TransitionAsia
ACCELERATING ASIAN CORPORATE CLIMATE ACTION

# HOW STEEL COMPANY CAN ACCESS GREEN ELECTRICITY AS RENEWABLE ENERGY ENTERS THE MARKET

May 2026

## SUMMARY


- Against the backdrop of evolving policy frameworks, steel companies are advised to adopt a diversified approach to accessing green electricity, tailoring options to their specific needs and available electricity supplies. Early planning is key to increasing green electricity use while improving the cost efficiency.

- There are three main pathways for steel companies to access green electricity: 1) On-site distributed renewable energy projects (primarily rooftop solar PV) provide direct access to green power and certificates, but are limited in scale and can only meet a small share of total electricity demand. 2) electricity market participation, including green power trading, green certificate purchases, and intra-provincial trading, offers flexibility but involves complex rules and price volatility, requiring a mix of long-term and spot strategies; 3) direct green power connections enable stable pricing and physical traceability, but require high upfront investment and further policy development, making them more suitable for export-oriented and carbon-compliant companies.

- Green electricity certificates help companies meet renewable electricity consumption targets set by the government and serve as a key accounting tool for renewable energy use. However, they may not be internationally recognised, posing a risk for export-oriented companies. As renewable energy becomes more fully integrated into the power market, a portion of the electricity generated may be traded in the conventional electricity market, reducing certificate availability and potentially driving up costs.


According to an article released by Transition Asia in January, "How Low-Carbon Steel Development Accelerates Energy-Sector Decarbonisation in China", the steel industry can effectively consume large-amounts of green electricity by adopting the "green hydrogen-direct reduced iron-electric arc furnace" process route. Building on this, this article further explores the current national policies related to green electricity and, taking Jiangsu as an example, outlines pathways for steel companies to access green electricity and their applicable scenarios.

China has accelerated electricity market reform through a series of evolving policy measures. In early 2025, the National Development and Reform Commission and the National Energy Administration introduced a new pricing system for renewable energy under the "Notice on Deepening the Market-Oriented Reform of On-Grid Tariffs for Renewable Energy and Promoting its High-Quality Development" (referred below as Document No. 136), and launched direct renewable connection pilots in the same year.[1][2]

1 https://www.gov.cn/zhengce/zhengceku/202502/content_7002959.htm
2 https://www.ndrc.gov.cn/xxgk/zcfb/tz/202505/t20250530_1398138.html

In February 2026, the General Office of the State Council set a clear goal of establishing a unified power market by 2030.[3]

Against the backdrop of evolving policy frameworks, steel companies can adopt the most cost-effective way to access green electricity while increasing its share in their energy mix.

Currently, the main pathways include self-owned renewable generation (more commonly distributed solar PV), participation in provincial or inter-provincial electricity market trading, more recently, direct renewable connections. However, before the unified national market is fully established, the current electricity market continues to exhibit strong provincial characteristics. Differences in local policies and power supply structures mean that companies must identify the most suitable approach based on their specific operating environment.

## PATHWAY 1: SELF-OWNED DISTRIBUTED RENEWABLE ENERGY—DIRECT AND EFFECTIVE, BUT LIMITED IN SCALE

It is common for steel companies to build rooftop solar PV projects at their production facilities. The largest rooftop solar PV project is the 148MW solar PV project cluster built by Baosteel in its Baoshan production base. In addition, HBIS, Jiangsu Shagang Group, Shanxi Taigang Stainless Steel, Zenith Steel Group, and Ansteel Group have all installed distributed solar PV ranging from 15.8MW to 72.5MW. [4]

These rooftop solar PV projects are usually classified as large-scale industrial and commercial distributed solar PV. In addition to providing direct access to green electricity, these projects can generate additional revenue by selling surplus power back to the grid, subject to specific policy conditions.

Issued in January 2025, the "Measures for the Administration of Development and Construction of Distributed PV Power Generation" stipulate that large-scale industrial and commercial solar PV projects may sell surplus electricity back to the grid and earn additional revenue but only in regions where electricity spot markets are continuously operational. At the implementation level, however, detailed rules vary across provinces.

For example, in Jiangsu, the electricity spot market entered continuous settlement trial operation in September 2025. Companies opting for this model are required to register rooftop PV projects as centralised power plants. As the volume of electricity exported by distributed generation remains relatively unstable and difficult to forecast on a monthly basis, Jiangsu is expected to continue relying primarily on monthly and intra-month trading for such projects in 2026. Notably, there is no cap on the self-consumption ratio.

In contrast, in other regions, such as Shandong, large-scale industrial and commercial distributed PV projects adopting a "self-consumption with surplus exported to the

3 http://www.scio.gov.cn/zdgz/jj/202602/t20260212_952499.html
4 https://www.greenpeace.org.cn/wp-content/uploads/2025/11/green-power-consumption-in-china-steel-industry-report-2025.pdf

grid" model are subject to a 50% cap on the self-consumption ratio, and all exported electricity must participate in the electricity spot market.[5]

*Table 1. National and Jiangsu Policies on Distributed Solar PV Self-Consumption, with Surplus Electricity Fed into the Grid*

| Announcement Date | Jurisdiction | Policy | Relevant content |
|---|---|---|---|
| **Jan 2025** | National | Measures for the Administration of Development and Construction of Distributed Photovoltaic Power Generation | Definition of large-scale industry and commercial solar PV and options for connecting to the grid |
| **Apr 2025** | Jiangsu | Implementation Opinions on the Distributed PV Development and Construction Management Measures (Draft for Consultation) | For large-scale industrial and commercial PV projects that require self-consumption with surplus electricity fed into the grid, this grid-connection model can be adopted; however, the project must be registered as a centralised solar PV power station. |
| **Dec 2025** | Jiangsu | Notice on Electricity Market Trading Arrangements for 2026 | Self-consumption projects (distributed solar PV / decentralised wind power) mainly participate in monthly and intra-month electricity trading. |

Document No. 136 not only ensures that projects can meet their own green electricity needs, but also establishes a revenue floor for surplus power exported to the grid through an off-site settlement mechanism (the "mechanism price") similar to a contract-for-difference (CfD) mechanism for renewable energy. When market prices fall below this level, generators are compensated for the shortfall; where they exceed it, the surplus is clawed back. This two-way adjustment mechanism provides greater revenue certainty and effectively guarantees a minimum return for power producers.

At the regional level, detailed implementation rules of Document No.136 have also been introduced. In Jiangsu, price caps and floors have been applied to electricity traded in the spot market to mitigate excessive price volatility. Under these rules, spot market offer and clearing prices are capped at RMB 1.5/kWh and floored at RMB 0/kWh.This framework is particularly relevant for projects operating under a self-consumption with surplus export model. Surplus generation typically occurs during periods of high renewable output, when market prices tend to fall sharply and occasionally even turning negative, as observed in Shandong. By setting a price floor, the mechanism limits downside risk and protects generators from revenue erosion caused by supply-demand imbalances in the power market.

5 Detailed Implementation Rules for the Administration of Distributed Photovoltaic Power Generation Development and Construction in Shandong Province

*Table 2. National and Jiangsu Policies on the Full Market Integration of Renewable Energy*

| Announcement Date | Jurisdiction | Policy | Relevant content |
|---|---|---|---|
| **Feb 2025** | National | "Notice on Deepening Market-Based Reform of New Energy On-Grid Tariffs and Promoting High-Quality Development of New Energy NDRC Price [2025] No. 136" | New energy projects (wind and solar power, same below) should, in principle, have all their grid-connected electricity traded in the power market, with a price settlement mechanism established to support the sustainable development of new energy. |
| **Oct 2025** | Jiangsu | "Implementation Plan for Deepening Market-Based Reform of New Energy On-Grid Tariffs and Promoting High-Quality Development of New Energy" | For the spot market, the offer and clearing price cap is provisionally set at RMB 1.5/kWh, while the offer and clearing price floor is provisionally set at RMB 0/kWh. |

Self-owned distributed PV systems provide an effective way for steel companies to directly access green electricity and green electricity certificates (GECs). As China's electricity market continues to evolve, some projects can generate additional revenue by exporting surplus power to the grid. However, due to site constraints, self-owned distributed PV can only meet a very small share of companies' renewable electricity demand. For example, the rooftop PV project at Baosteel's Baoshan base generates up to 100 million kWh annually, yet accounts for only around 1% of the site's total electricity consumption. This low contribution is also observed among smaller steel producers. At one steel plant in Shaanxi, a PV installation with a capacity of 11.17 MW similarly supplies less than 1% of total electricity demand.[6] From the perspective of economies of scale and overall system efficiency, this decentralised, self-generation model is not the most efficient allocation of resources. As the supply of renewable electricity in China continues to expand rapidly, its efficient integration will increasingly depend on optimisation through a unified national power market.

## PATHWAY 2: PARTICIPATION IN POWER MARKET TRADING—THE MAINSTREAM APPROACH, WITH RELATIVELY COMPLEX RULES REQUIRING ADVANCE PLANNING

Participating in green electricity trading or purchasing GECs separately are common approaches for steel companies to meet their renewable energy needs. Green electricity trading follows a "bundled" model, in which electricity and its associated environmental attributes (i.e. the value of GECs) are priced separately, but the GECs are transferred together to the buyer upon completion of the transaction. By contrast, GECs trading involves the standalone purchase of certificates, independent of physical electricity consumption. Green power trading is also typically conducted through medium- to long-

6 Green Steel Partner (2025), Case Studies of Low-Carbon Transition Practices by Chinese Steel Companies

term contracts, with trading horizons ranging from multi-year and annual agreements to monthly and intra-month arrangements. Transactions may be concluded through bilateral negotiations, centralised bidding, or listing mechanisms.

The conventional electricity market remains the primary platform for power trading, covering a wide range of generation sources, including thermal, nuclear, wind and solar. It encompasses both medium- to long-term transactions and spot market trading, with transactions conducted through bilateral negotiation, centralised bidding, or listing mechanisms. When purchasing electricity through bilateral contracts or listing mechanisms, buyers can specify the type of generation source (e.g. wind or solar). However, due to the fungibility of electricity, once power is fed into the grid, it is not possible for end-users to distinguish the actual source of the electricity they consume except in specific cases such as direct supply or self-generated power onsite. In other words, even without participating in green power trading, electricity users may still consume a share of renewable electricity. However, as this portion of electricity is not traceable, its environmental attributes cannot be clearly assigned. Nor are green certificates transferred alongside such transactions, meaning it cannot be counted towards renewable electricity consumption compliance. The same applies to inter-provincial electricity trading.

***Table 3. Jiangsu Electricity Market Trading Mechanisms and Green Power Analysis***

| Conventional Electricity Trading | Time Horizon | Trading Method | Does it include wind and solar power? | Traceability of electricity by generation source | Green certificate eligibility |
|---|---|---|---|---|---|
| Medium- to long-term trading | Annual | Bilateral negotiation | ○ | ○ | x |
| | | Centralised bidding | ○ | x | x |
| | | Listing | ○ | ○ | x |
| | Monthly/ Intra-month | Competitive bidding, etc. | ○ | x | x |
| | Day-ahead and longer | Continuous listing mechanism | ○ | ○ | x |
| Spot trading | Day-ahead/ Intraday | Centralised Bidding | ○ | x | x |
| Green Electricity Trading | (Multiple) Year/Month (Intra - month) | Bilateral negotiation/ Centralised bidding/ Listing | ○ | ○ | ○ |

Interprovincial trading is particularly important for regions with limited renewable energy resources but strong electricity demand, with Jiangsu being a case in point. In 2023, annual electricity consumption by the province's steel sector reached 49.1 billion kWh, accounting for 9.1% of total industrial electricity consumption and 6.2% of overall electricity demand.[7]

However, the volume of green electricity traded in Jiangsu in 2025 is estimated at only around 22 kWh, making up less than half of the steel sector's annual consumption, and

7 https://mp.weixin.qq.com/s/IHJ_d9Wd_wVY0L3cjIYqyg

this supply must also meet demand from other industries. Looking ahead, as Jiangsu advances industrial electrification and decarbonisation, local green electricity supply is unlikely to keep pace with demand, making cross-provincial procurement indispensable.

To address this gap, Jiangsu has already established several regular interprovincial transmission channels, including ultra-high voltage (UHV) lines such as Yanhuai and Xitai, which deliver renewable electricity from eight provinces and regions, including Qinghai and Xinjiang. In addition, the province plans to expand its imported power capacity to 46 GW by 2027, enable the integration of 130 GW of renewable energy, and secure around 40 billion kWh of green electricity supply through trading.[8]

For companies, participation in interprovincial electricity trading requires close attention to market platform announcements, in particular the application timelines, and proactive engagement with generators in other provinces for bilateral power purchase agreements.

Taking Jiangsu as an example, the power exchange began collecting intentions for multi-year green electricity trading for 2026 as early as October 2025. Monthly trading is typically organised around half a month in advance, with bidding notices for specific transmission corridors issued by the Beijing Power Exchange.

Interprovincial trading also follows a clear order of priority: annual (including multi-year) transactions take precedence over monthly (including multi-month) transactions, which in turn take precedence over intra-month trades. More broadly, medium- to long-term contracts are prioritised over interprovincial spot trading. Lower-priority transactions are only opened once capacity remains after higher-priority trades have been allocated.[9] As a result, most interprovincial trading volumes are secured through medium- to long-term contracts. For steel companies seeking to procure electricity from other provinces, it is therefore essential to plan ahead based on annual and monthly demand, engage early with external power generators, to lock in stable green electricity supply in advance.

***Table 4. Overview of Interprovincial Electricity Trading Mechanisms and Analysis of Green Power Sources***

| Interprovincial Trading | Time Horizon | Trading Method | Does it include wind and solar power? | Traceability of electricity by generation source | Green certificate eligibility |
|---|---|---|---|---|---|
| Conventional interprovincial | Annual /Monthly | Bilateral negotiation/ Listing | ○ | ○ | x |
| | | Centralised bidding / continuous matching | ○ | x | x |
| | Day-ahead/ Intraday | Centralised Bidding | ○ | x | x |
| Interprovincial Green electricity | Multiple Year | Bilateralnegotiation | ○ | ○ | ○ |
| | Annual /Monthly/ Intra-month | Centralised Bidding | ○ | ○ | ○ |

8 https://www.jfdaily.com/sgh/detail?id=1455985

9 Direct dispatch capacity is not taken into account in this analysis.

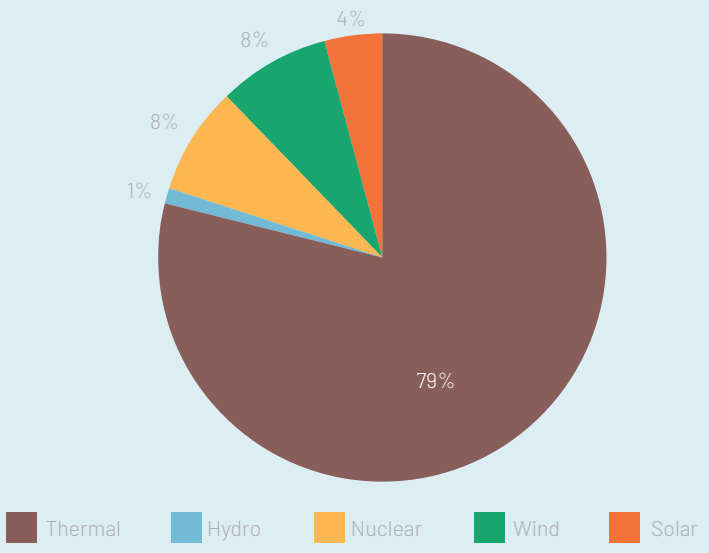
## WITH LIMITED GREEN ELECTRICITY SUPPLY, THE ENERGY TRANSITION OF STEEL COMPANIES IS CONSTRAINED BY THE POWER SUPPLY STRUCTURE

Distributed solar PV and green electricity trading remain limited in scale and are insufficient to provide the low-emissions electricity required for steelmakers to produce near-zero carbon steel (0.4 $tCO_2$ per tonne of steel). Based on China's average grid emissions factor in 2022 (0.52 $kgCO_2$/kWh), grid electricity could account for more than 85% of total emissions in near-zero-emission primary steel production.[10] A meaningful reduction in the grid emissions factor would also affect the default values used under the EU's Carbon Border Adjustment Mechanism (CBAM) for calculating indirect emissions from electricity, thereby helping export-oriented steelmakers reduce compliance costs.

The transition of the steel sector requires coordinated efforts across multiple stakeholders. The share of wind and solar in the grid determines how much renewable electricity steel producers can procure from the power market. In practice, provincial electricity generation mixes underpin electricity market transactions, while the available volume of wind and solar generation ultimately limits the actual tradable volume of renewable electricity.

Taking Jiangsu as an example, its power supply structure remains dominated by thermal generation. Despite rapid growth in renewables, thermal power still accounted for around 80% of total generation as of 2025, while wind and solar together contributed only about 12%, or approximately 77.5 billion kWh.

*Figure 1. Jiangsu Power Generation Mix by Source in 2025*




*Source: National Bureau of Statistics of China, TA analysis*

According to Jiangsu's annual disclosures on conventional electricity trading, thermal power remains dominant, accounting for 93% of total one-year contracts traded volume in 2026, followed by nuclear power at around 5%. Wind and solar power account for only a marginal share, even when considering both conventional and green electricity markets. In 2026, wind and solar accounted for only 2% of annual traded electricity in the conventional market, equivalent to approximately 4 billion kWh, while the total one-year contract green electricity trading

10 https://transitionasia.org/enabling-chinas-green-steel-transition/

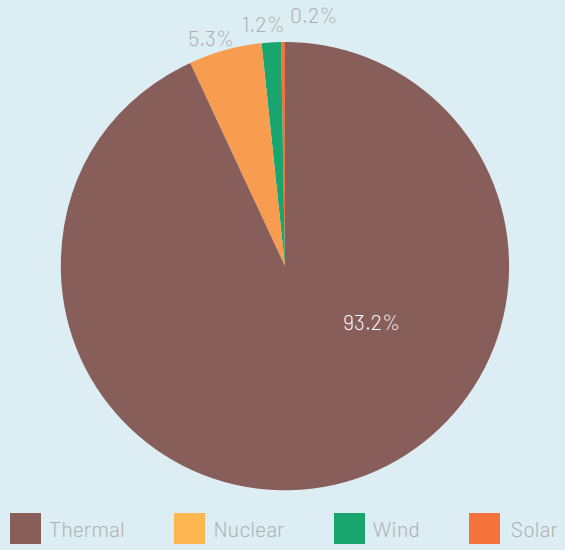
volume for these two sources was around 1.8 TWh. In 2025, Jiangsu's total green electricity trading volume reached approximately 22 billion kWh, including both annual and monthly transactions, with an average monthly volume of about 1.8 billion kWh and relatively limited fluctuation across months.

Taking Jiangsu's total wind and solar power generation in 2025, which was approximately 77.5 billion kWh, as a reference, even if the green electricity market were to expand to three times its current size, renewable energy would still be unable to become the dominant force in the market.

For Jiangsu, the key challenge for steel companies seeking renewable electricity lies in the limited availability of renewable electricity in the grid. Addressing this will ultimately require deeper decarbonisation of the power system. Leveraging a unified national electricity market to optimise allocation would not only help improve overall system efficiency, but also has the potential to provide large electricity users, such as the steel industry, with more stable and cost-competitive renewable power.

Only by achieving professional specialisation through market-based mechanisms, allowing the generation side to focus on supply and the consumption side to focus on production, can overall productivity be elevated to a more optimal level.

***Figure 2. Traded Electricity by Source in Jiangsu's 2026 Intra-Provincial Power Market, One-year Contract***




*Source: Jiangsu Electric Power Trading Center Co., Ltd, TA analysis*

## RISING MARKET VOLATILITY REQUIRES STEELMAKERS TO ADOPT A DIVERSIFIED APPROACH TO ACCESS GREEN ELECTRICITY

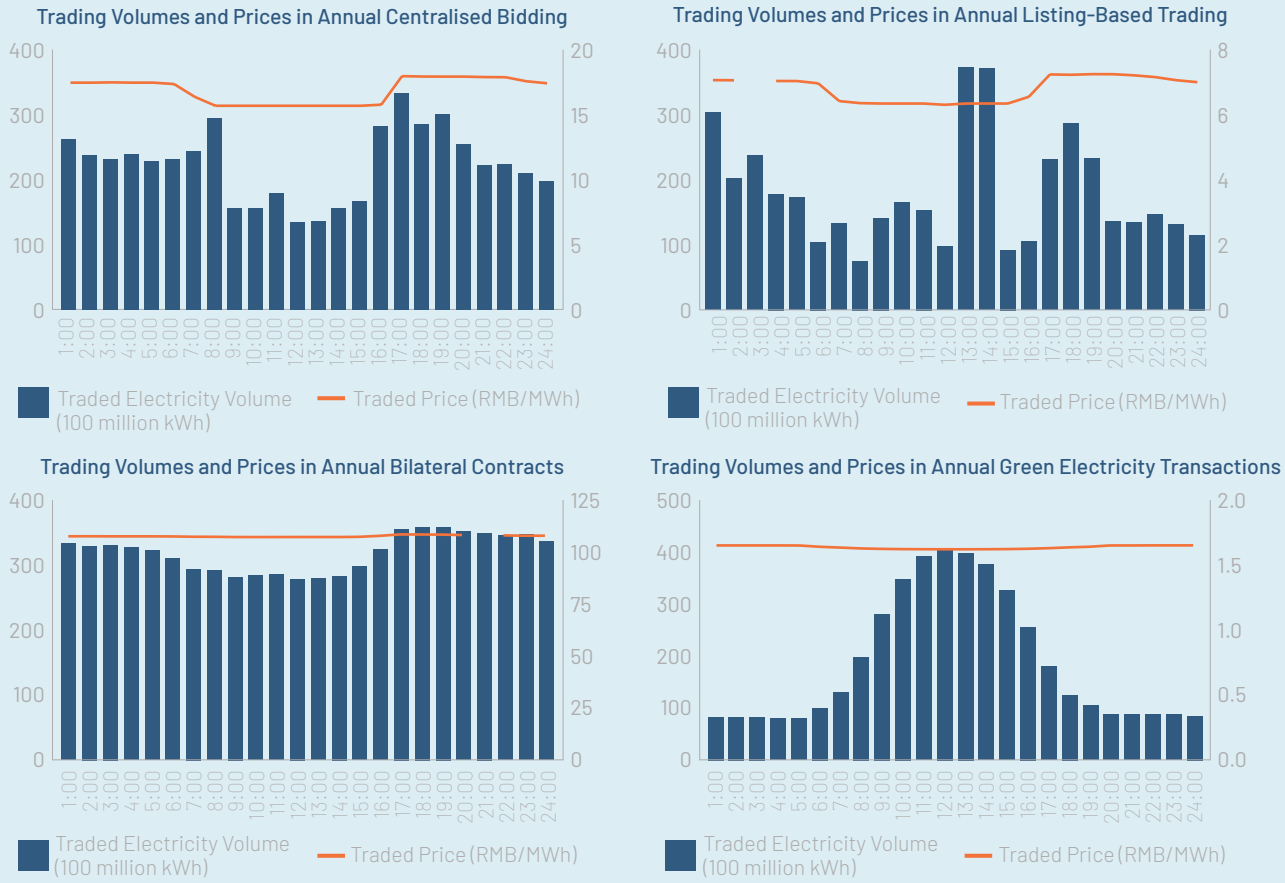
Although electricity market policies continue to evolve, most are primarily targeted at generators. For steel companies, the key concern lies in the resulting price impacts. Taking Document No. 136 as an example, the full market integration of renewable energy does not increase the total volume of renewable electricity available in Jiangsu. Electricity that was previously subject to guaranteed offtake remains within the grid; however, the revenue model for renewable generators has shifted from fixed tariffs to market-based pricing. This transition has implications for industrial consumers, particularly those relying heavily on green electricity and green certificate trading. Document No. 136 stipulates that "electricity volumes covered by the mechanism are not eligible for additional GECs revenues," meaning that a portion of electricity previously traded as green power is now incorporated into mechanism-based pricing and participates in the conventional electricity market. In Jiangsu, green electricity trading volume with one yar contract declined by 66%, from 5.2 billion kWh in 2025

to 1.8 billion kWh in 2026. As green electricity trading volumes shrink, the issuance of tradable GECs is also expected to decline. As a result, steelmakers' energy transition can no longer rely on a single channel and must instead adopt a diversified approach to accessing green electricity.

According to published one-year contractsl trading prices, the average cost of green electricity in Jiangsu is slightly higher than that in the conventional electricity market. In the conventional market, the weighted average price for wind power is around RMB 337/MWh, while solar PV is slightly lower at RMB 320/MWh. By comparison, the average one-year contracts transaction prices for green electricity are approximately 22–25% higher than conventional market prices. For wind power, around 61% of the premium is attributable to environmental attributes (i.e. green certificate value), while for solar PV, this share is about 27%.

Conventional electricity trading can be further divided into three main mechanisms: centralised bidding, listing-based trading, and bilateral agreements. Based on time-of-use price curves, the average prices across these mechanisms are broadly similar, but centralised bidding and listing-based trading exhibit greater intraday volatility with peak prices occasionally exceeding the average level of bilateral contracts. Long-term bilateral contracts have a weighted average price of around RMB 345/MWh and show minimal intraday fluctuation. Price stability is the main reason these contracts are favoured by sellers, and they account for the majority of traded volumes under one-year contracts. However, within the conventional electricity market, such long-term contracts are still dominated by thermal power, with relatively stable hourly traded volumes throughout the day. Green electricity trading is also predominantly conducted through long-term contracts, where the price-stabilising effect is even more pronounced. While daily traded volumes can vary by as much as 130 million kWh, price fluctuations remain limited, with a maximum variation of only around RMB 10/MWh.

***Figure 3. Trading Volumes by Transaction Type in Jiangsu's 2026 Annual Market***

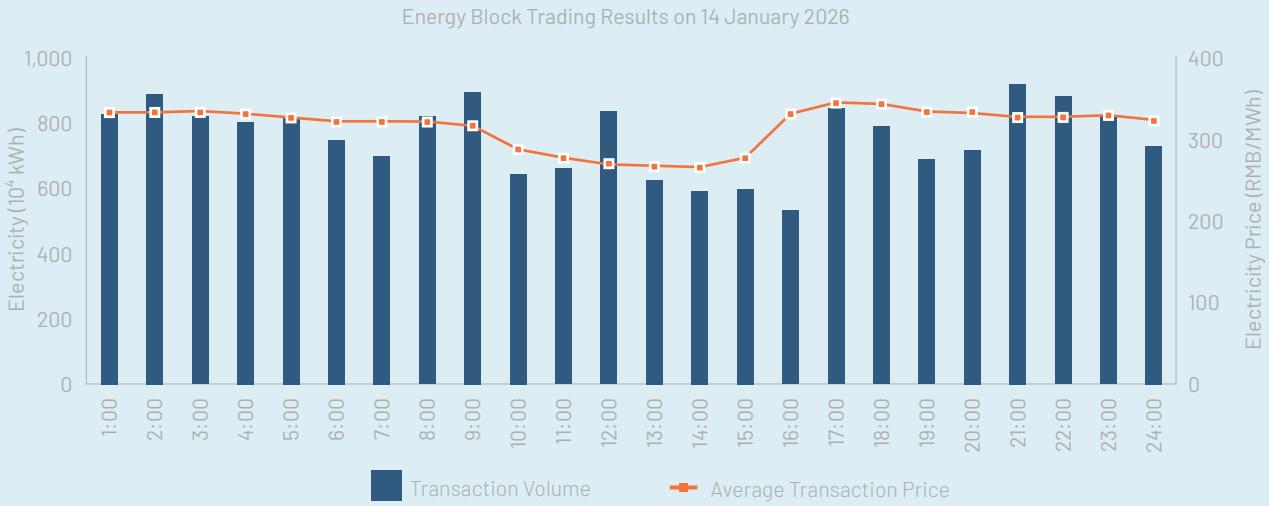



*Source: (Jiangsu Electric Power Trading Center Co., Ltd), TA analysis*

As for the spot market, average trading prices are generally lower than those in the medium- to long-term market, which is consistent with the nationwide trend. The figure below presents a randomly selected day of trading in Jiangsu's electricity spot market. Compared with the published annual contract prices, the average spot price is notably more competitive, at approximately 8% lower. In addition, the spot market is cleared every 15 minutes, and prices are significantly influenced by intraday supply–demand dynamics. In the chart below, a clear valley price can be observed.

***Figure 4. Trading Data from Jiangsu's Electricity Spot Market on 14 January 2026***

| Date | Traded Volume in Direct Trading | Average Transaction Price |
|---|---|---|
| 2026/1/14 | 18191.28 | 316.55 |




* Jiangsu electricity price on 14th January 2026
*Source: Jiangsu Electric Power Trading Center Co., Ltd*

For steel companies, decisions on how to access green electricity should be based on their own demand profiles and operating environments. From a cost perspective alone, given their high electricity consumption volume, entering into long-term bilateral power purchase agreements (PPAs) can help stabilise electricity prices that leads to cost saving. This is particularly relevant as power market reforms deepen and the share of renewable energy increases, making prices more sensitive to supply–demand dynamics. For companies using electric arc furnace (EAF) processes, combining green electricity trading with spot market procurement allows them to better optimise production schedules in response to price fluctuations. Due to the nature of EAF's operational flexibility in ramping production up or down, plants can shift output to periods of lower electricity prices. GECs can support companies in meeting decarbonisation targets and serve as an accounting tool for renewable energy consumption. However, they may pose certain risks for export-oriented companies. In particular, the carbon accounting methodologies under the EU Battery Regulation and the Carbon Border Adjustment Mechanism (CBAM) do not currently recognise standalone green certificates or virtual PPAs. Although CBAM does not yet impose costs on indirect emissions for the steel sector, it requires electricity-related emissions to meet stringent hourly physical traceability standards.

Against this backdrop, companies with export exposure—or those supplying export-oriented value chains—may need to explore alternative approaches, such as on-site distributed solar PV and direct connections to renewable energy sources.

## PATHWAY 3: DIRECT GREEN POWER CONNECTIONS—A NEW PATH FOR GOING GLOBAL

Direct renewable power connections were first piloted in the battery sector, driven by a draft supplementary regulation under the EU Battery Regulation, which proposes the use of directly connected renewable electricity data as one of the methods for calculating the electricity emissions factor in product carbon footprints. The concept has since been incorporated into policies for zero-carbon industrial parks, and more recently, has begun to be explored by steel companies. Relevant policies on direct renewable power connections were formally introduced in the first half of 2025. The *Notice on Matters Related to the Orderly Promotion of Direct Renewable Power Connections* clarified that renewable energy projects may supply electricity directly to end-users via dedicated lines. In September, the Notice on Improving Pricing Mechanisms to Promote the Local Consumption of Renewable Energy Generation (hereafter "Document No. 650") further clarified the pricing framework.

This policy unlocks additional renewable energy capacity that has been unable to connect to the grid due to curtailment constraints. It allows such projects, after completing the necessary change procedures, to establish direct green power connections. It also encourages dedicated renewable energy plants not to connect to the public grid, but instead to supply green electricity directly to a single power user via dedicated lines.

Direct connection projects can either be developed by end users themselves or structured through long-term power purchase agreements (PPAs) to establish stable supply relationships. This arrangement not only ensures the traceability of power sources, but also provides industrial users with more options for accessing renewable electricity. To some extent, it also alleviates the shortage or mismatch of green power supply and demand in certain regions, and has recently attracted widespread attention from steel companies.

The upfront investment for direct connection projects is relatively complex. In addition to the power plant itself, it also includes supporting infrastructure such as dedicated connection lines, substations, and, in some cases, energy storage (generally not mandatory). Additional power system charges depend on whether public grid assets and services are actually utilised. For off-grid green power direct connection projects that are not connected to the public grid, no transmission and distribution (T&D) charges or system standby fees are payable. By contrast, grid-connected direct connection projects may purchase electricity from the public grid to address shortfalls in renewable generation, and therefore are still required to bear a share of T&D charges and system standby fees.

Companies can choose, based on their own circumstances, either to pay T&D charges for the grid-supplied portion based on contracted capacity (or demand), or to adopt a two-part T&D tariff structure. Under the capacity (or demand)-based model, companies are suggested to align the configuration of renewable projects with their actual electricity

needs.[11]

If equipment utilisation is insufficient and the project's average load factor falls below the provincial benchmark for industrial and commercial users at or above 110 kV under the two-part tariff system, T&D costs may increase.

For companies with higher requirements for supply stability, they may opt for the prevailing two-part T&D tariff, which consists of capacity charges and energy charges, including electricity generated for self-consumption. System operation fees cover the routine costs of grid operation and are charged based on the volume of electricity drawn from the grid, i.e. settled based on electricity purchased from the grid. Meanwhile, electricity generated and consumed on-site is, for the time being, exempt from policy-driven cross-subsidies designed to maintain stable electricity prices for residential and agricultural users.

In addition, companies are advised to pay close attention to local implementation rules when applying for such projects. For example, provinces such as Yunnan, Jiangxi, and Ningxia have further clarified, based on Document No. 650, that in principle the power source and the end user should be located within the same prefecture or city, with a distance of less than 30 km or 50 km depending on provincial requirements.

In Sichuan, regions including Aba Prefecture, Ganzi Prefecture, Liangshan Prefecture, and Panzhihua have tightened the requirement under Document No. 650 that the proportion of electricity fed into the grid should not exceed 20%, further reducing it to 10%.

These projects enable physical traceability of renewable electricity, which is particularly advantageous for export-oriented companies, especially those subject to the Carbon Border Adjustment Mechanism (CBAM). For example, a direct connection project in Dongying, Shandong is integrated with the province's blockchain-based green electricity trading platform, generating an "electricity–carbon" certificate every 15 minutes. This enables compliance with CBAM requirements to use actual values rather than default values for calculating indirect emissions from electricity after CBAM officially covers steel sector.[12] The project connects battery production facilities via dedicated lines to 345 MW of installed wind and solar capacity, supported by 1,200 MWh of energy storage, along with two 110 kV substations and two dedicated 110 kV transmission lines.[13]

According to data from the National Energy Administration, a total of 84 green power direct connection projects nationwide had been approved as of the end of February.[14] Recently, some provinces have begun releasing requirements and project lists for direct renewable power connections. Eligibility criteria and prioritisation vary by region. For example, Hebei prioritises projects involving the steel sector, as well as those that

11 Capacity (or demand) charge = current regulated capacity (or demand) charge + electricity tariff at the relevant voltage level × average load factor × 730 hours × grid-connected capacity. Average load factor is based on provincial averages for ≥110 kV industrial and commercial two-part tariff users, as published by the provincial price authority. Grid-connected capacity refers to total transformer capacity and directly connected high-voltage motor capacity.

12 CBAM does not currently cover indirect emissions from steel. For companies under CBAM that calculate emissions using actual electricity-related emissions (rather than default values), it requires providing generation-side and consumption-side data with a time resolution of no more than one hour.

13 https://msolar.in-en.com/html/solar-2457077.shtml

14 https://mp.weixin.qq.com/s/bBrvCVClH-NEs3yVaxRVfA

achieve clean energy substitution by reducing output from captive power plants. From a supply perspective, priority is often given to projects in the pipeline, those not yet grid-connected or facing curtailment, and those located near end-users.

A number of steel companies are already actively planning such projects. Examples include a proposed 200 MW solar direct connection project by Xin Wuan Iron & Steel Group, a 50 MW distributed wind project by Aosen Special Steel Group, a 115 MW wind project by Tangshan Zhengfeng Steel, as well as multiple projects by Zhongshou Special Steel and Shougang Qian'an (350 MW wind; 310 MW solar and 250 MW wind, respectively), and a 200 MW wind project by Tangshan Donghua Steel. Notably, these projects are all being self-financed by the steel companies.

## CONCLUSION

The full market integration of renewable energy does not automatically resolve the challenges steel companies face in their energy transition. For an industry characterised by large-scale electricity consumption and increasingly stringent carbon constraints, the key lies in developing a renewable electricity procurement portfolio that best fits each company's specific needs. In practice, while on-site distributed solar PV can provide direct access to green electricity and green certificates, its contribution is inherently limited by space constraints and is unlikely to serve as a primary power source.

Companies are strongly suggested to adopt a diversified approach to green electricity procurement. From a cost perspective, although the conventional electricity market currently offers a cost advantage over green electricity trading, electricity purchased through the conventional market still requires separate procurement of green certificates. With certificate prices potentially rising under the influence of Document No. 136, this may not represent the most cost-optimal option in the future.

Instead, companies can combine green electricity trading with participation in the conventional market. Actively engaging in the electricity spot market is particularly beneficial for companies that rely on electric arc furnaces (EAFs), as their operational flexibility allows them to respond to price differentials by shifting production to lower-price periods to reduce overall costs and offset part of the premium associated with green electricity or standalone certificate purchases.

For electricity-intensive sectors such as steel, entering into long-term bilateral agreements can also help mitigate price volatility associated with the rapid expansion of renewable energy, thereby improving cost stability.

At the same time, companies can explore interprovincial green electricity trading, particularly those located in regions with limited renewable resources but high power demand. For companies with export exposure, it is increasingly important to pursue renewable electricity sources with physical traceability, such as direct renewable power connections, in order to meet tightening international carbon disclosure requirements.

Strong government efforts to drive grid decarbonisation will enable the manufacturing sector to reduce Scope 2 emissions more efficiently. The energy transition of steel companies is closely linked to the decarbonisation of the power sector. At present,

the high cost of self-developed solar PV projects, combined with the limited scale of green electricity trading, makes it difficult to fully meet the steel industry's renewable electricity demand. As the power sector further decarbonises and integrates a higher share of renewable energy into the grid, the grid intensity will decline. At the same time, this will expand the availability of renewable electricity in market-based trading. As a result companies can lower the carbon intensity of their electricity consumption even through the conventional market, with additional GEC purchases where needed to meet renewable consumption targets.

At the same time, as overseas requirements for carbon emissions disclosure continue to tighten, reducing the grid emissions factor will help lower compliance costs for export-oriented companies.

Governments can also play a proactive role by developing platforms or mechanisms that enable the physical traceability of renewable electricity for companies with such needs. Examples include the development of zero-carbon industrial parks, the digitalisation of power systems, and the integration of smart metering with blockchain-based solutions.

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## ABOUT TRANSITION ASIA

Founded in 2021, Transition Asia is a non-profit think tank dedicated to accelerating decarbonisation in Asia's materials and heavy industries to achieve the 1.5°C climate goal. Our multidisciplinary team combines diverse perspectives, experience and expertise, underpinned by a strong research foundation in Asia and a nuanced understanding of the region. Using analytical models and in-depth assessments, we evaluate and monitor corporations' decarbonisation efforts and actions. By engaging with stakeholders across sectors—including corporates, investors, policymakers and civil society organisations—we facilitate informed and impactful discussions that drive sustainable, low-carbon transitions aligned with a 1.5°C future.

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