

中国新能源参与电力市场和绿证制度的探索

Exploration of China's New Energy Electricity Markets and Green Certification

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中国新能源发展的新形势

New situation of China's new energy development



中国新能源参与电力市场的几点观察

Observations on the participation of new energy in electricity market



中国绿证制度的最新要求

New requirements for Green Certification



中国新能源发展的新形势

New situation of China's new energy development

(一) 新能源开发利用规模稳居世界首位



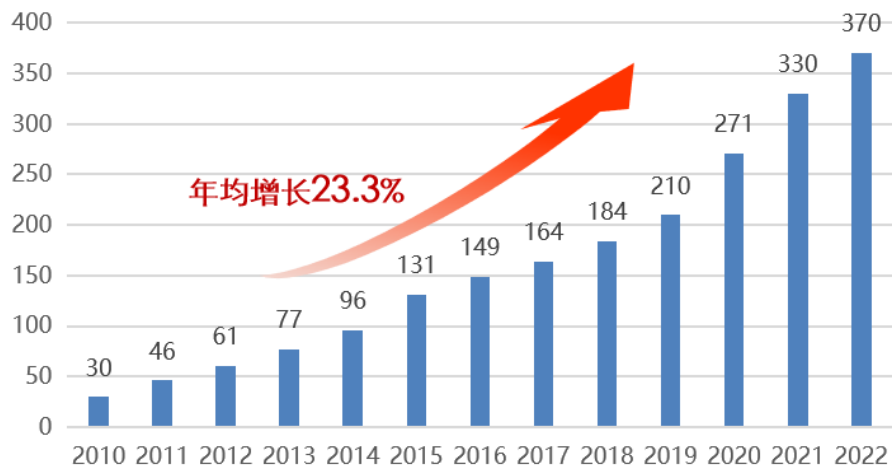
Largest scale of new energy development and utilization in the world

在标杆电价和保障性收购制度的支持下，新能源实现高速发展，并网装机规模持续增长。

Benchmark tariffs and guaranteed purchase system promote development of new energy and growing grid-connected installed capacity

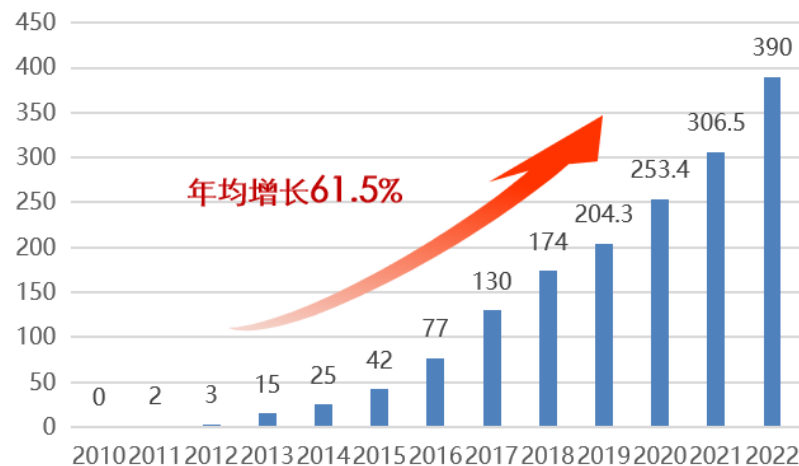
Installed wind power capacity(GW)

风电装机容量 (GW)



Installed solar capacity(GW)

太阳能装机容量 (GW)



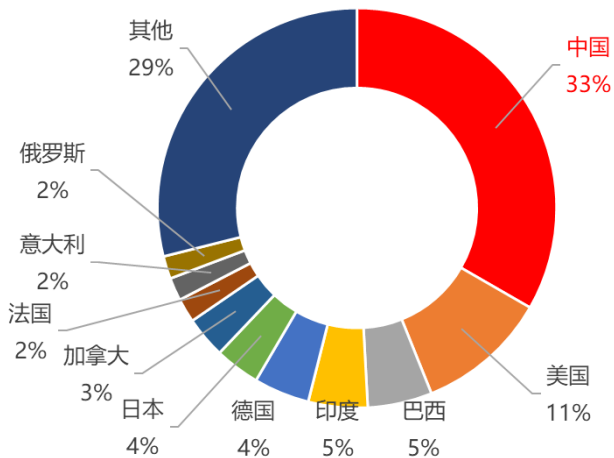
(二) 新能源装机占比逐步增长



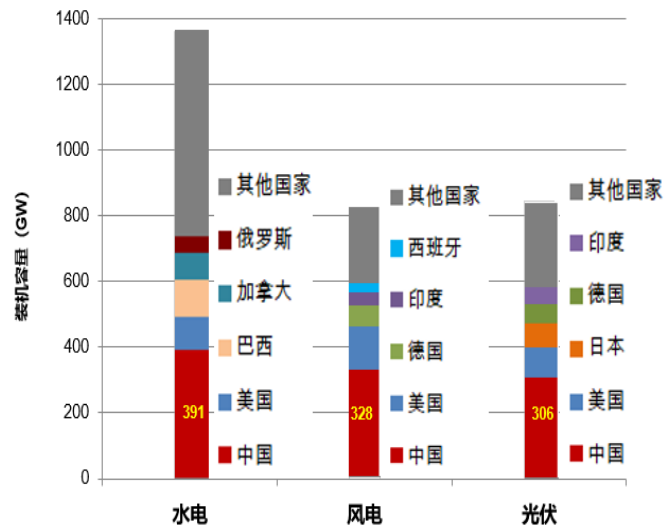
Increasing proportion of new energy installed capacity

截至2021年底，我国可再生能源发电装机和风电装机、光伏装机三者均占全球装机的1/3以上，分别为33%、40%和36%，水电装机容量占全球总装机29%。

By the end of 2021, China's installed capacity of renewables, wind power, and solar power all accounted for more than 1/3 of the global installed capacity. Hydroelectricity installed capacity accounted for 29% of the global total



2021年全球主要国家可再生能源装机占比情况



截至2021年底全球水风光发电装机构成

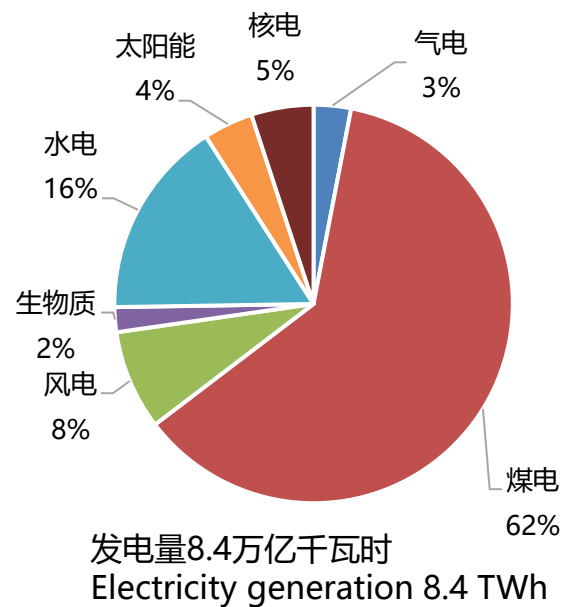
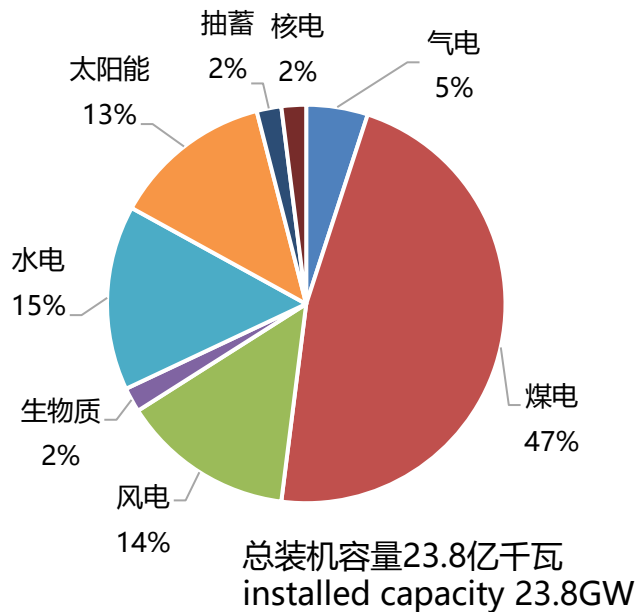
(三) 新能源加快助力能源生产消费端绿色低碳转型



New energy accelerates green and low-carbon transition

截至2021年底，我国新能源装机规模达6.34亿千瓦，占比达到27%；新能源发电量约11422亿千瓦时，基本相当于全国居民生活用电量，占全社会用电量的比重达到13.7%。

By the end of 2021, China's new energy installed capacity reached 634 GW, accounting for 27%; new energy power generation is about 1.1422 TWh, accounting for 13.7% of the total consumption.



(四) 新能源行业治理体系不断健全



Improved governance system of the new energy industry

我国已形成以《可再生能源法》为基础、日益完善的可再生能源政策支持和监管体系。

A renewable energy policy supporting and regulatory system is formed based on *the Renewable Energy Law*

法律法规 Laws and Regulations

《可再生能源法》

战略规划 Strategic plan

可再生能源发展规划、风能、太阳能、生物质规划

产业政策 Industry Policy

电价政策、建设管理政策、消纳保障政策

标准体系 Standardized system

设备、资源、开发建设、并网运行

监督管理 Supervision

产业监测、事中事后监管



(五) 新能源消纳仍面临一定的不确定性



New energy consumption still faces uncertainties

新能源快速发展，系统调节能力提升面临诸多制约，灵活性调节资源发展亟待加快。

With the rapid development of new energy, the enhancement of system regulation capacity faces many constraints, and the development of flexible regulation resources needs to be accelerated.

- 新能源出力具有间歇性、随机性、波动性等特点，大比例新能源并网对系统灵活性提出更高要求

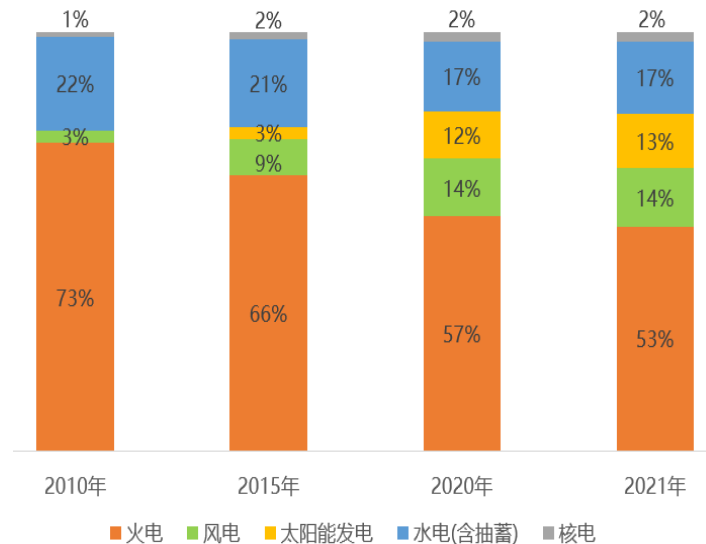
A large proportion of new energy connected to the grid puts forward higher requirements for system flexibility.

- 全国新能源利用率总体保持较高水平，但消纳基础尚不牢固，局部地区、局部时段弃风弃光问题依然突出

Foundation of consumption is not yet solid, and the problem of curtailment is still prominent.

- 未来，新能源大规模高比例发展对系统调节能力提出更高需求，但调节性资源建设面临诸多约束，区域性新能源高效消纳风险增大，制约新能源高效利用

- Construction of regulating resources faces many constraints, and the risk of efficient regional consumption of new energy has increased.



我国发电装机结构

Power Mix in China

二 中国新能源参与电力市场的几点观察
Observations on the participation of new
energy in electricity market

(一) 我国电力市场交易基本类型



Main types of electricity market transactions

优先发电、购电交易 Generation priority and power purchase

- **优先购电**指按照政府定价优先购买电力电量，并获得优先用电保障 priority in purchase at government price
- **优先发电**指按照政府定价或同等优先原则，优先出售电力电量 priority in saling at government price

中长期电能交易 Mid-and-long term power trade

- **省间市场交易**，指跨越省级电网的交易 Interprovincial market transactions
- **省内市场交易**，指电力用户、售电公司与发电企业通过交易平台开展的交易 Intra-provincial market transactions

合同转让交易 Contract transaction

- 指各类电量交易合同的转让交易
- **目前主要形式**：发电权交易，包括：火火、水火、新能源与常规电厂之间的合同替代交易，公用电厂与自备电厂的替代交易、省间替代交易等。主要包括合同转让、回购、置换交易

辅助服务交易 Ancillary services

- **区域省间辅助服务市场**方面，相继制定了区域省间辅助服务市场运营规则 Rules have been formulated for inter-provincial markets
- **省内辅助服务市场**方面，大部分省份均出台了辅助服务市场运营规则 most provinces introduced rules

现货市场交易 Spot market

- 根据发改委、能源局批复，开展省间电力中长期和现货交易
- **8个现货试点已全部实现长周期结算试运行**，其中山西、甘肃、广东、蒙西、福建已开展长周期不间断结算试运行 All 8 pilot spot markets have realized the trial run of long-cycle settlement

(二) 国内新能源参与省级现货市场的方式



Modalities for new energy in provincial spot markets

随着新能源的快速发展，各省域电力市场，特别是试点电力现货市场地区，对新能源参与市场的交易机制进行了初步探索。Pilot spot market have conducted preliminary exploration of the trading mechanism for new energy participation in the market.

		类型	山西	山东	广东	甘肃	蒙西
新能源 装机	风电	装机 (万千瓦)	2123	1942	1195	1725	2034
		占比 (%)	18.7	11.2	7.6	28.0	25.8
	太阳能 发电	装机 (万千瓦)	1458	3343	1020	1146	1065
		占比 (%)	12.9	19.3	6.4	18.6	13.5
	合计	装机 (万千瓦)	3581	5285	2215	2871	3099
		占比 (%)	31.6	30.5	14.0	46.7	39.2
新能源 发电	风电	发电量 (亿千瓦时)	469	409	137	288	518
		占比 (%)	12.2	6.6	2.2	14.9	16.7
	太阳能 发电	发电量 (亿千瓦时)	189	310	103	150	153
		占比 (%)	4.9	5.0	1.7	7.8	4.9
	合计	发电量 (亿千瓦时)	658	719	240	438	671
		占比 (%)	17.1	11.6	3.9	22.7	21.6

部分试点电力现货市场建设地区新能源
装机规模超过**30%**，发电量超过**15%**。

In some pilot spot markets, new energy accounts
for over **30%** of installed capacity and over **15%**
of power generation.

(二) 国内新能源参与省级现货市场的方式

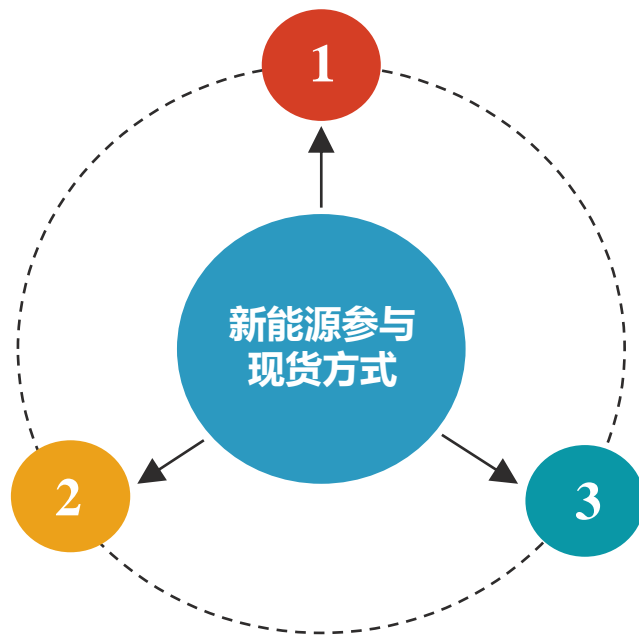


Modalities for new energy in provincial spot markets

报量不报价: 申报电量优先出清, 作为价格接受者按照现货价格结算。

Declared quantity not quoted: declared quantity of electricity is prioritized for clearing, as the price taker settles according to the spot price.

代表地区: 江苏、河南



报量报价: 与常规电源同台竞价, 按照现货价格结算电量

Quotation offer: bidding on the same platform with conventional power supply, settlement of power according to the spot price

代表地区: 山西、甘肃、蒙西、广东、山东

完全不参与: 作为市场边界条件, 按照核定价格结算

Complete non-participation: as a market boundary condition, settled at the approved price

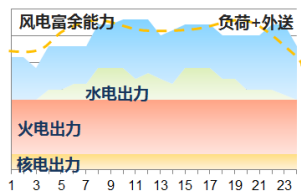
代表地区: 上海、浙江

(三) 国内新能源参与跨省跨区市场的方式

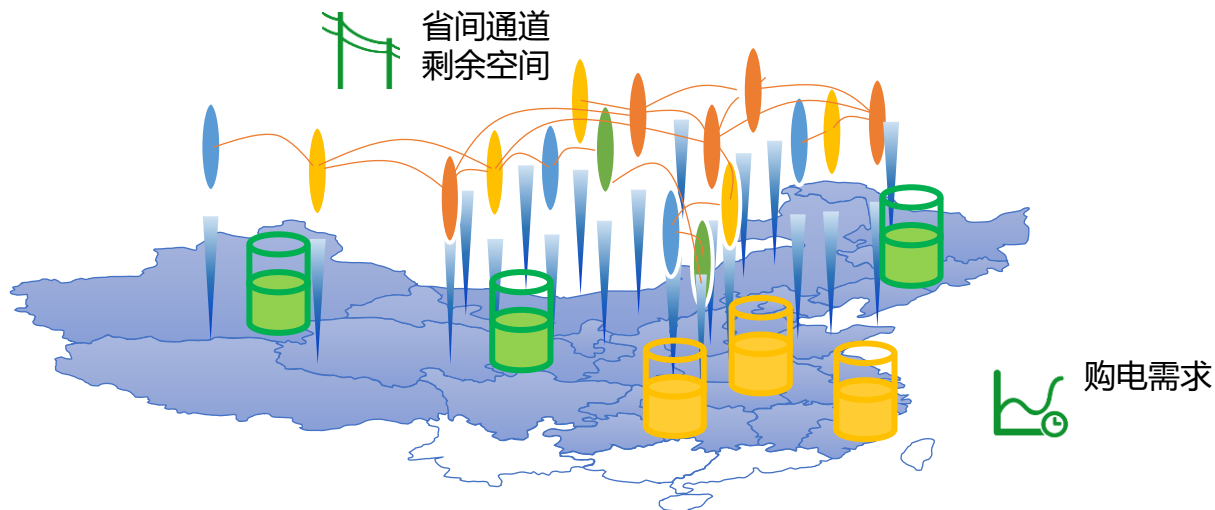


Modalities for new energy in inter-provincial and inter-regional markets

- 中长期市场：包括新能源外送交易、新能源与大用户直接交易、新能源与常规能源省间发电权交易三种形式
Medium- and long-term market: including new energy export, direct transactions between generator and large users, and inter-provincial power generation rights transactions between new and conventional energy sources.
- 现货市场：2017年启动跨区域省间富余可再生能源现货市场，2021年《省间电力现货交易规则》出台
Spot market: cross-regional inter-provincial surplus renewable energy spot market is launched in 2017, Inter-provincial Spot Trading Rules approved in 2021



省内富余发电能力



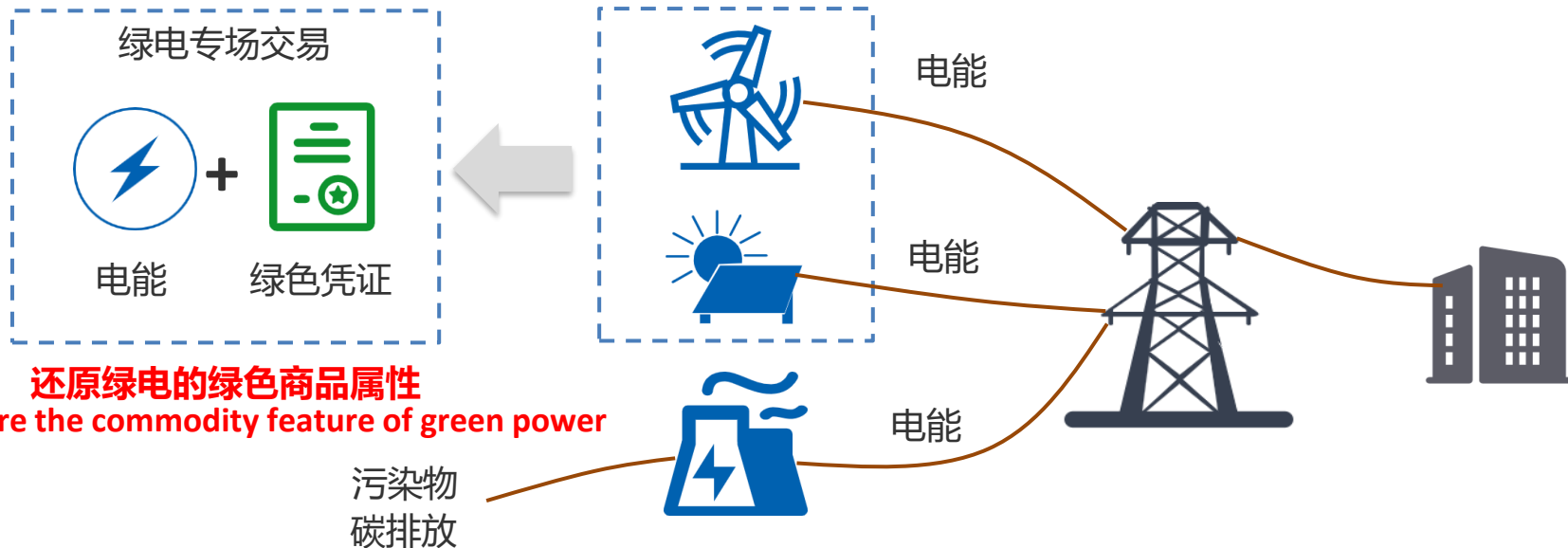
(四) 国内新能源参与绿电市场的方式



Modalities for new energy participating in green power market

通过开展新能源专场中长期交易，实现新能源电能与绿色凭证的“电证合一”。

With new energy specialized medium- and long-term transactions, the “unification of electricity certificates” for new energy power and green certificates was realized.



(五) 新能源参与电力市场的意义



Significance of renewable energy participation in power market

新能源参与电力市场是能源电力行业发展的必然趋势，是建设全国统一电力市场体系的重要任务。
New energy participation in power market is an inevitable trend in the development of energy and power industry, and is an important task in construction of a unified national power market system.

1 建设新型电力系统的必然要求

Inevitable requirements for building new power systems

- 新能源将逐步成为我国电力系统的主体电源。New energy will gradually become main power source of China's power system.
- 为发挥市场资源配置作用，必须建设适应新型电力系统的电力市场体系。Build a power market system adapted to the new power system, in order to play a role of market resource allocation.

2 促进多能互补、推动供应侧和需求侧资源协同互动的关键举措

Promote multi-energy complementarity and synergistic interaction between supply-side and demand-side resources

- 推动多种能源同台竞价，形成反映系统供需和运行成本的价格信号。Promote multiple energy sources to compete on the same platform, forming price signals that reflect system supply and demand and operating costs.
- 发挥新能源低发电成本、传统电源强调节能力优势，挖掘需求侧响应潜力。Utilize advantages of renewable energy sources in terms of low power generation costs, and strong regulation capability of traditional power sources to tap potential of demand-side response.

1

新能源出力特性导致难以获得较高收益

Difficulty in obtaining higher returns due to renewable energy output characteristics

- **新能源发电同时率高，与负荷匹配性差，很难在现货市场中卖出高价。** Renewable energy power generation has a high simultaneous rate and poor match with load, which makes it difficult to sell at a high price in spot market.
- **新能源成交均价低于传统电源成交均价和燃煤上网基准价。** Average price of renewable energy transactions is lower than that of traditional power supply transactions and benchmark price of coal-fired feed-in tariffs.

2

当前市场机制设计和新能源保障机制需要进一步完善

Current market mechanism design and renewable energy security mechanism are not perfected.

- 虽然，各地中长期、现货和辅助服务市场衔接的市场体系已经基本建立，但是仍存在中长期市场和现货市场价格机制不衔接、中长期市场中主体交易灵活性不足、辅助服务成本较多依靠新能源企业分摊、跨省跨区交易存在壁垒限制等问题，使得新能源企业面临更多的市场交易风险。 Medium and long-term market and spot market price mechanism does not converge, the main body of the medium and long-term market trading flexibility is insufficient, auxiliary service costs rely more on new energy enterprises to share the cost of cross-provincial and cross-region transactions, there are barriers and restrictions and other issues, so that the new energy enterprises are faced with more risks of market transactions.

(一) 完善电力市场机制

Improvement of power market mechanism

1

- 推动中长期和现货市场衔接，逐步放开对中长期交易电量的比例限制。

Promote convergence of medium and long-term and spot markets, gradually liberalize the restrictions on proportion of power traded in medium- and long-term.

2

- 完善辅助服务费用在用户侧的分摊机制。

Improve mechanism for sharing auxiliary service costs on user side.

3

- 打破省间壁垒，鼓励新能源企业在更大的交易平台和市场范围内开展市场化交易。

Breaking down inter-provincial barriers and allowing renewable energy enterprises to carry out market-oriented transactions within the scope of a larger trading platform and market.

(二) 推动碳市场、绿证市场、电力市场衔接

Promote convergence of carbon, green certificate and electricity market

1

● 从碳市场、绿证市场、电力市场衔接协同上做好顶层设计。

Top-level design in terms of linking and synergizing carbon market, green certificate market and power market.

2

● 打通碳市场、绿证市场、电力市场间政策的衔接赌点，通过市场机制引导新能源行业或整个能源行业高质量发展。

Open up betting points of policy convergence among carbon market, green certificate market and power market, and to guide the high-quality development of the new energy industry or the energy industry as a whole through the market mechanism.

(三) 引导企业或个人绿电消费

Guiding businesses or individuals to green power consumption

1

- 鼓励用户增加绿电消费、减少高碳电消费。

Encourage users to increase green electricity consumption and reduce high-carbon electricity consumption.

2

- 推动能耗双控向碳排放双控转变，建立碳配额分摊和碳市场交易机制，提高高碳电源的生产交易成本，提升可再生能源市场竞争力。

Promote shift from dual control of energy consumption to dual control of carbon emissions, establish carbon quota sharing and carbon market trading mechanisms, increase the production and trading costs of high-carbon power sources, and enhance the competitiveness of renewable energy markets.

 我国绿证制度的最新要求
New requirements for Green
Certification

(一) 绿证的必要性

Necessity of green certification



“绿证”是指**可再生能源绿色电力证书**，是可再生能源绿色电力的**“电子身份证”**。
The "green certificate" refers to the renewable energy green power certificate, which is the **"electronic ID card"** of renewable power.

1 个绿证单位 = 1000 千瓦时
可再生 能源 电量



绿证的必要性

- 完善支持绿色发展政策的创新举措
Innovations to improve policies supporting green development
- 认定可再生能源电量环境价值的唯一证明
The only proof of the environmental value of renewable energy electricity
- 认定可再生能源电力生产、消费的唯一凭证
The only certificate to recognize the renewable power production and consumption
- 促进绿电消费、保障绿电消纳的有力抓手
A strong measure to promote and guarantee green power consumption

(二) 绿证的特点

Characteristics of green certification



- 国家能源局负责绿证相关管理工作，提升绿证的**权威性**。
The NEA manages green certificates to enhance the **authority**



- 绿证是可再生能源电量环境属性的**唯一证明**，是认定可再生能源电力生产、消费的**唯一凭证**。Green certificates are **the only proof** of the environmental attributes of renewable power, also **the only credentials** for the production and consumption

- 明确绿证支撑绿电交易、认定绿电消费、核算可再生能源电力消费量等**基础性作用**。Clarify **the fundamental role of green certificates** in supporting green power trading and consumption .

(三) 规范绿证核发

Standardized Green Certificate issuing



绿证核发单位

Green certificate issuing authority

- 国家能源局

National Energy Administration

绿证核发依据

Criteria for issuing green certificates

以电网企业、电力交易机构提供的数据为**基础**，与发电企业或项目业主提供数据相**核对**。

Based on data provided by the grid company and electricity trading institutions, cross-referenced with data provided by power generation companies or project owners.

绿证核发对象

(Recipient of green certificates)

- 对全国已建档立卡的可再生能源发电项目所生产的**全部电量核发绿证**，实现绿证核发**全覆盖**。
- Issuing green certificates for all electricity generated by nationally registered renewable energy power generation projects, achieving comprehensive green certificate issuance **coverage**.



风电

wind power

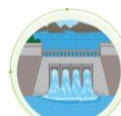
集中式风电
(含海上风电)、
分散式风电



太阳能

发电solar

集中式太阳能发电
(含光热发电)、
分布式光伏发电



常规水电

hydroelectric

仅包含2023年1月1日
(含)以后新投产的完全
市场化常规水电项目



生物质

发电

biomass



地热能

发电

geothermal
power



海洋能发电

ocean

energy
generation

(四) 完善绿证交易

Improved Green Certification Trading



交易平台 Platforms

- 中国绿色电力证书交易平台
- 北京电力交易中心
- 广州电力交易中心

交易方式 Methods

- 绿证交易采取**双边协商、挂牌、集中竞价**等方式进行。
- bilateral negotiation, listing, centralized bidding, etc



交易次数 Times

- 现阶段可交易绿证仅可交易**一次**。
- Tradable green certificates can only be traded **once**.

交易收益 Benefits

不享受财政补贴的项目，收益归发电企业或项目业主所有；

享受财政补贴的项目，收益按相关规定执行。

Different policies for different generators with or without financial subsidies

(五) 扩展应用场景

Expanded utilizing scenario



01

支撑绿色电力交易 support green power trading

绿证由核发机构批量推送至电力交易机构，按约定将**绿证随绿色电力一同交易**。Green certificates are transferred from the issuing authority to the electricity trading institutions and **traded with green electricity**

02

核算可再生能源消费 calculate renewable energy consumption

国家统计局会同国家能源局核定全国和各地区**可再生能源电力消费数据**。The National Bureau of Statistics, along with the NEA, verifies the national and regional data on **renewable power consumption**.

03

认证绿色电力消费 certify green power consumption

通过两年内的绿证开展**绿电消费认证**。Conduct green **electricity consumption certification** through green certificates within two years.

04

衔接碳市场 connect carbon markets

推进绿证与**碳排放权交易、温室气体自愿减排交易**的衔接机制。Advance the linkage mechanism between green certificates carbon emissions trading, and CCER.

05

推动绿证国际互认 promote international recognition

积极推动国际组织的**绿色消费、碳减排体系与国内绿证衔接**。Actively promote the **integration of international systems of green consumption and carbon reduction with domestic green certification**.

THANKS



70th Anniversary
电力规划设计总院成立70周年
1952-2022