
STATE OF THE MARKET 2018 :

CORPORATE RENEWABLE PROCUREMENT IN CHINA



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ABOUT ROCKY MOUNTAIN INSTITUTE

Rocky Mountain Institute (RMI)—an independent nonprofit founded in 1982—transforms global energy use to create a clean, prosperous, and secure low-carbon future. It engages businesses, communities, institutions, and entrepreneurs to accelerate the adoption of market-based solutions that cost-effectively shift from fossil fuels to efficiency and renewables. RMI has offices in the United States in Basalt and Boulder, Colorado; New York City; Washington, D.C.; and in Beijing, People’s Republic of China.



The Business Renewables Center (BRC) is a member-based platform that streamlines and accelerates corporate purchasing of off-site, large-scale, wind and solar energy.



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Executive Summary



Executive summary

- Historically, massive installation of renewable energy (RE) in China has been mainly driven by government targets supported by a feed-in-tariff (FIT). However, China is gradually transitioning from the FIT to a Renewable Portfolio Standard (RPS) system.
 - ♦ The government has indicated a clear goal that RE reaches grid parity as soon as possible. A series of policies have been released this year reducing the FIT level and limiting new projects, which on one hand slows new project development, but on the other hand encourages the deployment of more efficient technology and further cost reductions.
 - ♦ A RPS will be released by the end of 2018 to create requirements for purchasing RE across all provinces and establish a national Renewable Energy Certificate (REC) market for tracking RPS compliance, which will enable more active market transactions for RE.
- Both multinational, and increasingly Chinese, corporations are driving the growth of RE mostly via on-site installations while at the same time setting more aggressive targets and taking a leadership role to grow the renewable market.
- More options for corporations to procure green electricity are being piloted in China, though significant work remains to implement those pilots and scale viable transaction mechanisms.
 - ♦ Several currently-available mechanisms offer an entry point to make progress towards green procurement goals and gain market experience: Green Electricity Certificates (GECs), on-site solar, and direct investment in utility-scale renewables.
 - ♦ Distributed wind options are emerging this year. Pilot projects of distributed energy transactions were open for application earlier this year but progress is currently stagnant.
 - ♦ Mechanisms to enable larger-scale transactions are not widely available; additional enabling policy is needed.
 - ♦ Details of the RPS and REC design (currently being drafted) will influence who can claim environmental attributes in a transaction.

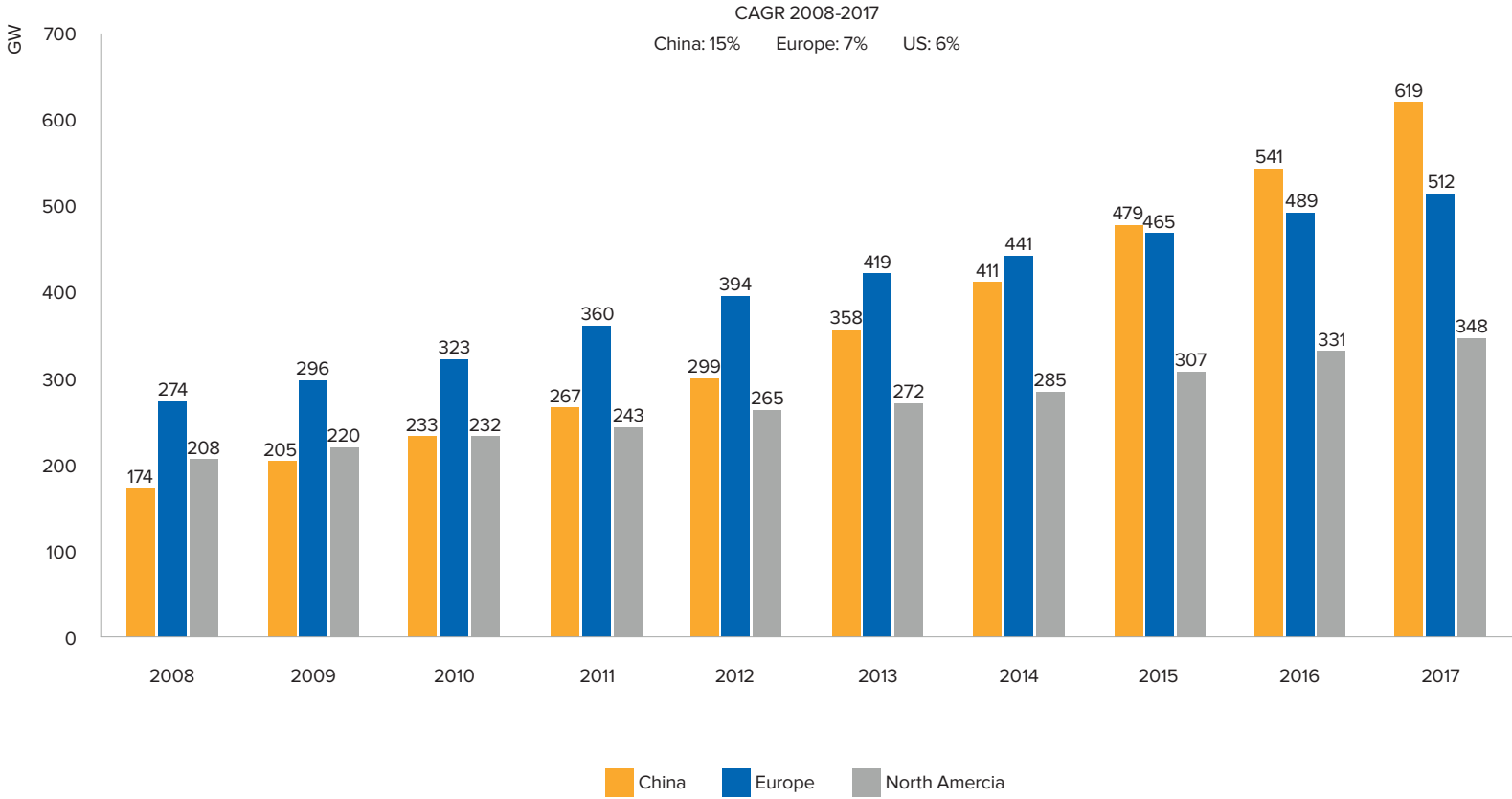


Renewable Energy Market Context



China has been the world leader in annual renewables capacity additions for a decade

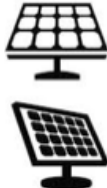
Total renewable energy installed capacity



Source: International Renewable Energy Agency

Installed capacity of wind and solar has grown significantly and further reductions in solar costs are expected

2013-2017 Changes in China's Renewable Energy Market



21%
CAGR in installed capacity

65%
CAGR in installed capacity

1%
installed cost reduction of onshore wind projects

21%
installed cost reduction of solar projects

7%–22%
reduction of onshore wind FiT*

39%–57%
reduction of solar FiT*

Note:
*The FiT range reflects the FiT change in different resource zones from 2013 to 2018.

The current geographic mismatch between load and generation is being addressed by encouraging more project development in high-load, southeast provinces

- Western and northern provinces have better renewable resources and more available land, so the majority of installed capacity has historically been developed in these regions. Conversely, load is concentrated on the east coast. Renewable installed capacity in those regions remains relatively low.
- Since 2016, the National Energy Administration (NEA) has released a series of policy guidance meant to reduce renewable curtailment, and resulting in slowing approvals of additional capacity in the northwestern provinces.
- As a result of these policy changes, Shandong, Anhui, Henan, Zhejiang, and Jiangsu saw the largest increases in RE capacity in 2017, with over 70% being solar PV installations.

China 2017 Electricity Consumption



100 300 and up TWh

China 2017 Installed Wind and Solar Capacity



0 25 and up GW

▲ = Largest increase in renewable capacity from 2016 to 2017 (MW).

Source: National Energy Administration

Curtailment rates improved in 2017; however, there is further opportunity to reduce curtailment through market mechanisms

China Wind Curtailment (2016)



National 17%

China Wind Curtailment (2017)

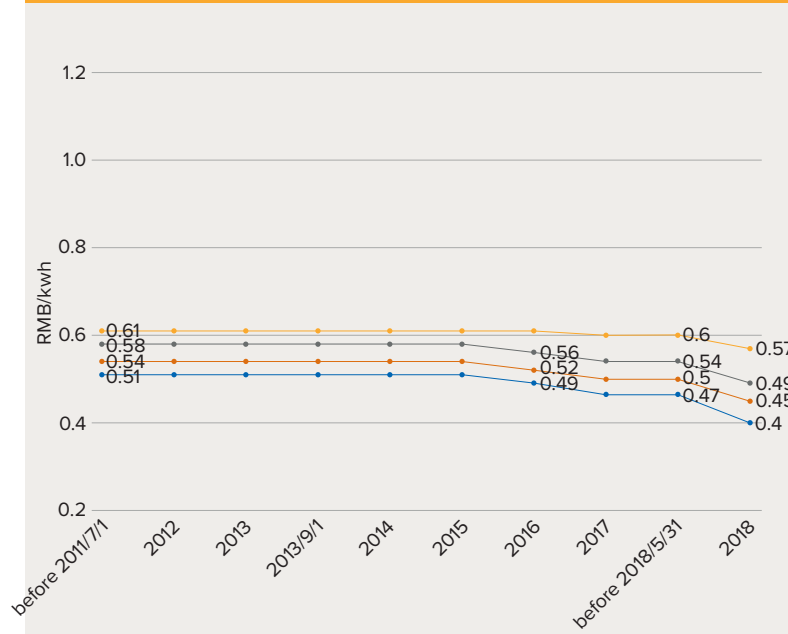


National 12%

- National wind curtailment reduced from 17% in 2016 to 12% in 2017 in part as a result of 1) better system operations, 2) spot market for curtailed renewable energy, and 3) piloted ancillary market.
- Renewable curtailment was mainly from wind. Comparatively smaller levels of solar curtailment occurred primarily in Xinjiang and Gansu.

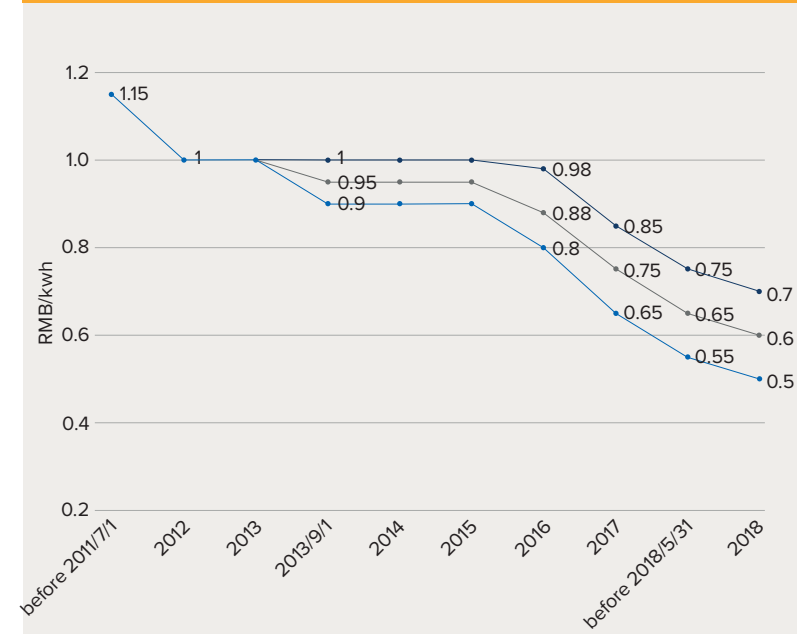
Wind and solar growth has been stimulated through a FiT mechanism, which has been reduced every year

Wind FiT from 2011-2018



—●— Zone 1 —●— Zone 2 —●— Zone 3 —●— Zone 4

Solar FiT from 2011–2018



—●— Zone 1 —●— Zone 2 —●— Zone 3

Note:

- Provinces in China are divided into four zones for wind projects and three zones for solar based on resource availability. Higher resource zones are given a lower FiT such that projects across different zones have similar ROI.
- Since 2011, wind FiT has reduced by 22% in Zone 1, 17% in Zone 2, 16% in Zone 3 and 7% in Zone 4.
- Solar FiT has reduced by 39% in Zone 1, 48% in Zone 2 and 57% in Zone 3.
- FiT = benchmark coal price (paid by grid) + subsidy (paid by government).

Source: National Energy Administration

Facing serious FiT deficit, the national government announced significant policy changes to reduce FiT, control new project development, and accelerate grid parity

FiT system and subsidy deficit:

- China's RE development has historically been encouraged through a FiT system. However, as a result of higher than expected development, the Chinese government has a significantly overdrawn subsidy account compared with budget.
- Both wind and solar FiT payments are significantly delayed. However, unlike western markets, this largely does not affect bankability, as Chinese lenders are satisfied by the government's promise of future cash flows.
- Therefore, opportunity for corporations to drive additional renewable development in the market has been limited. But, as China moves away from FiT, corporations can potentially play an important role.

Policy change (solar):

May 31, 2018

1. Reduced FiT rate by RMB 0.05/kWh across all zones for utility-scale and on-site solar projects already under development and commissioned after the policy release.
2. In 2018, no additional utility-scale solar projects that need subsidy are permitted.
3. In 2018, on-site solar projects can receive FiT up to a national quota of 10 GW, which has already been reached. 2019 details have not been released.
4. Policy ambiguity has created revenue uncertainty for some projects already built, which are potentially above the on-site 10 GW cap. Utility installations are expected to cease in 2018 until project revenue mechanisms are clear.

Policy change (wind):

May 24, 2018

1. Starting in 2019, all new utility-scale wind projects will be required to submit FiT price bids in order to be integrated to the grid (distributed wind was not included in this policy release).
2. Encourage wind projects that do not require subsidies and can be 100% consumed by large industrial customers and industrial parks.

Latest policies demonstrate the government's strong determination to reduce curtailment and increase renewable consumption

Release Date	Policy	Content
September 2018	National Development and Reform Commission (NDRC) released the "Renewable Portfolio Standard and Assessment Methods for 2nd Round Comment"	<ul style="list-style-type: none"> Combine the proposed REC system and GEC into one certificate system, still using the name "GEC". Selling GECs will not replace subsidies, and government will subsidize the difference between promised subsidy level and GEC price, which is set by the market.
September 2018	National Energy Administration (NEA) released a notice on "Accelerating Wind and Solar's Integration into the Grid without Subsidy for Comment"	<ul style="list-style-type: none"> Renewable projects not requiring subsidies can be approved by provincial government without the need for national government approval. Direct power purchase between RE projects and non-utility buyers shall be encouraged.
July 2018	NDRC and NEA together released a notice on "Advance Power Market Reforms and Improve Transaction Mechanisms"	<ul style="list-style-type: none"> Advocate for more developers (including renewables) and buyers to participate in the direct power purchase markets across all provinces.
April 2018	NEA released the "Renewable Energy Integration Action Plan (2018–2020) for Comment"	<ul style="list-style-type: none"> Target by 2020: National-level wind curtailment rate at a "reasonable" rate (5% target); solar curtailment rate below 5%.
March 2018	NEA released the "Renewable Portfolio Standard and Assessment Methods for Comment"	<ul style="list-style-type: none"> A mandatory requirement to purchase RE across all provinces. A new REC system, which will be used to track RE generation used to meet RPS targets.

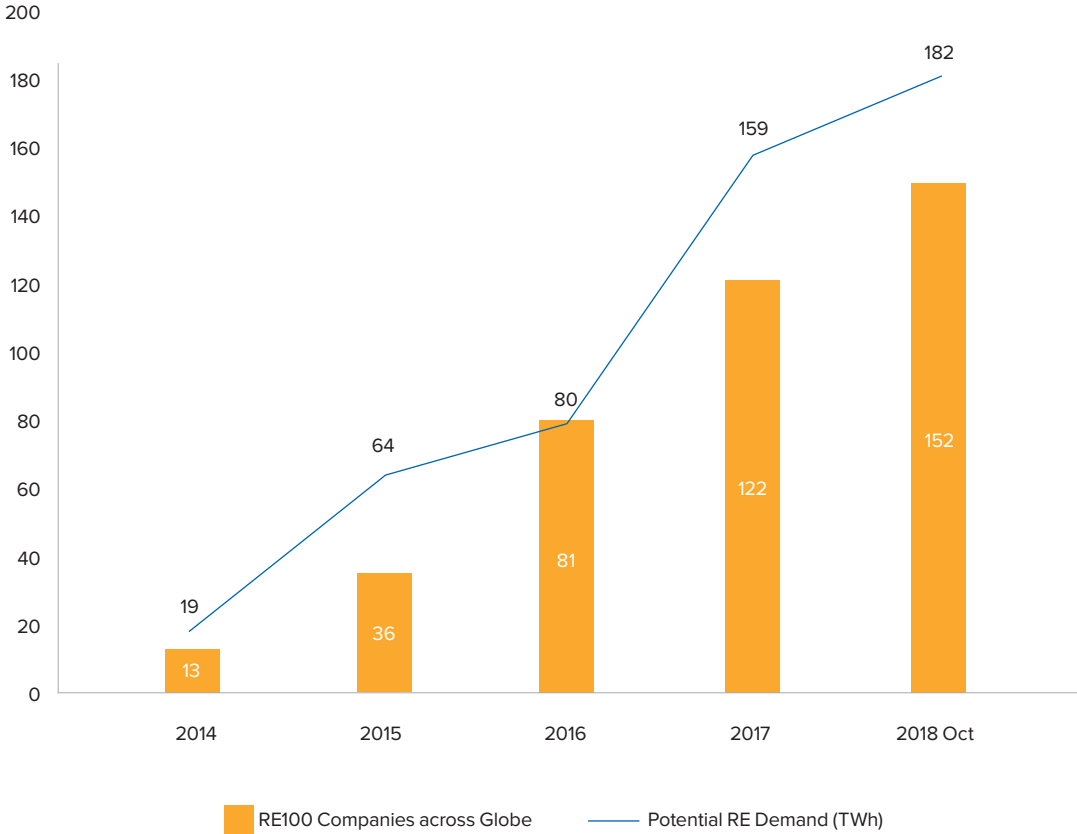
Implications

- Corporate renewable procurement is aligned with recent national policy objectives to support renewables and market-based transactions.
- National policies do, however, require specific implementation at the provincial level.
- The Chinese government's principle concern remains to support national renewable growth while reducing curtailment by ceasing additional installations in curtailment regions and encouraging installations in non-curtailment regions.
- Corporations might consider curtailment reduction measures as increasing additional consumption and consider this approach at an equivalent value to deploying new generation capacity if company's internal policies allow. Additional research needs to be done to verify this.

Status and Options for Corporate Renewable Procurement



A growing number of companies have committed to procure "100% renewable" and many of them have operations in China



Source: RE100, CDP Worldwide

Corporations have different motivations to procure renewable energy



Companies in China are taking different options to achieve their target based on their needs

Case studies

Buyer: Anheuser Busch InBev

Developer: GCL

Mechanism: On-site Solar

Size: 15 MW

Location: Fujian

Seeking to be a **market leader**, on June 5, 2018, Anheuser Busch InBev announced the integration of a new 15 MW on-site solar project into a facility in Fujian province. This project is the largest on-site solar project in the beer industry and in Putian city.

This project is part of Anheuser Busch InBev's approach to meeting a 100% renewables by 2025 commitment.

Buyer: Apple and 10 Apple Suppliers

Developer: TBD

Mechanism: Direct Investment

Size: 1,000 MW+

Location: China

Having met their own load, Apple is seeking to **engage and enable their supply chain** partners to also reach 100% RE supply. One step in this journey occurred on July 12, 2018, when Apple announced that in the next four years, it will raise a nearly USD 300 million fund with 10 suppliers to jointly invest in renewable projects in China. Expected additional capacity will be over 1,000 MW.

Options for corporations are expanding through small-scale pilots, but significant work remains to enable large-scale transactions

Mechanism	Brief description	Changes in 2018
1. GECs	Certificates representing RE attributes; customers purchasing certificates can claim that amount of renewable electricity consumed. Prices are high.	<ul style="list-style-type: none"> No changes at the moment of writing. The release of RPS policy in late 2018 will establish a national certificate system and might change the current GEC system.
2. Direct investment	Companies directly invest in renewable projects, owning a share of the renewable projects.	<ul style="list-style-type: none"> No changes at the moment of writing. RE attribute claim might be changed under new RPS policy releasing soon. Waiting on policy clarification.
3. On-site solar	New solar capacity installed on company premises, behind the meter or grid tied.	<ul style="list-style-type: none"> Significant policy changes in 2018.
4. On-site wind	Piloted this year after the April 2018 policy released. New wind capacity installed on company premises, behind the meter or grid tied.	<ul style="list-style-type: none"> Piloted in 2018.
5. Distributed energy transaction (local region)	Companies buy excess on-site project renewable generation within a highly localized region.	<ul style="list-style-type: none"> Pilot project proposals were submitted in 2018, but no progress on pilot approval at the moment of writing.
6. Negotiated bilaterals	Direct contract signed between renewable generators and corporate buyers for utility-scale projects.	<ul style="list-style-type: none"> First interprovincial transaction occurred in 2018.
7. Centralized bidding	Buyers and generators transact through a centralized, provincial platform and buyers could not trace their purchase of electricity to a specific generator.	<ul style="list-style-type: none"> No changes at the moment of writing.
8. Virtual PPA (VPPA)	A financial agreement (no title transfer) between a corporate buyer and a renewable generator, requiring open market prices, for corporates to acquire environment attributes at scale.	<ul style="list-style-type: none"> No changes at the moment of writing.

1~3 Ready to go
 4~5 Piloting
 6~7 Not nationally replicable
 8 Not yet available

Please see the 2017 State of the Market report

<https://www.rmi.org/report-release-state-market-2017-corporate-renewable-procurement-china/> for more details on specific mechanisms.

Some options that are ready to go or at pilot stage could be undertaken by corporations without geographic constraints

Characteristics for procurement mechanisms without geographic constraints

Mechanism	Price	Available now?	Limiting factor	Additional	Scale
GECs	Premium	Yes	None	No	High
Direct investment	N/A	Yes	Capital	Yes	High
On-site solar	Can be less than grid	Yes	Land, resource	Yes	Low
On-site wind	Can be less than grid	Yes (pilot projects)	Land, resource	Yes	Low
Distributed energy transaction (local region)	Awaiting pilot results	No (pilots waiting for approval)	Provincial approval	Yes	Low-medium

- **GECs** are the easiest option but are not an appealing option for most corporations due to the high price of GECs.
- **Direct investment** is available right now, but not all buyers are set up for direct investment with significant capital investment and require additional knowledge. The upcoming RPS policy released later this year might influence the RECs associated with the invested projects and bring ownership unclarity.
- Experienced buyers repeatedly say that **on-site projects**, although not a scalable solution to meeting targets, build internal transaction experience and are an essential foundation for large-scale transactions. The policy released this year had significant influence on the industry and capped the growth on on-site solar projects.
- Pilot projects of **distributed energy transactions** were open for application earlier this year, although progress is stagnant.

Intraprovincial transactions are available, with single-year contract terms, in provinces with high curtailment or rich hydro resources

2018 Intraprovincial negotiated bilateral deal map



- Wind and thermal bundled transactions continue to be offered for single-year contract terms.
- Highly curtailed provinces have experienced pure-wind and -solar transactions, also with single-year terms.
- Pure-hydro transactions continue to be possible with single-year terms.

- Intraprovincial RE deals happen only in curtailment provinces because renewable generators are motivated to generate and sell otherwise-curtailed power to make additional profits.
- Within high-load provinces, such as Jiangsu and Guangdong, renewables are still procured 100% by the grid company at full FiT payment; renewable generators lack the motivation to transact directly with non-utility users.

One interprovincial direct power purchase transaction of renewable energy has piloted, but many barriers remain that limit market scaling

2018 Interprovincial negotiated bilateral deal map



■ The first interprovincial transaction occurred in January 2018 between a metalware production company in Shandong and a wind developer in Shanxi, through a retail company, using the Ximeng extra high voltage line.

- Most interprovincial deals in China are grid-to-grid transactions rather than direct purchase by buyers, because provincial governments want to spread the benefits of cheap imported renewable power equitably.
- Main challenges that need to be addressed to replicate the model include:
 - ◆ Transaction complexity for provincial governments
 - ◆ Misaligned incentives between provinces
 - ◆ Limited HVDC transmission availability

Centralized bidding is a viable option for buyers in provinces where it is allowed, but it is often capped and not traceable to a specific project

2018 Centralized bidding deal map



- Wind and solar can be procured through centralized bidding.
- Hydro power can be procured through centralized bidding, due to the rich hydro resource.
- Bundled renewable and thermal power can be procured. It is transmitted through the Yindong extra high voltage line. The percentage of clean energy is capped at 40%.

- All centralized bidding contracts have had single-year terms, are often paired with thermal generation, and do not provide the ability to trace output to a specific project.

An aerial photograph of a solar farm. The solar panels are arranged in neat, parallel rows across a lush green field. The sun is shining brightly from the upper right, creating a lens flare effect and casting long, dark shadows from the panels onto the grass. The overall scene is bright and clear, emphasizing the clean energy theme.

Appendix: How BRC is Enabling Market Growth

BRC China's annual workshop held in June 2018 in Beijing convened 65 participants from over 40 companies

Objectives

- To build a shared understanding on the current policy reality and what has changed over the past 12 months
- To clarify available transaction options in provinces with buyer load
- To identify the two or three most important leverage points/crux of the issue to enable transactions in specific provinces



Workshop components

Learning

Small group market updates about the state of China's RE market and opportunities and challenges for corporate procurement.

Provincial focus

Participants identified specific opportunities in 13 provinces and then dived into specific barriers in six priority provinces.

Developer-hosted tables

Developer-hosted small groups of buyers answered specific questions and discussed near-term opportunities. China General Nuclear, EDF Renewables, Envision Energy, Guodian Longyuan, Longi Group, and Tianrun hosted tables.

NEA and policy speakers

Speakers from NEA, China Renewable Energy Engineering Institute, and Tsinghua University spoke about key policy issues.

Solutions to common barriers

Small group working sessions on priority issues including: creating direct power purchase pilots, supporting distributed pilots and transactions, clarifying renewable attribute ownership, and enhancing community education and sharing.



Based on the discussions at the June 2018 workshop, the community uncovered three critical areas of work

Work stream	Scale	Overview	Timescale
1. Developing insights from and informing key national policies	National	Provide insights into the impact of key national policies affecting non-utility procurement and provide input into policy development	Ongoing, as relevant national policies are announced
2. Creating replicable intraprovincial direct power purchase (DPP) transactions	Provincial	Build a group of motivated actors and coordinate efforts to execute a DPP transaction in a specific province	Duration of transaction structure creation and pilot execution
3. Disseminating on-site best practices and lessons learned	On-site	Develop a library of best practices and lessons learned from on-site transactions, including key standard terms	As unique transactions are completed with lessons for all



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