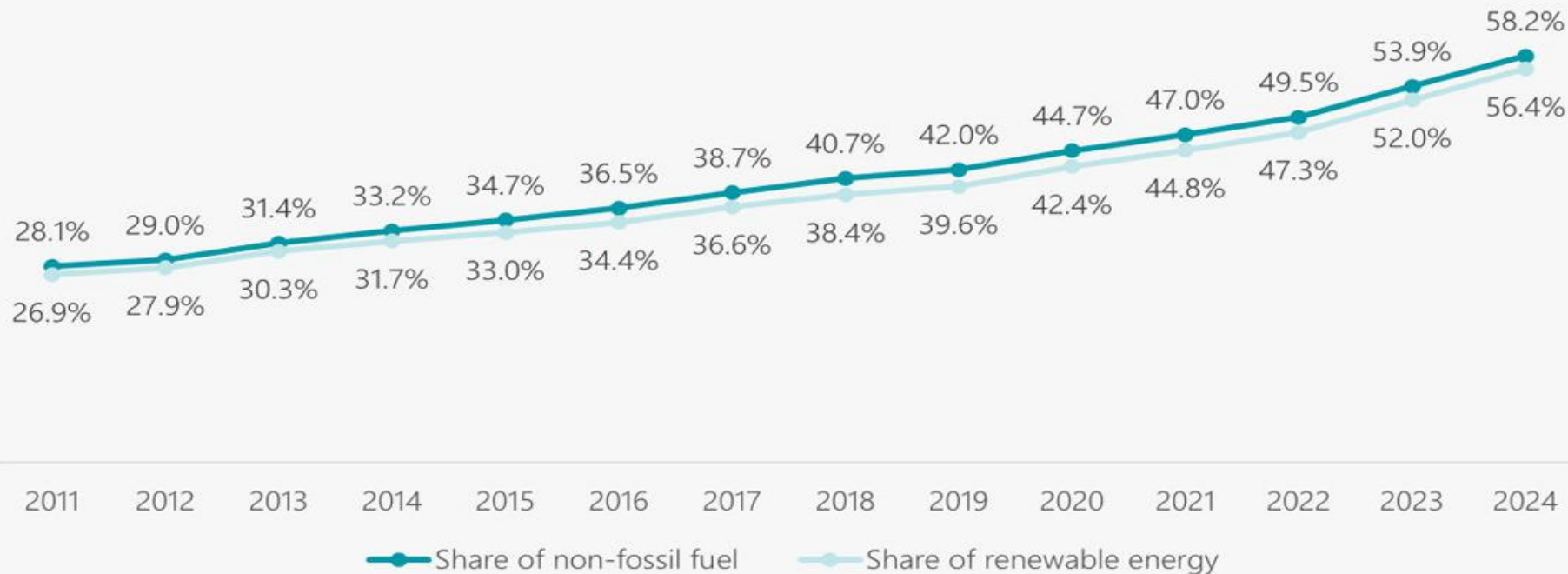
2024 Newly installed power generation capacity by technology and their year-on-year growth rate (right)



Source: CEC and NEA, accessed in March

2024年非化石能源装机和可再生能源装机占比分别超过56%和58%

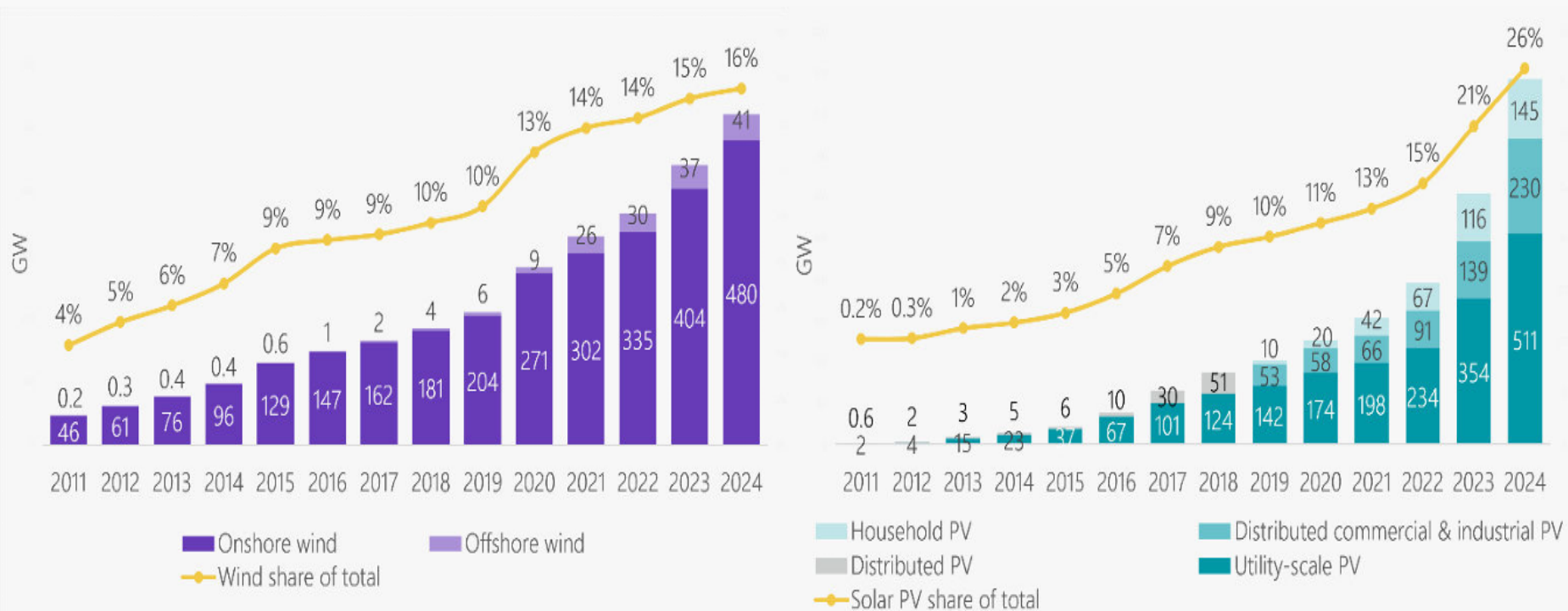
2011-2024 Non-fossil energy and renewable energy share in total installed power generation capacity



Source: Calculated based on CEC and NEA's data, accessed in March 2025

风电和太阳能发电累计装机情况 (2011-2024)

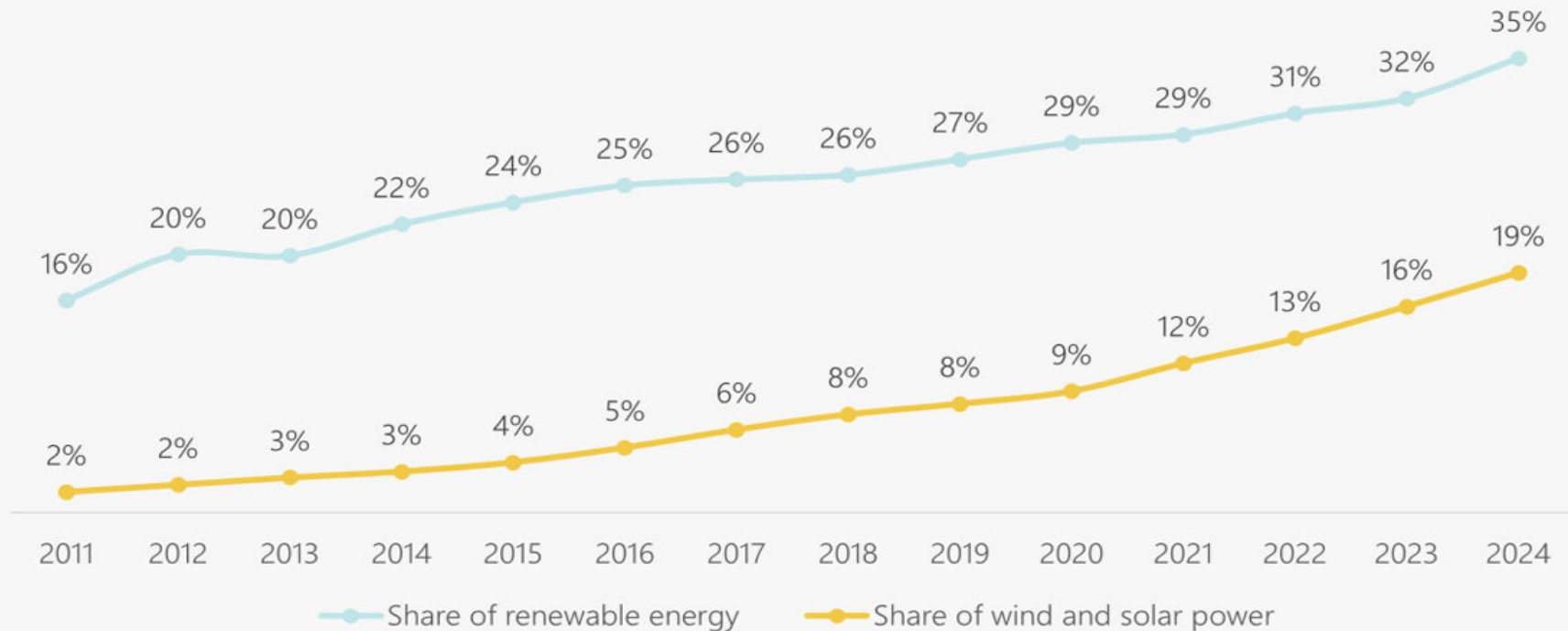
2011-2024 Total installed capacity of wind power (left) and solar PV (right) and their share of total



Source: NEA, accessed in March 2025

可再生能源发电量从十分弱小发展到提供全国三分之一的发电量

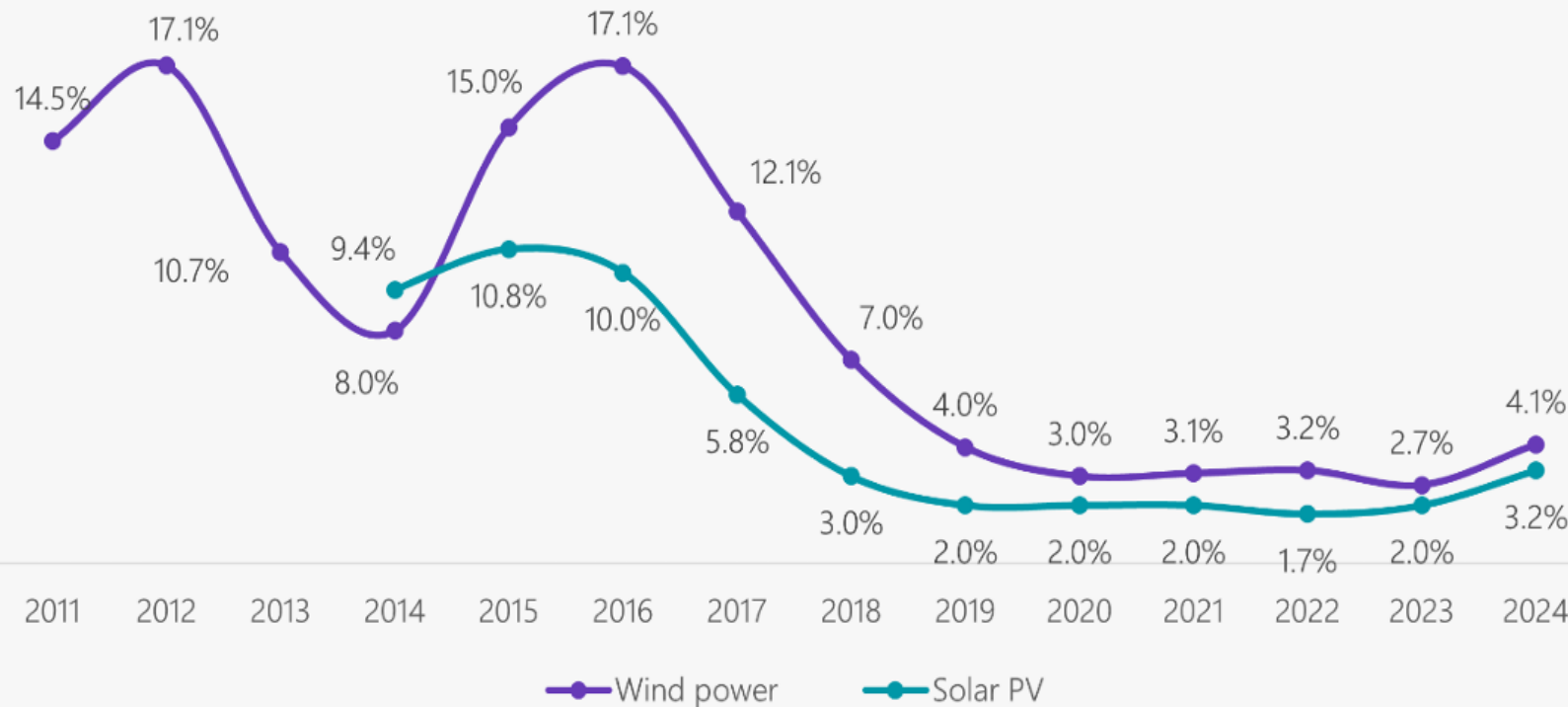
2011-2024 The share of renewable energy and share of wind and solar power in total electricity consumption



Source: CEC, NEA and NBS, accessed in March 2025

风能和太阳能发电弃风和弃光率大幅下降

2011-2024 Wind and solar power curtailment rates



Source: NEA and Electric Power and Planning Engineering Institute (EPPEI), accessed in March 2025

煤炭产区引领低碳转型——需大力推进能源革命

Coal-producing regions lead the low-carbon transformation - a vigorous push is needed for the energy revolution

中央全面深化改革委员会会议审议通过的《关于在山西开展能源革命综合改革试点的意见》，提出山西要通过综合改革试点，争当全国能源革命排头兵，并在以下方面努力取得突破：

The "Opinions on Launching a Comprehensive Reform Pilot for the Energy Revolution in Shanxi", which was deliberated and approved by the Central Committee for Comprehensively Deepening Reforms, proposes that Shanxi should strive to become a pioneer in the national energy revolution through comprehensive reform pilots, and make breakthroughs in the following aspects:

- 提高能源供给体系质量效益 Improve the quality and efficiency of the energy supply system
- 构建清洁低碳用能模式 Build a clean and low-carbon energy consumption model
- 推进能源科技创新 Promote energy technology innovation
- 深化能源体制改革 Deepen the reform of the energy system
- 扩大能源对外合作 Expand external cooperation in energy

目前：山西煤炭先进产能占比达到83%，智能化煤矿数量达到268座。Currently, the proportion of advanced production capacity in Shanxi's coal industry has reached 83%, with the number of intelligent coal mines reaching 268.

煤炭产区引领低碳转型——需大力推进能源革命

Coal-producing regions lead the low-carbon transformation - a vigorous push is needed for the energy revolution

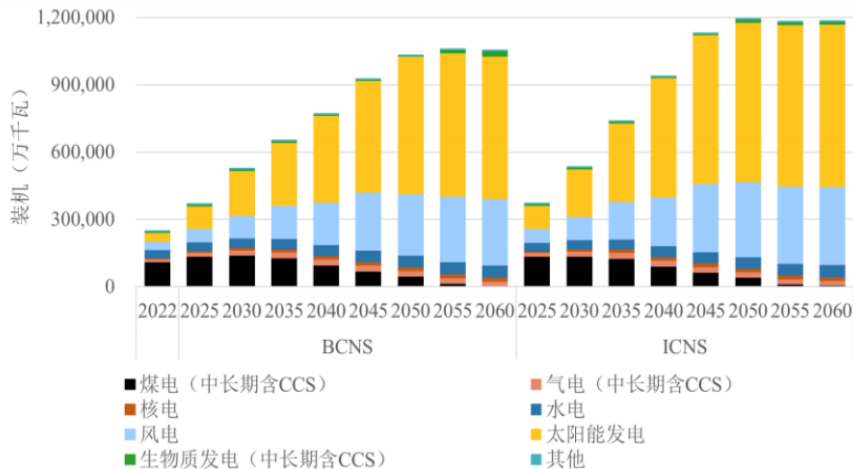
- ◆ 像山西这样的全国性以煤为主的能源基地，未来较长一段时期仍将承担全国煤炭和煤电供应，深入推动能革命，一方面，要大力推动煤炭绿色安全生产，包括大力推进绿色开采技术创新，从源头上减量和减少固废，以及更加广泛应用智能化技术，提升煤矿生产和安全水平，还要续加大煤电灵活性改造，探索新型储能技术与煤电融合，建设新一代灵活、智能、清洁的低碳煤电单元。

Promote green and safe coal production, including innovating green mining technologies, reducing solid waste from the source, and more widely applying intelligent technologies, explore the integration of new energy storage technologies with coal power, and build a new generation of flexible, intelligent, clean, and low-carbon coal power units.

- ◆ 另一方面，要紧跟能源转型技术进步趋势，推动能源新模式新业态发展，打造高端炭材料和碳基合成新材料等新产业，大力推动数智化技术应用，发展虚拟电厂、绿电园区、智能微电网、能源自平衡单元、车网互动等新模式新业态，培育壮大转型新动能。

Keeping up with the technological advancement trend of energy transformation, promote the development of new energy models and business forms, vigorously promote the application of digital and intelligent technologies, develop new models and business forms such as virtual power plants, green power parks, smart microgrids, energy self-balancing units, and vehicle-grid interaction, and cultivate and expand new driving forces for transformation.

2022-2060 年的发电装机和结构





“十五五” 将从 “能源双控” 转到 “碳双控”

Shifting from Energy Consumption Dual Control to Carbon Dual Control

- ◆ During the 15th Five Year Plan period, China will make reducing carbon emission intensity a binding indicator for national economic and social development, implement a comprehensive evaluation and assessment system for carbon peak and carbon neutrality, implement a management system for key energy consuming and carbon emitting units, conduct carbon emission evaluations for investment projects, and establish a product carbon footprint management system and product carbon labeling certification system.
 - ◆ After reaching the peak of carbon emissions, a dual control system for carbon emissions will be implemented, with total emissions control as the main focus and intensity control as a supplement. This will strengthen carbon emission control in various regions, key areas, industries, and enterprises, and promote a steady decrease in total carbon emissions.
 - ◆ “十四五” 期间，中国将把降低碳排放强度作为国民经济和社会发展的**约束性指标**，实施碳达峰、碳中和**综合评价考核制度**，落实重点能耗和碳排放单位**管理制度**，开展投资项目**碳排放评价**，建立产品碳足迹管理体系和产品**碳标签认证制度**。
 - ◆ 在碳排放达到峰值后，将实施碳排放双控体系，以总量控制为主、强度控制为辅。这将加强各地区、重点领域、行业和企业碳排放控制，促进碳排放总量稳步下降。
- 

“十五五” 将从 “能源双控” 转到 “碳双控”

Shifting from Energy Consumption Dual Control to Carbon Dual Control

- ◆ In the early stage of the 15th Five Year Plan, the dual control indicators for carbon emissions will be decomposed to each province.
- ◆ We will establish national and provincial carbon emission annual reporting systems, and each region will prepare carbon emission budgets.
- ◆ Establish an evaluation and assessment index system focusing on total carbon emissions and intensity indicators, incorporating indicators such as energy structure, energy consumption intensity, resource utilization efficiency, ecosystem carbon sinks, and green transformation in key areas.
- ◆ In the 16th Five Year Plan and beyond, each region will establish strict carbon emission control and constraint mechanisms, and implement full process management of carbon emission budgets. In the initial stage of the 15th Five Year Plan, the carbon emission dual control indicators were decomposed to each province.
- ◆ 在“十五”规划初期，碳排放双控指标将分解到各省市。建立国家和省级碳排放年度报告和快快系统。
- ◆ 在“十五”期间，各地区将编制碳排放预算，并根据降低碳排放强度的目标进行动态调整。建立以碳排放总量和强度指标为重点的评价和考核指标体系，纳入能源结构、能源消费强度、资源利用效率、生态系统碳汇、重点领域绿色转型等指标。
- ◆ 在“十六五”及以后，各地区将建立严格的碳排放总量控制约束机制，对五年规划期和年度碳排放预算实施全过程管理。

中国在“十五五”期间将继续大力推动“双碳”和能源转型发展

During the "15th Five-Year Plan" period, China will continue to vigorously promote the "dual carbon" goals and energy transformation development

以下两个重大工程将对西部地区的电力供应格局产生重大影响，也将降低北煤南运和西电东送强度，给煤炭产地转型发展带来新的机遇。The following two major projects will have a significant impact on the power supply pattern in the western region, and will also reduce the intensity of transporting coal from the north to the south and transmitting electricity from the west to the east, presenting new opportunities for the transformation and development of coal-producing areas.



历时15年建设的环塔里木盆地750千伏输变电工程全线贯通。该工程由9项750千伏输变电工程分阶段施工完成，线路总长4197公里，预计整个工程于2025年11月投入运行。

The 750 kV power transmission and transformation project around the Tarim Basin, which has been under construction for 15 years, has been completed and will be put into operation in November 2025. The project consists of nine 750 kV power transmission and transformation projects completed in stages, with a total length of 4,197 kilometers.

China's largest hydropower project starts construction in Xizang (Tibet)

Sketch Map of Medog Hydropower Plant

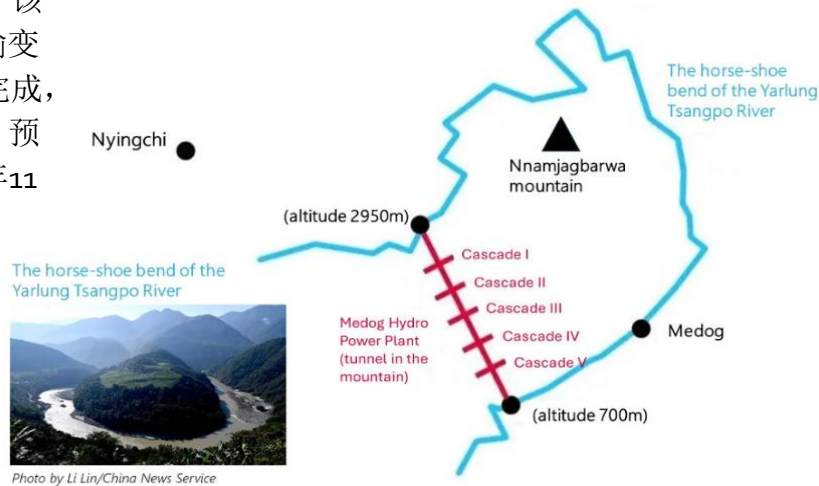


Photo by Li Lin/China News Service

Source: Remade from Geographical Window's graph posted, July 2025

用新能源新技术新模式服务产业园区

Serve industrial parks with new energy, new technologies, and new models

发改、工信、能源关于开展零碳 园区建设的通知（2025年6月30日）

附件：

- [1.零碳园区建设基本条件.pdf](#)
- [2.国家级零碳园区申报书大纲.pdf](#)
- [3.国家级零碳园区建设指标体系（试行）.pdf](#)
- [4.零碳园区碳排放核算方法（试行）.pdf](#)

主要任务：

- 1.加快园区用能结构转型。**
- 2.大力推进园区节能降碳。**
- 3.调整优化园区产业结构。**
- 4.强化园区资源节约集约。**
- 5.完善升级园区基础设施。**
- 6.加强先进适用技术应用。**
- 7.提升园区能碳管理能力。**
- 8.支持园区加强改革创新。**



对大力推进能源转型与零碳零废城市建设的一点建议

Some suggestions on urban energy transformation and the construction of zero-carbon and zero-waste cities

- ◆ 以零碳园区、零碳区镇、光储直柔建筑等新型零碳模式为契机，推动绿电直连、电热氢耦合、低碳零碳交通替代燃料、电力系统新型经营主体等新模式、新业态，深化城市能源革命。Taking advantage of new zero-carbon models such as zero-carbon parks, zero-carbon districts and towns, and flexible photovoltaic and energy storage buildings, we will promote new models and business forms such as direct connection of green electricity, coupling of electricity, heat, and hydrogen, low-carbon and zero-carbon transportation alternative fuels, and new types of operators in the electricity system, deepening the urban energy revolution.
- ◆ 因地制宜并面向新型电力系统未来，推动城市配电网扩容，提高对分布式能源的接纳能力，提高对新型调节资源的接纳和调度能力，增强电力系统韧性和对城市绿色低碳发展的支撑能力。Adapting to local conditions and aiming at the future of new power systems, we should promote the expansion of urban distribution networks, enhance the acceptance capacity for distributed energy sources, improve the acceptance and scheduling capabilities for new regulating resources, and strengthen the resilience of power systems and their support for urban green and low-carbon development.
- ◆ 大力推进城市能源领域新型废弃物循环利用，强化回收利用政策设计，扩大覆盖面，强化技术创新，明确主体责任，加大资金投入，建立市场化长效机制。We should vigorously promote the circular utilization of new types of waste in the urban energy sector, strengthen the design of recycling policies, expand coverage, enhance technological innovation, clarify main responsibilities, increase capital investment, and establish a long-term market-oriented mechanism.



谢谢

THANK YOU FOR YOUR ATTENTION