
STATE OF THE MARKET 2017: CORPORATE RENEWABLE PROCUREMENT IN CHINA

ADAPTED FROM PRE-READ MATERIALS FROM BRC CHINA'S
WORKSHOP HELD JULY 12 – 13, 2017, IN BEIJING, 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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01

ABOUT THIS REPORT

企业可再生能源中心 中国项目工作坊

CORPORATE RENEWABLE PROCUREMENT IN CHINA: A BRC WORKSHOP

7月12-13日 | 北京

JULY 12-13, 2017 | BEIJING



This report is the result of a year and a half of research and was put together for BRC China's July 2017 Workshop.

In July 2017, the Business Renewable Center China (BRC China) hosted more than 50 participants from multinational companies, large renewable energy developers, and market intermediaries in Beijing to collectively share their knowledge, unpack the barriers preventing them from transacting in today's marketplace, build their network, and support China's burgeoning corporate renewable procurement market. The Workshop was inspiring – buyers and developers worked together to understand each other's motivations and barriers while identifying possible solutions. But workshop participants also faced some hard truths – there is a lot of work before corporations can meet their increasingly ambitious sustainability and renewable energy goals with in-market solutions in China.

The BRC China team spent over 18 months conducting on the ground research, spoke with over 60 different buyers, over a dozen developers, and with local government and grid companies. We tested out ideas for new mechanisms and examined previous deals. In preparation for our workshop in July 2017, we created a market overview to make sure all participants had a base level of understanding and shared terminology. This report is a modified version of that pre-read. In making it public, our hope is that it spurs discussions among buyers, developers, and others who can help move the market forward.

Sincerely,

The BRC China Team

ABOUT THE AUTHORS

The Business Renewables Center's (BRC) started with 28 members in US and has grown to an organization with more than 200 members. To date, 94% of the deals done to date in the US involve at least one BRC member, totaling over 8GW of renewable capacity. BRC provides distinct values to its members:

- Generates industry awareness
- Builds a strong market community
- Develops effective tools and services

Based on member interest and market opportunity, BRC expanded to China. BRC China was initiated to support progress toward transactions among leading corporations in a rapidly evolving market.

BRC China is a membership organization that is open to corporate buyers, renewable energy developers, and others in the market such as consultants and lawyers. BRC China provides four key areas of service:

- Research Services
- Pilot Support
- Market Facilitation
- Network Development

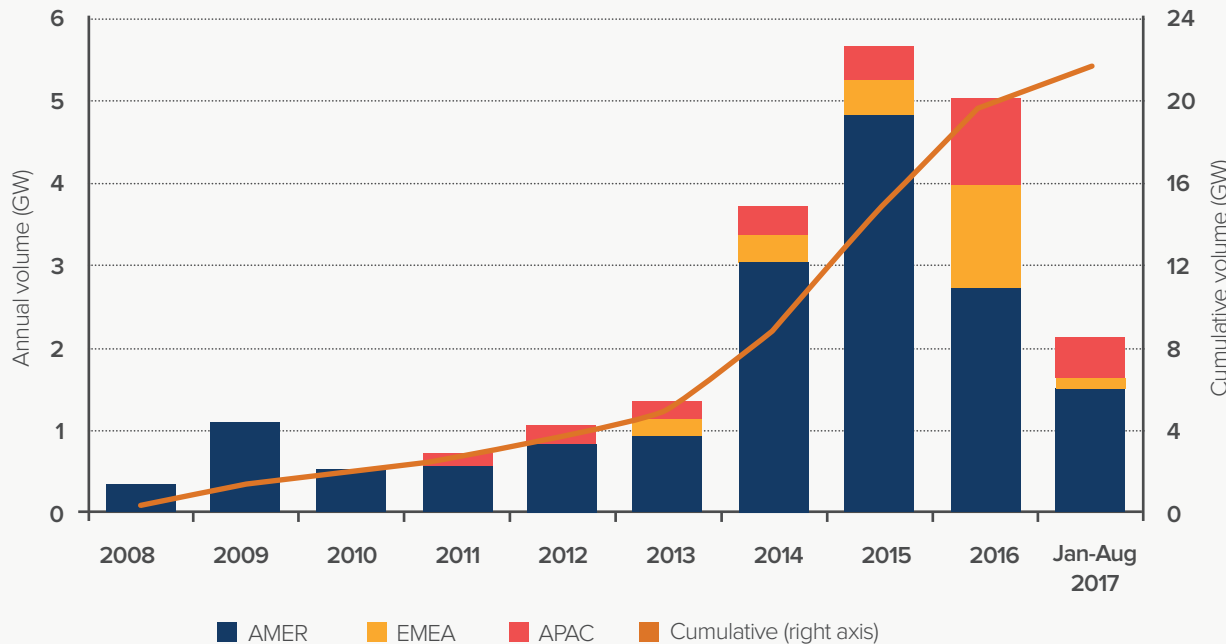
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A BRIEF UPDATE ON US CORPORATE RENEWABLE PROCUREMENT



North America accounts for more than 75% of global corporate Power Purchase Agreements (PPA)

Global Corporate PPAs by Region and Signing Year
2008-2017 (as of August 2017)



The US leads corporate renewable procurement in both the number of deals and volume of deals signed. US companies are the top corporate PPA off-takers.

Meanwhile, other countries are catching up. **Mexico** installed 2.4GW of wind as of March 2016. Early in 2017, the Mexican government approved the new Clean Energy Certificate (CEL) targets, to further support Mexico's goal of achieving 35% renewables by 2024.

As of Q1 2017, corporate renewable energy consumption in India (onsite and offsite) accounted for approximately 70% of the total amount in APAC region, at almost 6 GW.

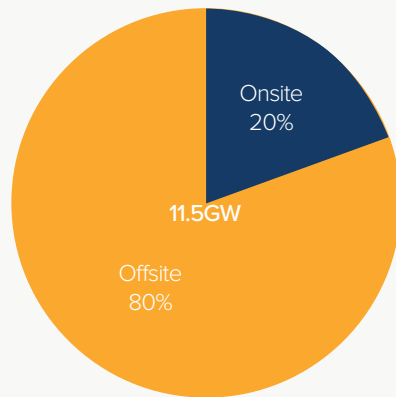
Cumulative PPAs as of Q1 2017

AMER (North America and South America)	14.4GW
EMEA (Europe, Middle East, and Africa)	2.2GW
APAC (Asia)	2.4GW

Notes: APAC capacity is estimated. Mexico PPAs use the off-taker maximum capacity volumes. These figures are subject to change and update as more information is made available.
Source: Bloomberg New Energy Finance

There are a variety of procurement mechanisms in the US

Corporate PPAs in the US – Onsite vs. Offsite (as of 2017)



THE MAJOR MECHANISMS AVAILABLE ARE:

Onsite Investment or PPAs

- A direct investment in (or a PPA contract on) renewable onsite (e.g., rooftop solar) that serves the load of the facility

Physical PPA (offsite)

- A long-term contract where the generator “physically” delivers power to the buyer

Virtual PPA

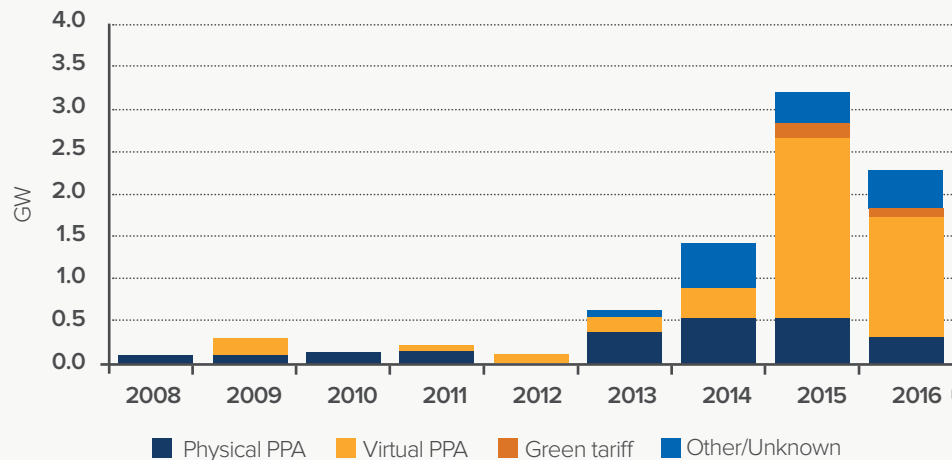
- A financial agreement, where buyers receive Renewable Energy Certificates (RECs) without taking power from a renewable generator

Green Tariff

- An additional fee on a buyer’s regular utility bill. This happens in regulated power markets when utilities provide clean energy to buyers

Since 2013, more than 90% of deals signed were offsite physical or virtual PPA, with VPPA rising in popularity in 2015.

Corporate PPA in the US by Deal Type 2008-2016

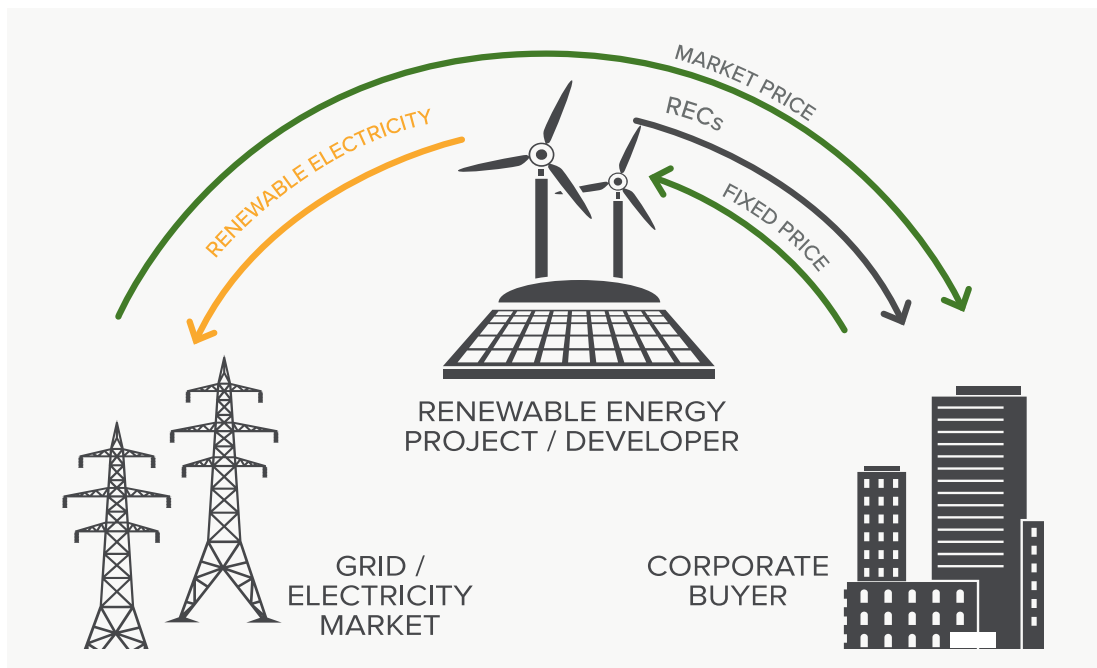


Note: Offsite only

Source: Bloomberg New Energy Finance

Most US corporate buyers use VPPA with bundled RECs to procure renewable energy

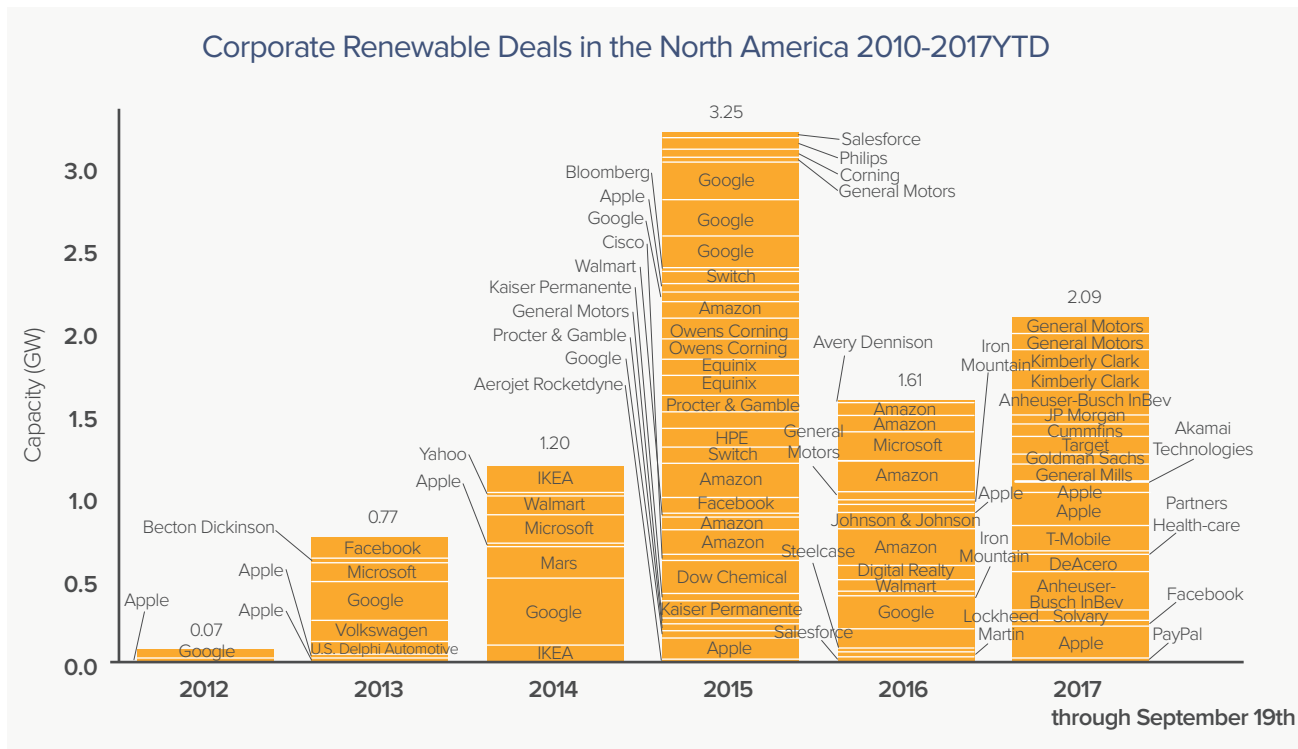
Virtual Power Purchase Agreement (VPPA) is a financial agreement between a corporate buyer and a renewable generator that provides (1) additional renewable generation onto the grid, (2) price stability for generators over the term of the contract, and (3) a clear claim of additional renewable power for buyers in an area with limited renewable curtailment.



KEY FEATURES FOR A PLAIN VANILLA VPPA:

- Typically a direct contract with wind or solar farm.
- Allows developer to secure financing.
- Allows buyers to claim additionality.
- Buyers receive Renewable Energy Credits (REC) if it's bundled deal. Buyers can retire RECs and claim they used renewable power or they can resell the RECs.
- It's not linked to the utility bill or to the physical consumption of electricity, but linked to production volumes.
- It's priced as swap – buyers pay a fixed price in exchange for the spot-market revenue from the electricity generation.
- The contract tenor is normally 12-25 years.

Along with rising volumes (in MW), the number of companies participating in deals is increasing



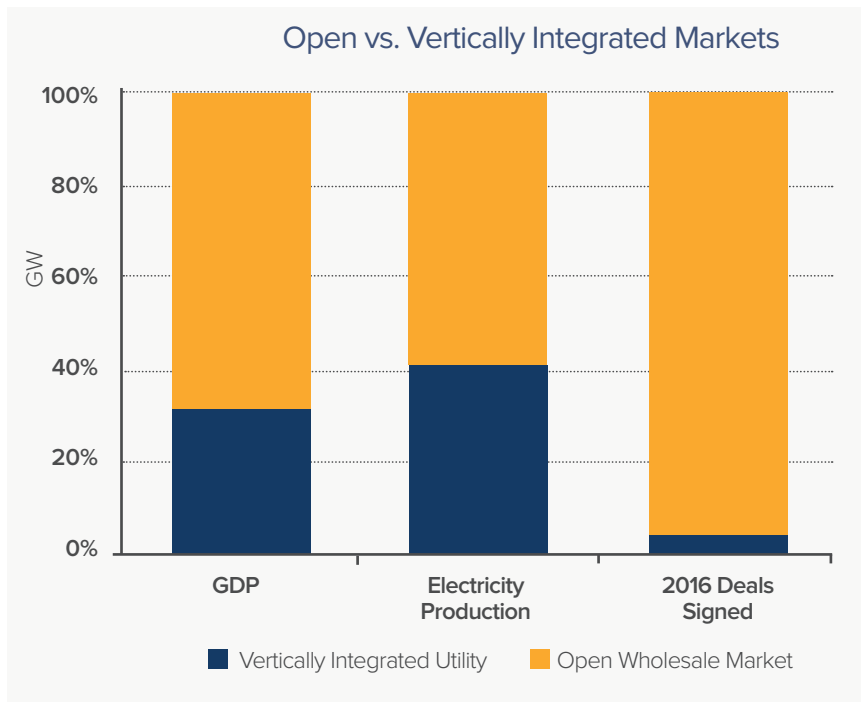
CORPORATE BUYERS ARE DRIVING NEW
RENEWABLE CAPACITY IN THE U.S.

- Publicly announced contracted capacity of renewables procurement by corporations accounted for 40% of total renewables procurement in the US in 2015. That year corporate demand outpaced utility demand in the wind market, and corporates signed 56% of wind PPAs.
- The market shrank in 2016 as the after effect of the 2015 boom, and picked up again in 2017. As of September, over 2GW was signed in the first three quarters of 2017, with multiple first-time buyers (e.g., Solvay, Anheuser Busch InBev, Goldman Sachs).

Note: Publicly announced contracted capacity of corporate Power Purchase Agreements, Green Power Purchases, Green Tariffs, and Outright Project Ownership in the US and Mexico, 2012-2017YTD. Excluded on-site generation such as rooftop solar PV and deals with operating plants.

Source: Business Renewables Center

Corporate renewable procurement was made possible by favorable economic incentives and market deregulation



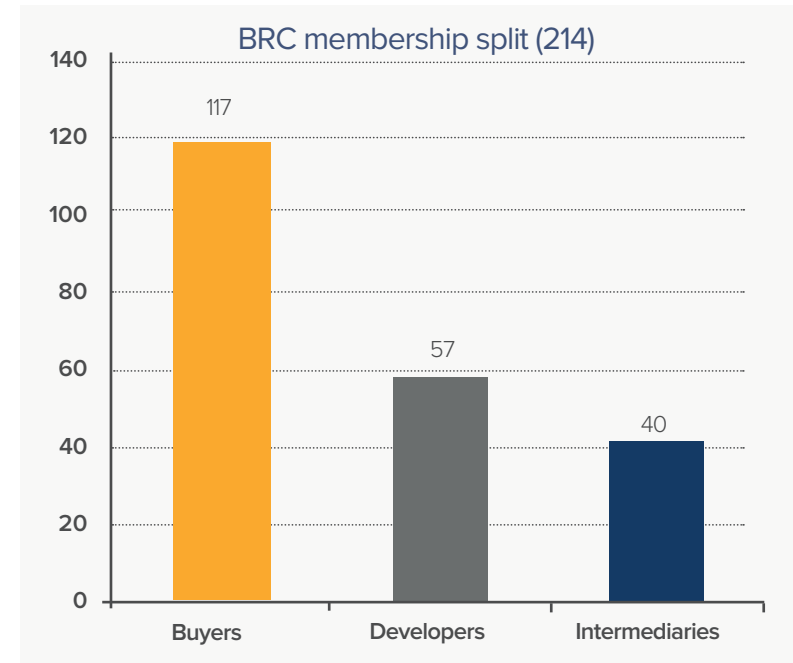
Market Deregulation

- More than half of areas in the US are open to corporations purchasing renewable directly. Deregulated wholesale markets cover a geographic area that accounts for two-thirds of US GDP.
- While there are procurement examples (e.g., green tariffs) in regions with vertically-integrated utilities, the vast majority (95%) of transactions in the US occur where electricity markets exist.

Improving Economics

- Thanks to geographic advantages, many US states are rich in wind and solar energy. Alongside technological progress and falling costs for renewable energy, the current price of wind and solar power are often economically attractive to corporations.
- Tax credits lower the price of wind power and solar energy. In late 2015, Congress extended the Renewable Electricity Production Tax Credit (PTC) for wind and the Investment Tax Credit (ITC) for solar. While both the ITC and the PTC were renewed, both credits are scheduled to decline over time. However, it is expected that renewables costs will continue to fall and they will be increasingly competitive in the market.
- Accelerated depreciation accounting rules and tax abatement provided by state and local governments also contribute to the favorable economics of renewable projects.

Business Renewables Center US is a member-led organization that streamlines and accelerates corporate purchases of renewable power

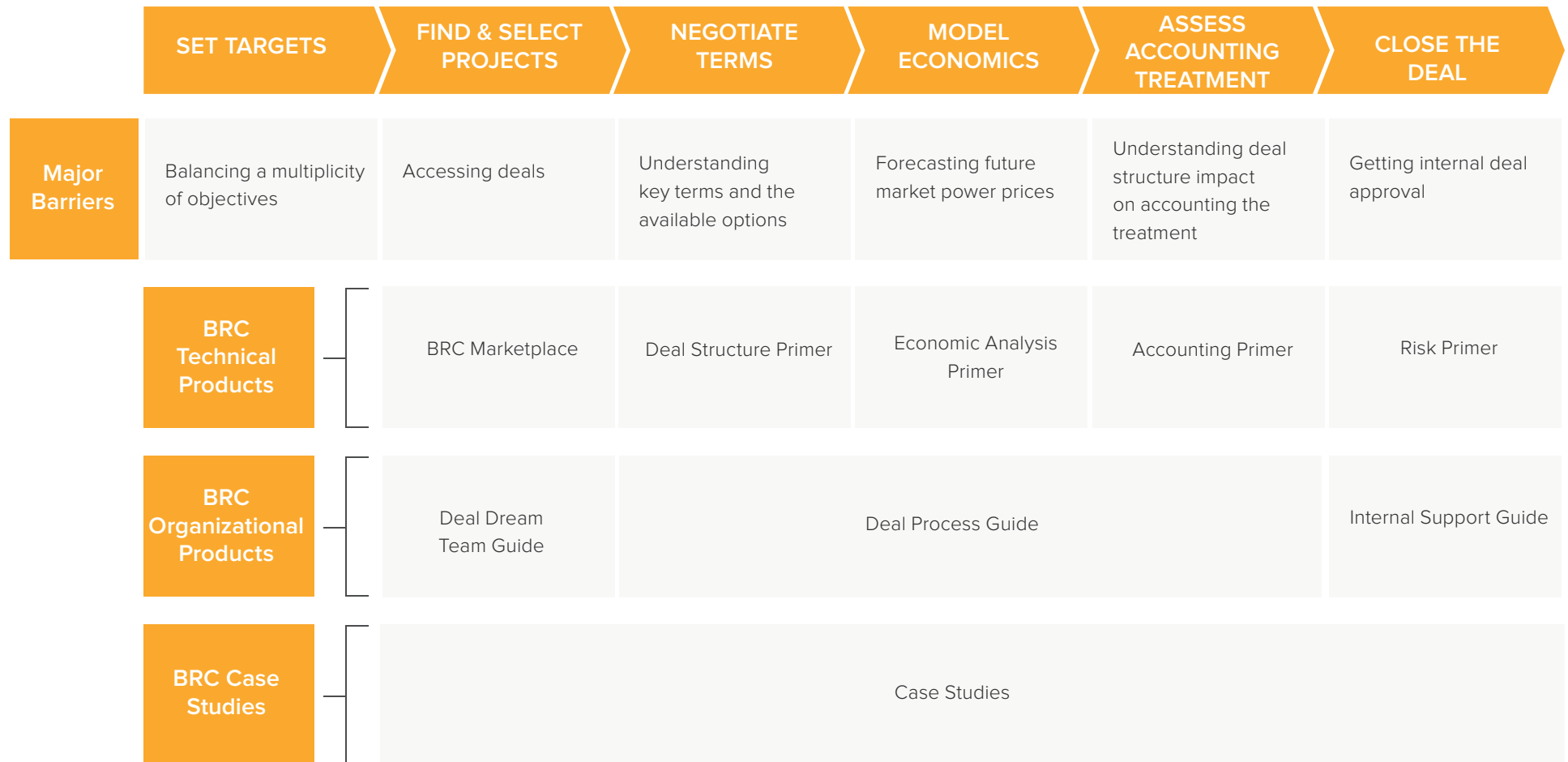


BRC started with 28 members, and has grown to an organization with more than 200 members. To date, 94% of the deals done to date in the US involve at least one BRC member.

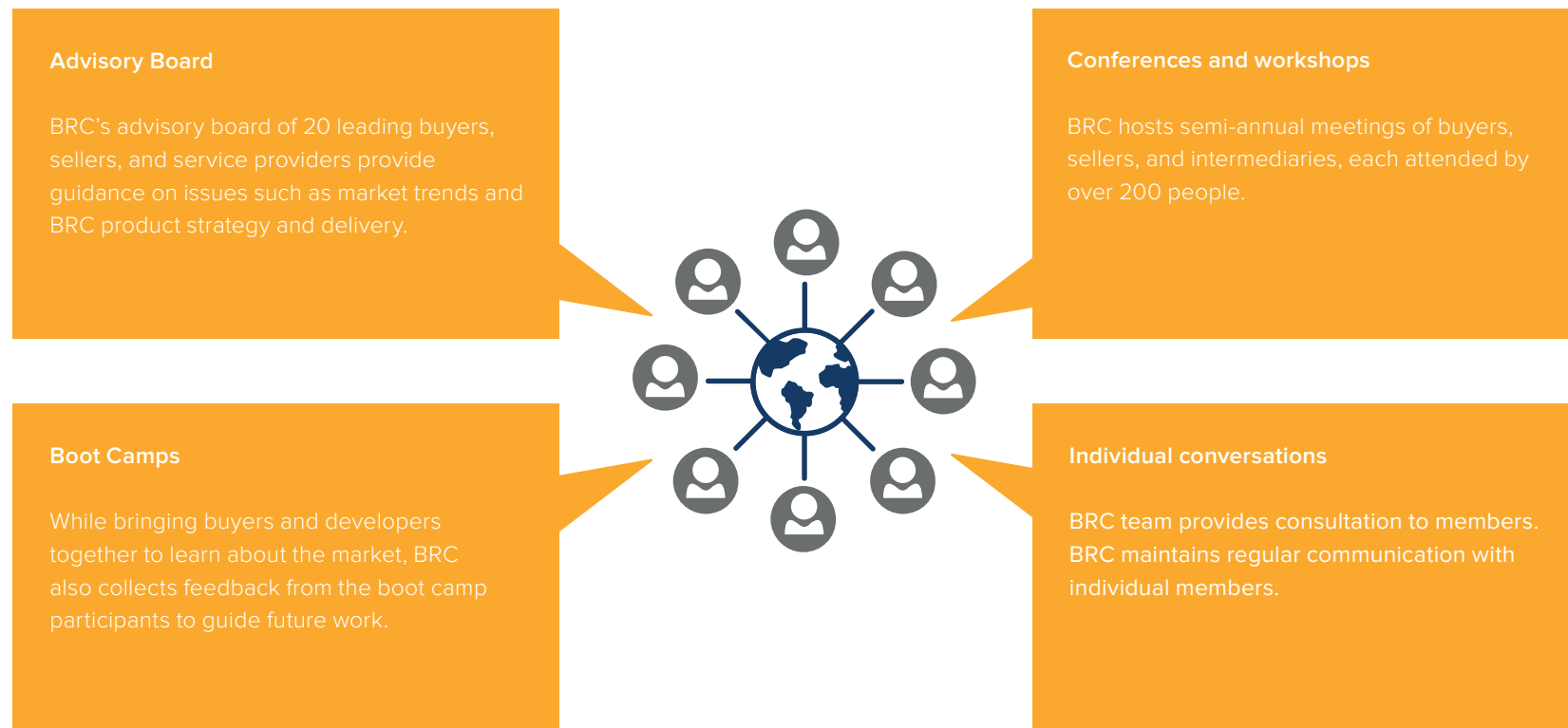
BRC US rapidly responds to members' needs and takes action as the market evolves

	NEED		ACTION
TRACK I	New buyers need to understand common challenges and how to overcome them, as well as how to start engaging their internal team at an early stage.		<ul style="list-style-type: none"> BRC produced case studies and written guides to common challenges (e.g., accounting, risks, economic analysis). BRC developed a detailed roadmap of how and when to engage internal stakeholders as well as a template pitch deck to present to CFOs.
TRACK II	New buyers and developers require a deep understanding of the entire transaction process.		<ul style="list-style-type: none"> BRC designed and holds bi-annual Buyers' Boot Camp, leading buyers through the transaction process. BRC hosted the first Developers' Boot Camp, walking developers through the buyer's internal process to enable stronger solution providers.
TRACK III	Access to standardized transaction documents and visibility into available projects in the market accelerate the process for both buyers and sellers		<ul style="list-style-type: none"> BRC created term sheets and customizable RFP templates to make transactions more efficient. BRC established an online platform to enable an efficient meeting place for offsite renewable energy PPA transactions.
TRACK IV	Experienced buyers and sellers looking for a deeper understanding of market conditions require sophisticated analytical tools.		<ul style="list-style-type: none"> BRC created the Fair Value Tool to help buyers understand how project revenues and costs vary across the US, and help sellers quickly identify the locations where electricity's value exceeds estimated project costs. Future tools will analyze grid congestion to identify locations where curtailment is more likely.

BRC US provides tools and resources to help members overcome barriers and complete deals faster, easier, and better



BRC US determines needs of the market through frequent member engagement



Those interactions allow BRC team to continuously learn the market participants' views on:

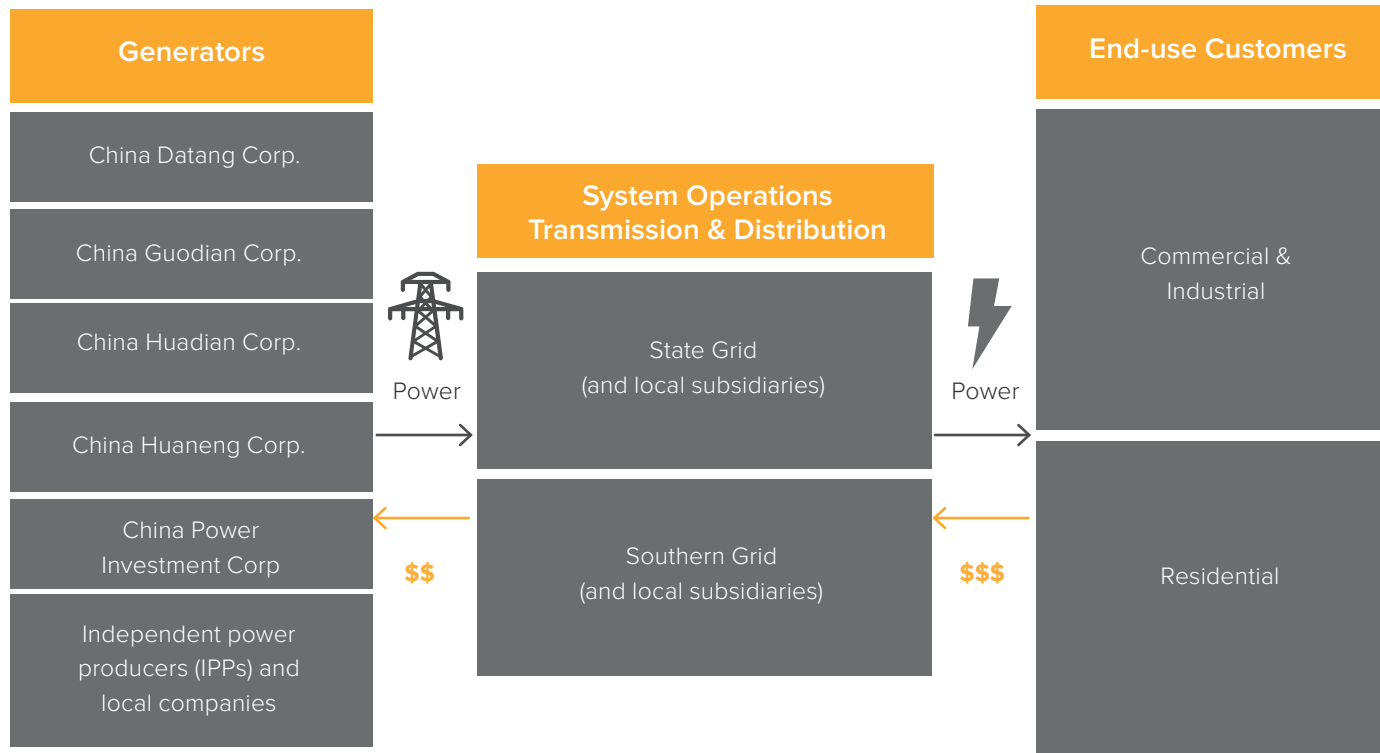
- Challenges in the market
- Ways the BRC could address those challenges
- Expectations for the future

03

THE EMERGING LANDSCAPE IN CHINA FOR CORPORATE RENEWABLE PROCUREMENT



China's power sector is largely managed by state-owned enterprises with regulated prices



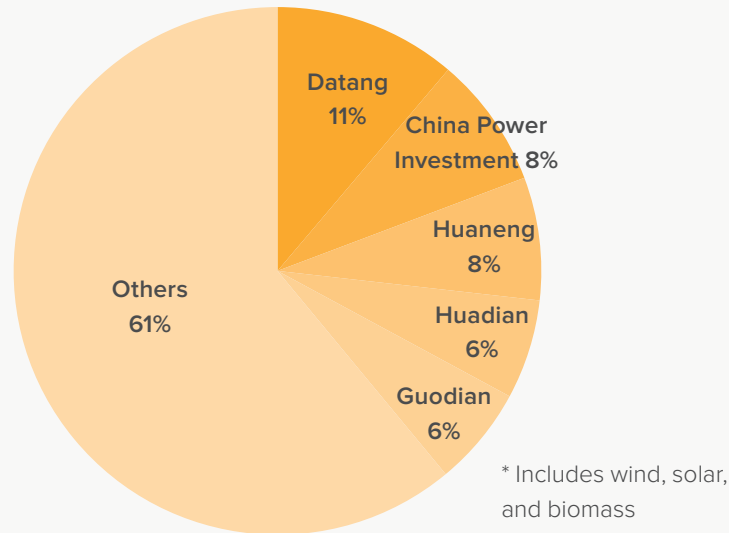
In China, both wholesale and retail power prices are regulated by the government, and are not updated regularly. China's power system rewards generators based on the amount of electricity produced, meaning generators are incentivized to produce as much electricity as possible. Despite aggressive goals for renewable energy, the current pricing mechanism provides insufficient incentives for generators to lower their thermal operation hours to allow for more renewable generation.

Grid companies profit from providing T&D and system operation services, though the cost of that is not publically available. A conflict of interest may exist — if companies lose revenue streams if direct purchasing between end users and generators is allowed.

Major renewable energy players are big SOEs

2016 Non-hydro* Renewable Installed Capacity

**TOTAL CAPACITY:
238 GW**



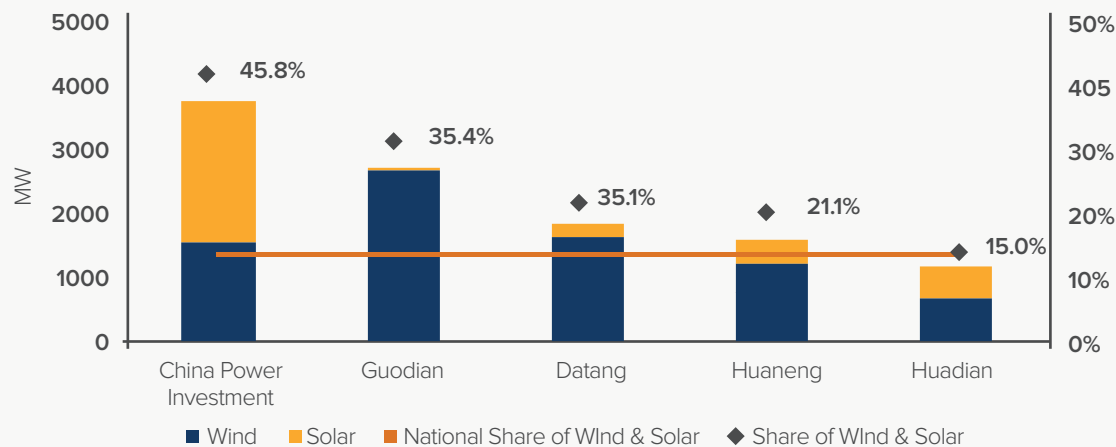
At the end of 2016, total installed capacity in China reached:

- 149 GW for wind and
- 77 GW for solar,

accounting for about 13.7% of total power capacity.

State-owned enterprises are key players in renewable development. The "Big 5" generators together contribute to 39% of the total non-hydro renewable capacity installed (wind, solar, and biomass) in 2016. Generator's national average share for wind and solar for total installed capacity in China is 13.9%. In 2016, the Big 5 generation companies planned new capacity in 2016 for wind and solar exceeded the national average.

2016 Capacity Installation for "Big 5" (planned)



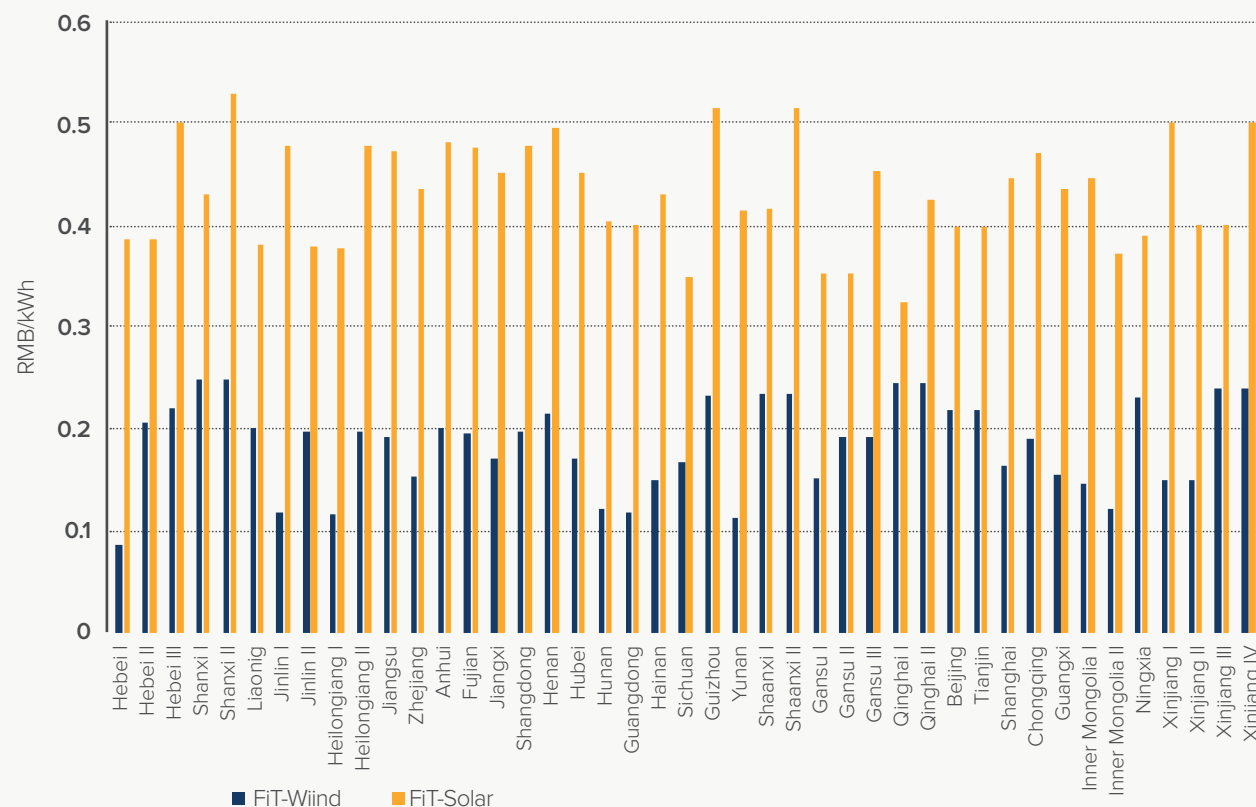
China dispatches power through Equal Allocation Dispatch or Energy Efficient Dispatch

	DESCRIPTION	ISSUES
EQUAL ALLOCATION (EA)	<ul style="list-style-type: none"> In 27 provinces, “operators dispatch coal-fired generators to maintain approximately equal capacity factors for all [plants] to allow them an equal chance to ... earn a reasonable ROI”¹ 	<ul style="list-style-type: none"> Inefficient plants operate as much as efficient plants Renewables are not prioritized Uneconomic plants are not retired
ENERGY EFFICIENT DISPATCH (EED)	<ul style="list-style-type: none"> Starting in 2010, eight provinces began dispatching power based on generation type. Hydro, nuclear, and renewable energy are prioritized over thermal plants Thermal plants are prioritized based on heat rates (efficiency) 	<ul style="list-style-type: none"> Wholesale prices are not adjusted, resulting in limited incentives for stakeholders to adopt EED System costs are too high Merit order is not flexible (e.g., natural gas always prioritized over coal)

While eight provinces adopted Energy Efficient Dispatch in 2010, Equal Allocation Dispatch is still widely used in China and does not prioritize renewable energy or more efficient thermal plants. As a result, renewable power is curtailed, often at high levels. This also hinders renewable procurement deals between buyers and generators, since there is no guarantee that the amount of renewable power generated can be dispatched to the grid.

The development of renewable energy has been mainly driven by feed-in tariffs that are likely to be phased out

Feed-in-Tariffs (FiT) for Solar and Wind Power Across China



The government sets the price for wind and solar feeding into the grid based on region (these are mostly set at the provincial level but some are set at the city level). For example, Qinghai has the lowest FiT for solar at 0.33 RMB/kWh, while parts of Shanxi have the highest at 0.53 RMB/kWh. The feed-in-tariff varies regionally.

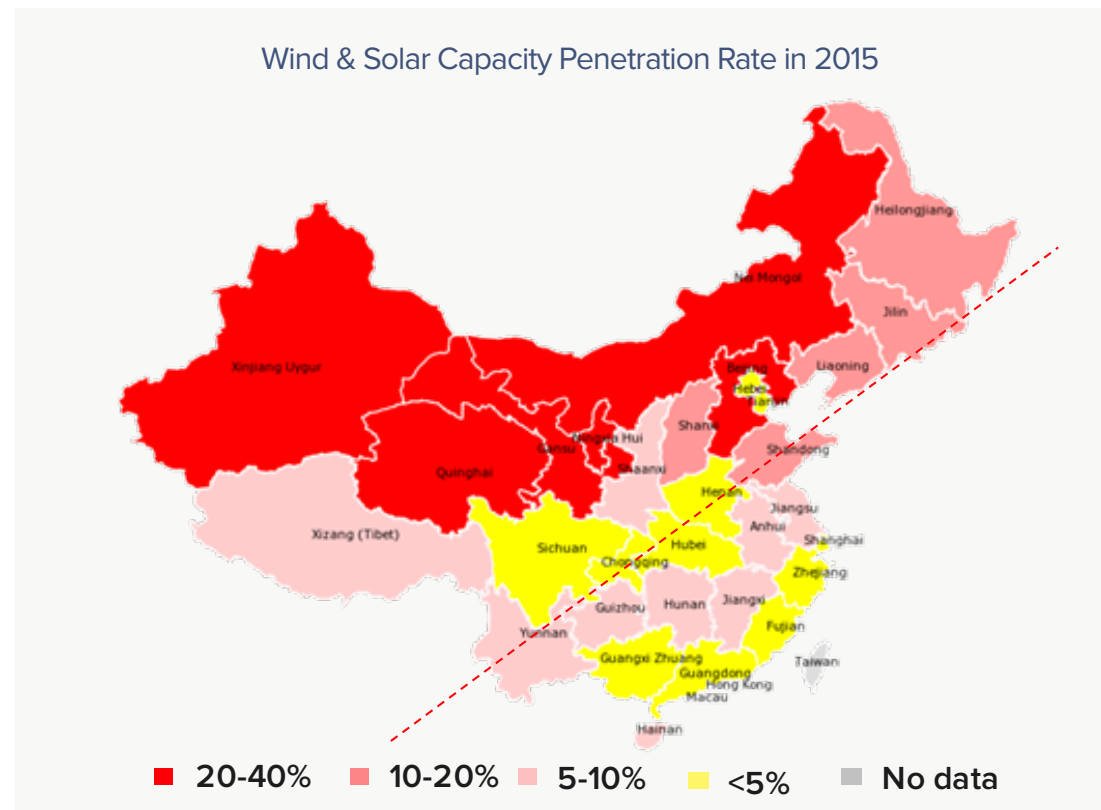
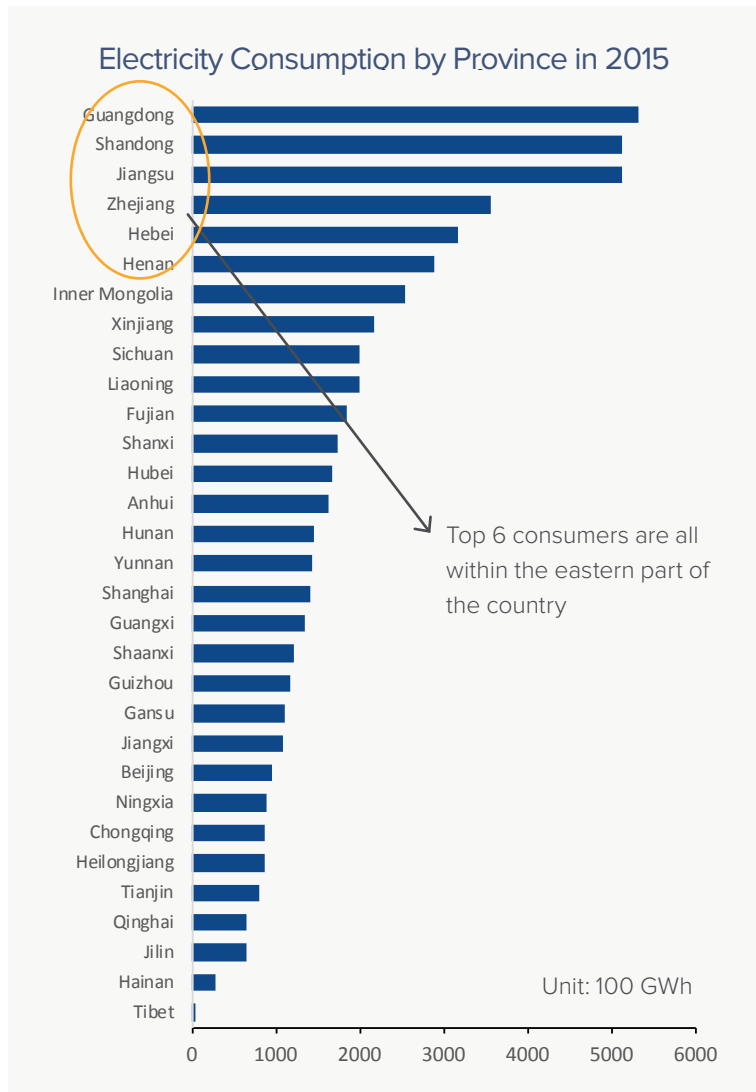
This has implications for China's pilot REC market, which began in July 2017. China's pilot REC market is aimed at replacing and phasing out China's subsidy (FiT) for wind and solar (more on RECs in the next section).

Note: I, II, III reflects different regions within the province accordingly to resource zones defined in Benchmarking Prices for Wind and Solar.

In Tibet, the benchmarking price for solar is set separately from those defined resource zones at 1.05RMB/kWh

Source: 国家发改委(NDRC).

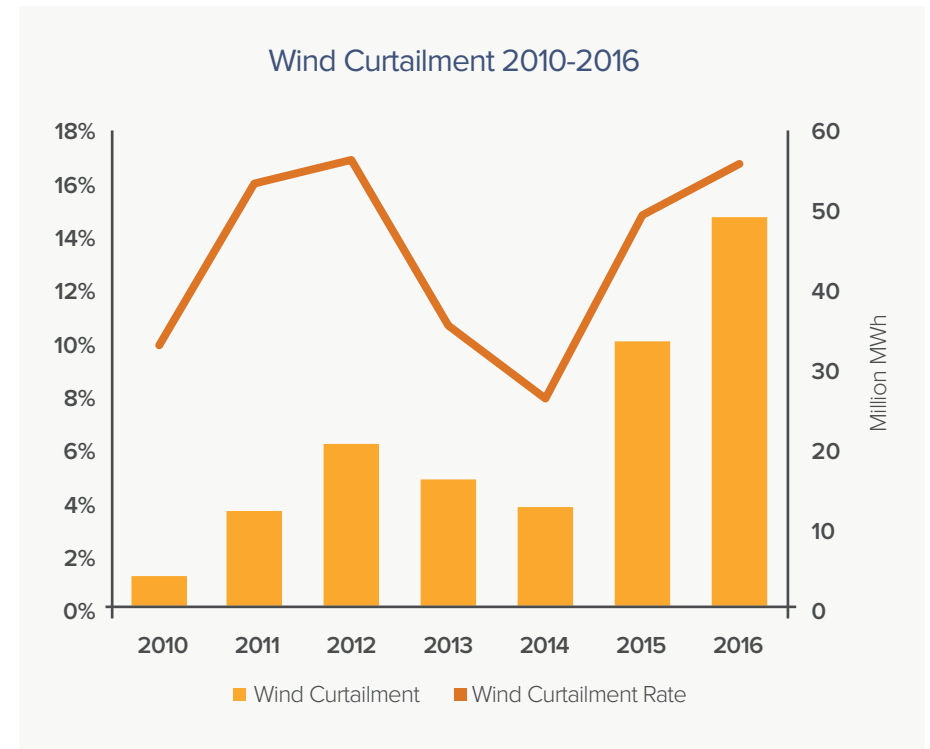
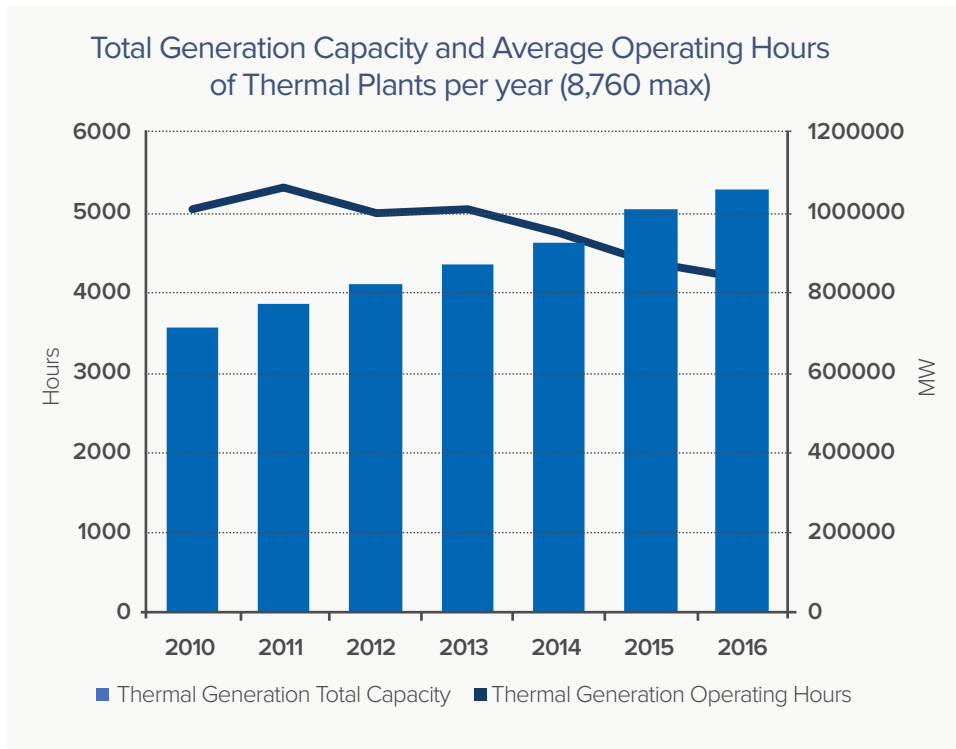
China's renewable resources are concentrated in the North and West while demand centers are in the South and East



In 2015, wind capacity in China accounted for 33.6% of total global wind capacity. The US – the second largest market for wind energy – accounted for 17.2% of global capacity. In 2016, China further grew its global market share to 34.7%. China also has the largest solar capacity worldwide.

Renewable resources in China are concentrated in northwestern regions. In Gansu Province, wind capacity topped 12.8 GW in 2016 and solar capacity reached 6.9 GW; Xinjiang exceeded 17.8 GW for wind and 8.6 GW for solar. On the other hand, electricity demand is strongest in the eastern part of the country.

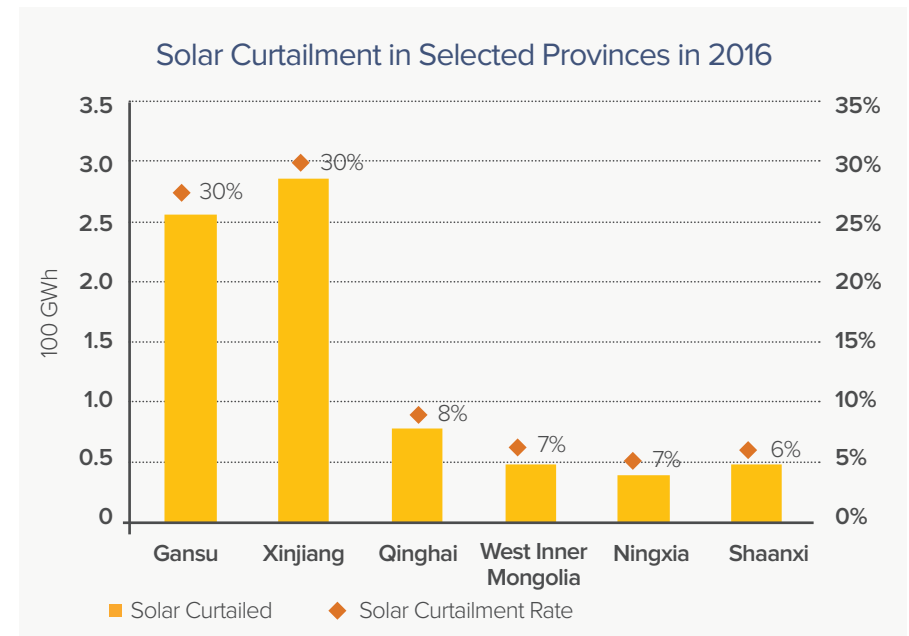
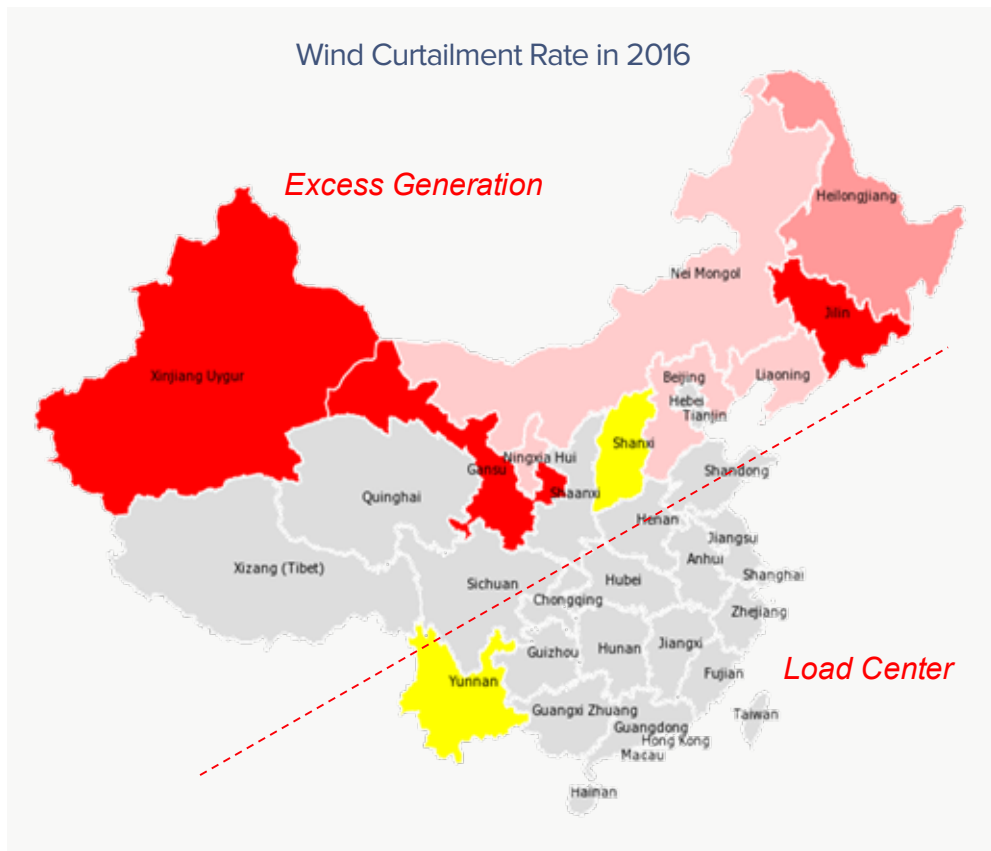
China continues to increase total installed capacity, leading to lower thermal generation run times and increased wind and solar curtailment



China's growth in installed capacity outpaces growth in demand. Despite steady capacity growth in the past few years, thermal generation operating hours have declined. Meanwhile, renewable curtailment is a serious problem. In 2016, total wind curtailment was 49.7 million MWh. Solar curtailment was more than 3.8 million MWh in China's northwestern region in the first half of 2016 alone.

According to EIA data, wind turbines operating in 40 US states generated a record total of 226 million MWh during 2016; and in EU, total generation was almost 300 million MWh. During the same time period, the amount of wind curtailed in China was equivalent to 22% of total US generation and 17% of generation in the EU.

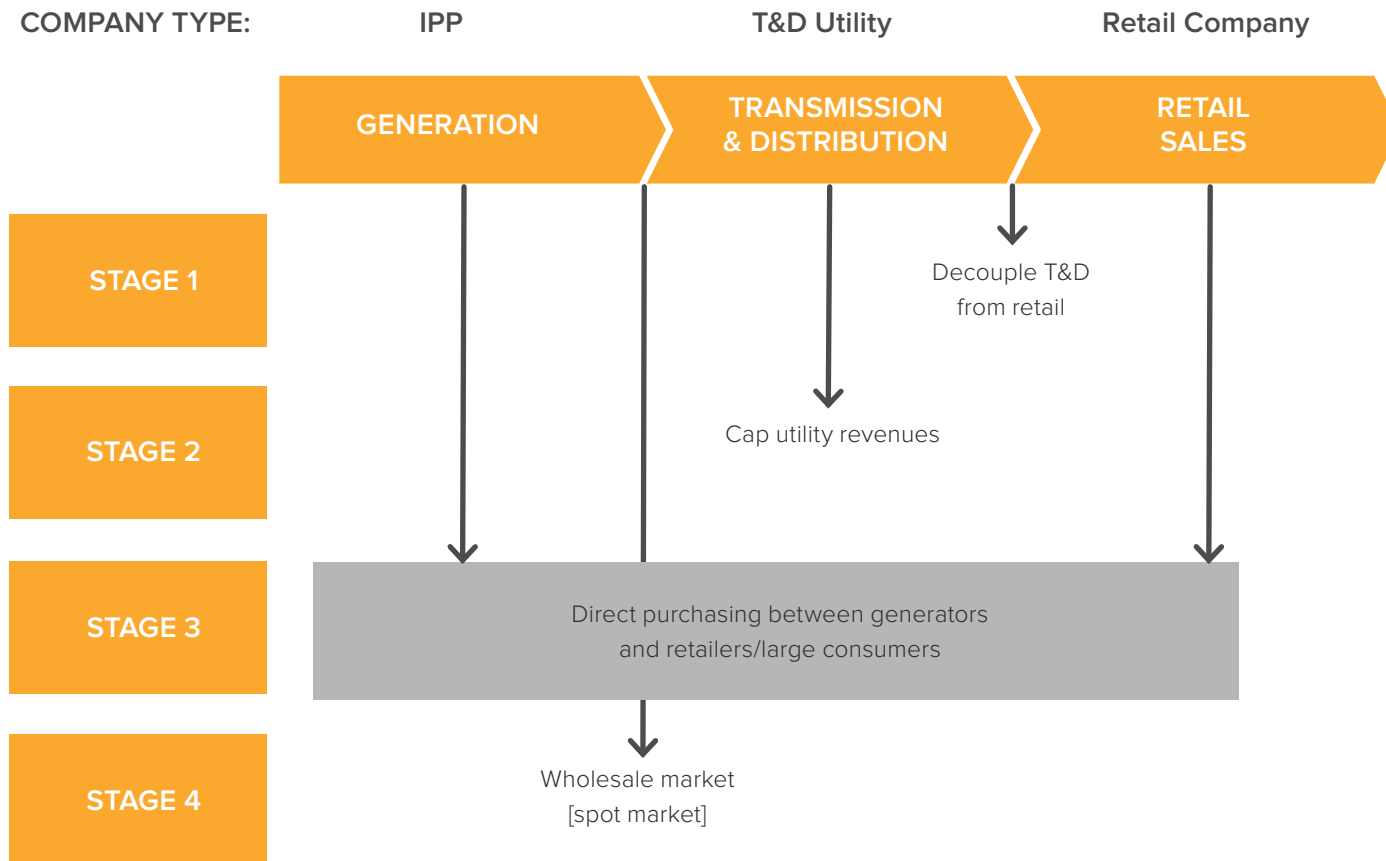
High levels of curtailment and small balancing areas add complexity to procurement



Curtailment is most severe in China's northwestern regions mainly because of the imbalance of renewable resources and local electricity demand. In Gansu province, the curtailment rate was 43% for wind and 30% for solar in 2016.

Lack of infrastructure (e.g., inter-provincial HVDC lines) and small balancing areas further prevents the exportation of renewable power across provinces and regions, which restricts market scale and adds complexity for renewable procurement.

Recent reforms are creating opportunities for market-based solutions for renewable integration from every point in the value chain, with a focus on customers and retailers



In March 2015, China kicked off a new round of power sector reform, which aims to further establish and open up the retail market for electricity and improve renewable integration.

There are four general stages of the reform:

- Stage 1 – to decouple T&D from retail, allowing more retail companies to enter the market.
- Stage 2 – to cap T&D revenues, which requires verification and design of T&D pricing.
- Stage 3 – to promote direct purchasing between generators and retailers and/or large consumers.
- Stage 4 – to establish a wholesale market with marginal cost based dispatch mechanisms, and eventually create a fully functioning spot market.

BRC China seeks to accelerate development of renewable procurement market, especially for corporate buyers, addressing Stage 3 of the power reform.

Following recent reforms, detailed policy documents are paving the way for renewable procurement

	POLICY & MILESTONE	IMPLICATIONS
Mar 2015	<ul style="list-style-type: none"> Opinions on Further Deepening the Reform of Power System 《关于进一步深化电力体制改革的若干意见》 	<ul style="list-style-type: none"> Kicked off a new round of power reform that steadily pushes for retail reform
May 2015	<ul style="list-style-type: none"> Notice on Improving Interprovincial Transaction Power Price Mechanism Issue 《关于完善跨省跨区电能交易价格形成机制有关问题的通知》 	<ul style="list-style-type: none"> Standardizes the interprovincial transaction rules and the structure of mid- and long- term contracts
Nov 2015	<ul style="list-style-type: none"> Opinions on the Promotion of Power Transmission and Distribution Price Reform 《关于推进输配电价改革的实施意见》 Opinions on the Promotion of Power Market Establishment Implementation 《关于推进电力市场建设的实施意见》 Opinions on the Formation and Operation of Power Trading Organizations 《关于电力交易机构组建和规范运行的实施意见》 Opinions on the Promotion of Retail Side Reform of Power System 《关于推进售电侧改革的实施意见》 	<ul style="list-style-type: none"> The supporting documents clearly points the reform direction towards a transparent and independent power transmission and distribution price system, establishing relatively independent power transaction organizations, forming fair and standardized market platform, and opening the competition retail side market
Mar 2016	<ul style="list-style-type: none"> Interprovincial power transaction centers established in Beijing and Guangzhou Retailers participated in monthly power bidding transaction in Guangdong province Full-amount Guaranteed Procurement Method for Renewable Energy 《可再生能源发电全额保障性收购办法》 	<ul style="list-style-type: none"> Power transaction centers are piloted and aim to promote direct transactions between generators and buyers Attract private-sector capital into the power retail market Reduce curtailment
July 2016	<ul style="list-style-type: none"> Temporary Rules for Direct Transactions Between Generators and Big Power Consumers in Beijing - Tianjin - Tangshan Grid 《京津唐电网电力用户与发电企业直接交易暂行规则》 	
Aug 2016	<ul style="list-style-type: none"> Transaction Rules for Power Centralized Bidding in Jiangsu Province 《江苏省电力集中竞价交易规则（试行）》 Guangzhou Power Transaction Center Market Management Committee established. It's the first market management committee for regional market in China 	

Following recent reforms, detailed policy documents are paving the way for renewable procurement (continued)

	POLICY & MILESTONE	IMPLICATIONS
Aug 2016	<ul style="list-style-type: none"> Trading Rules for Interprovincial Spot Market of Incremental Renewable Energy (Draft) 《跨区域省间可再生能源增量现货交易规则（征求意见稿）》 	<ul style="list-style-type: none"> Start spot market trading for incremental demand via interprovincial transmission lines; Focus on conducting day-ahead and real-time transaction for curtailed renewables
Dec 2016	<ul style="list-style-type: none"> Basic Rules for Mid- and Long-Term Power Transactions (Temporary) 《电力中长期交易基本规则（暂行）》 Pricing Method for Transmission and Distribution in Provincial Level Grid (Trial) 《省级电网输配电价定价办法（试行）》 	<ul style="list-style-type: none"> Standardizes the trading, transaction procedures, and operation mechanism of mid- and long- term power market, which are mainly based on direct purchasing Standardizes the power transmission and distribution pricing principals and calculation methods for provincial level grid
Feb 2017	<ul style="list-style-type: none"> Notice on the Implementation of Trading and Certifying system of Voluntary Renewable Energy Certification 《关于实行可再生能源绿色电力证书核发及自愿认购交易制度的通知》 	<ul style="list-style-type: none"> Pilots voluntary renewable energy certification market (RECs). Officially launched on July 1st, 2017
Mar 2017	<ul style="list-style-type: none"> Comments gathering for the Notice of Developing Market Transaction Pilots of Distributed Power 《关于开展分布式发电市场化交易试点的通知》征求意见函 	<ul style="list-style-type: none"> Allows for distributed renewable energy to be integrated directly via nearby distribution lines and consumed locally. Areas with relatively large load, such as industrial park, will be the initial pilots

There have only been a limited number of renewable deals to date

Negotiated Bilaterals

- Wind-thermal bundling DPP in Inner Mongolia
- Wind and solar deals in Gansu
- Hydro deals in Yunnan and Sichuan

Centralized Bidding

- Yindong deal (solar and wind sent from Gansu, Ningxia to Shandong) through the Interprovincial Transaction Center

Direct Investment

- A few direct investments in solar plants in Sichuan and Inner Mongolia, and wind plants in Henan, Shandong, Shanxi and Yunnan

Retail Companies

- Operational mostly in Guangdong, but without renewable deals
- Limited numbers of retail companies are exploring renewable deals in Inner Mongolia and Sichuan

Renewable Spot Market

- Qinghai piloted and sent the power to Zhejiang and Jiangsu
- Xinjiang released policy design documents

REC

- National REC pilot started on July 1st, Green-e Purchasing Online Platform established
- Generators are wide spread, mainly from the “Sanbei” area. The map shows where the national REC suppliers are



While new policies look supportive for corporate renewable procurement, barriers still limit opportunities

SYSTEMATIC BARRIERS TO RENEWABLE INTEGRATION

- Equal allocation policy and the absence of the wholesale market make integration of renewable power challenging
- State ownership of major market players make project financing and economic incentive less important for developers than in other markets

BARRIERS TO RENEWABLE DIRECT PURCHASING

- High transaction costs
 - Lack of stakeholder knowledge and capacity
- May not improve stakeholder economics
- Curtailment risk
- Grid constraints on absorbing additional renewable power
- Interprovincial transmission congestion
- Monitoring and verification



**BUSINESS
RENEWABLES
CENTER**

A ROCKY MOUNTAIN INSTITUTE INITIATIVE

BRC China aims to address existing barriers and explore solutions to scale renewable deals by convening stakeholders to have open discussions, creating a networks of buyers eager to be pioneers, and providing them with resources and tools as needed.

The team has done extensive research – identifying and starting to evaluate possible mechanisms for renewable procurement in China, which will be discussed in the next section.

04

EXISTING AND EMERGING MECHANISMS IN CHINA



Recent reforms may allow various options for large-scale renewable procurement

1	Renewable Energy Certificates (RECs)	<ul style="list-style-type: none"> Certificates that represent renewable generation; customers purchasing RECs can claim that amount of renewable electricity consumed
2	Negotiated Bilaterals	<ul style="list-style-type: none"> Direct contract signed between renewable generators and corporate buyers
3	Centralized Bidding	<ul style="list-style-type: none"> Buyers and generators transact through a centralized match-making platform
4	Interprovincial Renewable Spot Market	<ul style="list-style-type: none"> Dedicated to dispatching otherwise curtailed renewables in northern and western provinces
5	Retail Companies	<ul style="list-style-type: none"> Retail companies resell power to commercial and industrial (C&I) customers
6	Virtual PPA (VPPA)	<ul style="list-style-type: none"> A financial agreement between a corporate buyer and a renewable generator
7	Direct Investment in Utility-Scale Renewables	<ul style="list-style-type: none"> Companies directly invest in renewable projects, owning a share of renewable project
8	Onsite Solar and Wind	<ul style="list-style-type: none"> Companies install distributed renewables onsite
9	Community Solar	<ul style="list-style-type: none"> Companies buy excess renewable generation from neighbors onsite generation

Mechanism #1: REC market

DESCRIPTION

What is it?

- Renewable Energy Certificates (RECs) are certificates verifying the generation of renewable electricity. Customers that purchase RECs can claim they are consuming renewable electricity.
- There are two markets for REC in China: one national REC market recently established by the government, the other an international REC market operated by an international REC issuing organization.
- The national REC Market requires generators to choose between the government FiT or RECs. Developers must forego the government's FiT subsidy if they sell RECs to corporate buyers, indicating that the purpose of the REC market is to replace the government subsidy.
- The domestic REC price cannot exceed the FiT. REC prices differs by technology and geography.
- No secondary market exists yet.
- The government has lowered the FiT over the past few years and many believe it will disappear completely, forcing developers to either enter the REC market or find another source of revenue.

Pros & Cons:

- For buyers: RECs are fast and achievable in the short term and are one of the simpler mechanisms.
- But buyers pay a price premium on top of their retail energy bill for RECs, and there's no additionality.
- For generators: RECs are potentially a faster way to get subsidy (the government FiT suffers from long delays), but the revenues are either equal or lower than the FiT.

EXAMPLES

National REC

- The national REC pilot started on July 1, 2017.
- Both corporations and individuals can purchase RECs from the Green-e Online Purchasing Platform.
- The daily average price for the first three weeks of September ranged from 137 RMB/MWh to 300 RMB/MWh for wind, and ranged from 627 RMB/MWh to 750 RMB/MWh for solar.¹

International REC

- Tetra Pak bought solar RECs in Jilin to power their plant in Beijing.²
- Novo Nordisk bought wind RECs in Tianjin to power their local plant.³

OUTSTANDING QUESTIONS

- Will there be a secondary market for REC in the future?
- Will the domestic REC market replace international RECs, will the two systems merge, or will there be distinct markets for both systems (i.e., international RECs cover renewable power built pre 2017 and the domestic market covers new build?)

Note:

¹ <http://www.greenenergy.org.cn/history/echarts.jhtml>

² <http://www.cnbc.com/2017/05/16/tetra-pak-announces-big-boost-in-renewable-electricity-use.html>, <http://3blmedia.com/News/Tetra-Pak-Uses-More-one-Third-Renewable-Electricity>

³ <http://www.prnasia.com/story/161974-1.shtml>

Mechanism #2: Negotiated bilaterals

DESCRIPTION

What is it?

- Negotiated bilaterals are direct contracts signed between generators and corporate consumers (normally within a province).
- Each province has established its own power transaction center. Customers and generators need to be included in a government-designated list to transact in the provincial transaction centers.
- In general, transactions are limited within a single provinces (i.e., if a consumer's load is in Jiangsu, the bilateral must be signed with a generator in Jiangsu).

Pros & Cons:

- Bilateral contracts are straightforward for consumers to claim ownership.
- Procuring power from another province – where renewable supply may be more readily available – is challenging because of barriers to secure interprovincial transmission capacity.
- It's hard for medium sized customers or developers to get in the government catalog.

EXAMPLES

- Gansu completed 2.3 TWh renewable bilateral deal in 2016.
- Inner Mongolia piloted DPP that bundled wind and thermal power.
- Guangdong and Jiangsu are exploring interprovincial bilateral deals with hydro generators in Yunnan and Sichuan.

OUTSTANDING QUESTIONS

- Are buyers willing to sign bilaterals within a province if it's not additional?
- Should renewable bilaterals be priced differently than thermal power?
- Do negotiated bilaterals include RECs? (In other words, are bilaterals bundled deals)?

Mechanism #3: Centralized bidding

DESCRIPTION

What is it?

- Both intraprovincial and interprovincial transaction centers offer centralized match-making platforms for buyers and generators.
- Buyers and generators submit bid and offers, and the market clearing price is determined by demand and supply.
- Buyers get a discounted price (from the government-set catalog price) for undifferentiated power.

Pros & Cons:

- This is an emerging mechanism with few deals.
- Buyers can only bid into the system in specific regions (this may change in the future).
- The portion of renewable generation within the total transaction is fixed and higher than the grid average.
- Buyers' preferences do not influence the mix of renewable/thermal generation.
- The additionality argument is still murky – while interprovincial transaction centers may take otherwise curtailed power, there's no tracking system or agreement on whether this is additional in China.

EXAMPLES

- Intraprovincial: Guangdong monthly market, but no renewables yet
- Interprovincial: Yindong deal in 2016, 40% renewables out of 9 TWh transaction from Gansu, Ningxia to Shandong

OUTSTANDING QUESTIONS

- Are generators/buyers motivated to sign VPPAs on top of centralized bidding?
- What is an acceptable discount for the centralized market?

Mechanism #4: Interprovincial renewable spot market

DESCRIPTION

What is it?

- An interprovincial spot market that's dedicated to transmitting otherwise curtailed renewables in the northern and western provinces.
- Buyers are limited to the grid companies but there's potential to extend buying rights to corporate consumers

Pros & Cons:

- There is a strong argument for additionality.
- It's still at a preliminary stage of development.
- It's challenging to match supply with demand because it's tough to set a fixed output for renewables.

EXAMPLES

- Xinjiang released its market design policy at the end of 2016
- Qinghai sent 6.4 GWh to Zhejiang and Jiangsu in the first pilot in February 2017
- Gansu is potentially piloting the renewable spot market in the second half of 2017.

OUTSTANDING QUESTIONS

- When can corporate consumers access the market?
- How is the pricing determined? If it's all renewables, could the clearing price be zero or negative?

Mechanism #5: Retail companies

DESCRIPTION

What is it?

- Retail companies are allowed to resell power to C&I customers and represent them in transaction center deals.

Pros & Cons:

- Retail companies can help customers with smaller loads enter deals or help companies with a low tolerance for price volatility be shielded from market risk.
- While thousands of retail companies registered (signaling high interest), the majority are not operational yet.
- Without a clear business model, it's difficult for retail companies to survive the price competition.
- In some regions, there are constraints about whether customers can still buy power from the utilities if they choose to buy from the retail companies. (Lack of fallback option).
- Currently there's no mechanism for additional, renewables procurement through retail companies.

EXAMPLES

- Guangdong: retail companies own 40% of the market share (no renewable deals yet).
- Sichuan: retail companies help corporations buy hydro power within the province.

OUTSTANDING QUESTIONS

- How can retail companies procure large-scale renewables?

Mechanism #6: Virtual power purchase agreement

DESCRIPTION

What is it?

- Virtual Power Purchase Agreement (VPPA) is a financial agreement between a corporate buyer and a renewable generator that provides
 - (1) additional renewable generation onto the grid,
 - (2) price stability for generators over the term of the contract, and
 - (3) a clear claim of additional renewable power for buyers in a province with limited renewable curtailment.
- Is likely to work only in areas without renewable curtailment.
- VPPA is an increasingly popular option in the US.

Pros & Cons:

- VPPAs could allow for Chinese and multinational companies in China to support further development of renewable power on the east coast.
- For buyers: procure renewable energy without large upfront investment, a tried-and-tested approach in other markets, can claim for additionality.
- For generators: contract allows for bank financing, price stability, alternative to government feed in tariff (FiT).
- The more uncertainty around market-based revenues, the more interests for generators to pursue VPPA.

EXAMPLES

- Not yet done in China

OUTSTANDING QUESTIONS

- Without a vibrant wholesale market, the hedging advantages in the US are not apparent. Will buyers still be sufficiently motivated?
- Can companies that lease their facilities but still have metered power use a VPPA?
- Is there a third-party regulation organization that can deal with dispute and settlement?
- Would buyers be comfortable signing a long-term contract, or would generators be comfortable signing a short-term contract?
- Are financial institutions in China comfortable with project financing?

Mechanism #7: Direct investment in utility-scale renewables

DESCRIPTION

What is it?

- Companies directly invest in utility-scale renewable projects, owning a specified share of the renewable project.

Pros & Cons:

- Companies have clear ownership of the additional renewables.
- There are fewer geographic constraints and more options for project types.
- It's not core to many businesses.
- It requires significant capital investment, as well as additional knowledge.
- Project developers may be not willing to share ownership unless companies can provide value adds other than capital.
- The economics might not be clear if the project is located in regions with curtailment problems.

EXAMPLES

- Apple invest in solar plant in Sichuan and Inner Mongolia. They also invested in wind plants in Henan, Shandong, Shanxi, and Yunnan, with an equity ratio of 30% in each plant.¹

OUTSTANDING QUESTIONS

- Will buyers be comfortable and capable to provide significant capital to non-core business?
- How do companies find the right project and local developer?
- Do companies require a higher equity ratio to invest in renewable projects in China?

Note:

¹ <http://news.solarbe.com/201511/25/92664.html>, <http://news.dahe.cn/2016/12-07/107892426.html>

Mechanism #8: Onsite solar and wind

DESCRIPTION

What is it?

- Companies put distributed renewables onsite so they can directly consume the power, and sell the excess power back to the grid.

Pros & Cons:

- The economics of rooftop solar project are often favorable.
- It's relatively easy and fast to process.
- Customers can claim clear renewable power consumption and additionality.
- While these deals can be significant, the amount onsite renewables can generate normally does not meet internal goals. For example, many companies can only produce 5-10% of load with onsite renewable generation.
- Buyers may hesitate to lock in a long-term deal with onsite renewables since they may think future power price are likely to decline or may want flexibility in future siting.
- Some companies have problems with credit-worthiness.

EXAMPLES

- IKEA and Mars installed rooftop solar on their retail stores or manufacturing facilities.¹

OUTSTANDING QUESTIONS

- If power prices decline, will distributed energy be economically competitive in China?
- How should this option be tailored for companies that do not own (or partly own) their facility?
- What is needed to scale this mechanism effectively and efficiently?

Note:

¹<http://solar.ofweek.com/2014-03/ART-260019-8460-28787853.html>, <http://www.china-nengyuan.com/news/93741.html>

Mechanism #9: Community solar

DESCRIPTION

What is it?

- Companies buy excess renewable energy from their neighbor's rooftop via distribution lines.
- The renewable power is not limited to rooftop solar, but could be other forms of distributed or even mid-scale renewables.
- China recently released policy documents regarding distribution fees for such options, indicating a future development pathway for this mechanism.
- Community solar is emerging with the industrial park microgrid development.

Pros & Cons:

- Customers can claim renewable power consumption and additionality.
- It's not constrained by a single company's rooftop or their ownership status.
- Construction on a company's own site is not needed.
- The scale may be larger than onsite renewables, but is unlikely to meet many company's internal goals for renewable generation.
- It's a relatively new policy and uncertainty around its direction exists.

EXAMPLES

- Not operational yet, but the national policy is encouraging pilots in industrial parks.

OUTSTANDING QUESTIONS

- Will the local grid support these deals?
- What's the price, time scale, and risk of such deal?

An initial evaluation of the potential mechanisms by the BRC team shows many possibilities, but many barriers

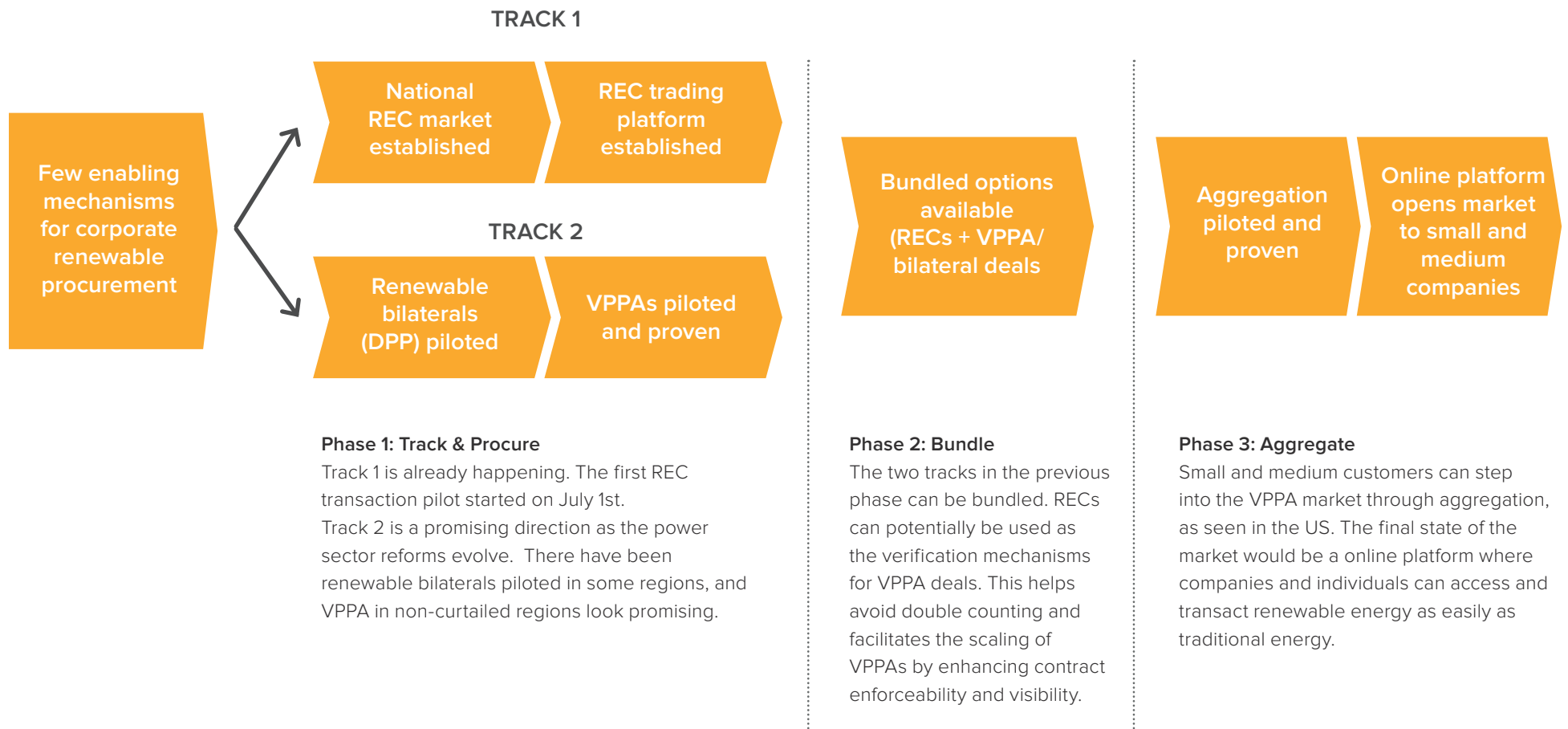
	Price premium vs. discount (+/~/-)	Ready to implement (+/-)	Additionality (+/~/-)	Scale (+/~/-)
	Do buyers pay a price premium, receive a neutral price, or get a discount?	Is the mechanism ready to be implemented?	Is the mechanism clearly additional, clearly not additional, or unclear?	Is the size of the deal large, small or uncertain?
REC	+	-	-	~
VPPA	~	-	+C	+
Negotiated bilaterals	-	+	~	+
Centralized bidding	-	+C	~	+
Spot Market	-	+C	+	+
Retail Companies	~	+C	+C	~
Rooftop Solar	-	+	+	-
Community Solar	-	-	+	-

+C: Only applicable to certain areas

Buyers considering transactions in China should answer the following questions to help choose the appropriate mechanism

	QUESTION	IMPLICATION	OPTIONS
Asset-based Questions	Are you in a region with curtailment?	Yes – it will be difficult to ensure the renewables contracts can be fulfilled if procuring within a single province, so the economics of direct purchasing deals may be unclear	If yes - RECs or rooftop solar circumvent issues tied to large-scale grid integration.
	Do you own or lease your facilities?	Lease – rooftop solar is challenging (dealing with landlords with a different incentive structure)	Pilot a contract between the company, the landlord, and the onsite renewable provider. Or, look at other mechanisms.
	For leased facilities: 1. Do you have metered power? 2. Can you determine where you source power?	If buyers have metered power, it provides more options. Buyers without data on actual consumption should look into options on how to verify consumption.	For buyers without consumption data, there's no clear mechanism. For buyers with metered power, RECs or VPPAs may be options.
	How big is your load?	Some mechanisms have a minimum consumption level (i.e., transaction centers) while other mechanisms may evolve to target small loads (i.e., retail companies)	Small - rooftop solar may cover a company's load. Medium – retail companies. Large – direct purchasing.
	Are your facilities concentrated in one/a few locations or distributed across the country?	Distributed loads offer additional complexity, especially if some loads are in curtailed regions and others are not.	Distributed - it might make more economic sense to sign virtual contracts (VPPAs or RECs) rather than entering every provincial market.
Strategic Questions	What is your timeline?	Buyers willing to be pioneers and set the direction for renewable procurement in China can act now. Buyers wanting to follow more established mechanisms are likely to wait.	For buyers with urgent timelines who are not willing to pilot/pioneer new mechanisms, RECs might be a good option.
	Do you have internal requirements on additionality?	While China's REC market is in the pilot stage, there's no clear tracking mechanism in China. The issue of additionality in China lacks clarity due to curtailment.	Yes - bilateral contracts within provinces might be the clearest path to additionality.

China is piloting tracking systems and procurement mechanisms, but combining these two may lead to a more robust market



05

APPENDIX: BRC US PRODUCT OVERVIEW



An advisory board engages on key issues and ensures that BRC US tackles the most pressing and relevant challenges for the market

BRC US ADVISORY BOARD

- Consists of 20 representatives of leading corporate buyers of renewable energy, project developers, and third-party service provider
- Meets quarterly
- Advises on market trends, product strategy, product delivery, membership recruitment, funding strategy, and external partnerships (i.e., with other NGOs)
- Provides feedback on hypotheses and actions proposed by BRC staff

Supports BRC staff to:

- Continuously learn the market participants' views on challenges in the market, ways the BRC could address those challenges, and expectations for the future
- Hone messages to be shared with the broader membership

BRC US supports market education through bootcamps for buyers and developers

BUYERS' BOOT CAMP

- Three days of intensive and in depth training on the fundamentals of the PPA transaction process
- Customized learning for corporate buyers seeking to navigate wholesale energy markets and utility-scale PPAs
- Small intimate groups create a 'safe place' to learn and ask questions
- Facilitated by RMI staff, with experienced buyers acting as faculty

DEVELOPERS' BOOT CAMP

- Tailored learning for developers to better 'know your customer'
- Detailed sessions explaining how and why buyers pursue renewable energy
- Directions on things to do and to avoid in responding to buyers' RFPs
- Walking developers through the buyer's internal process, to enable stronger solution providers

Through continuous interaction with membership and the board, BRC US rapidly responds to members' needs

ALLOCATION OF RISK

The need:

- In some contracts, developers failed to attract financing necessary to construct the wind or solar plant.
- In some contracts, buyers carried too much risk, leading to poor economic performance for the buyers.

The solution:

- The BRC recognized that both problems resulted from improper allocation of risk in the contracts.
- The BRC convened key buyers, sellers, financiers, and lawyers to explore more efficient risk allocation, which led to the development of a term sheet that buyers and sellers may use to negotiate a fair deal.

RFP EXPERTISE

The need:

- Many buyers new to this market did not understand how to run an RFP for utility-scale renewables, including what terms to include in the RFP document itself.

The solution:

- The BRC staff created an RFP template that buyers can customize and use, and it provided guidance on ways to run an effective RFP (e.g., when to award negotiation exclusivity).

DEAL APPROVAL

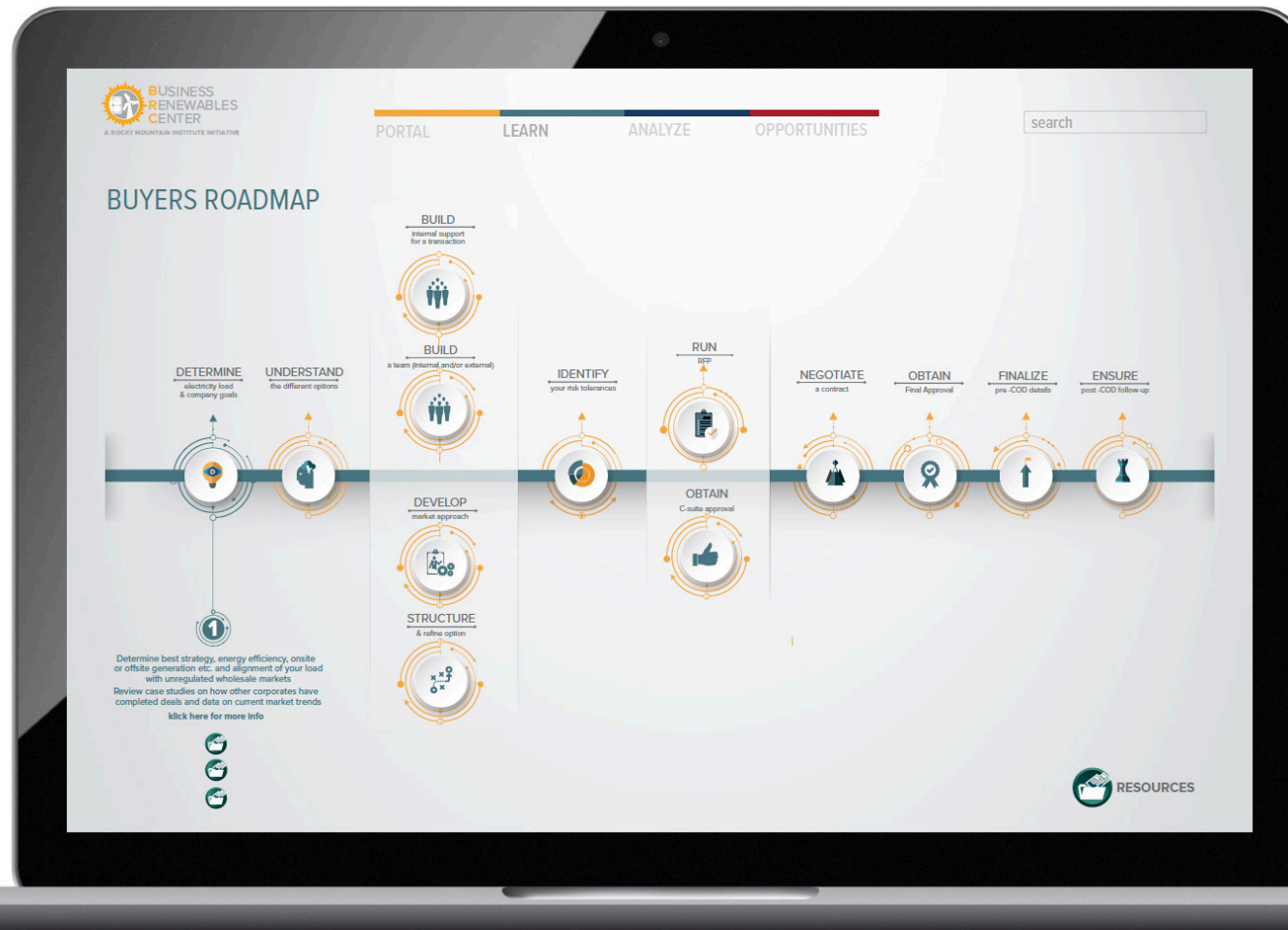
The need:

- For most corporate buyers, it is necessary to obtain the final approval of the CFO before the contract can be signed.
- Many buyers did not understand what the CFO's concerns would be or how to more effectively "sell" the deal internally.

The solution:

- The BRC staff developed written primers on accounting issues, deal economics, and risk.
- Additional resources include a detailed "road map" of when and how to engage internal stakeholders as well as a template "pitch deck" for use when presenting to the CFO.

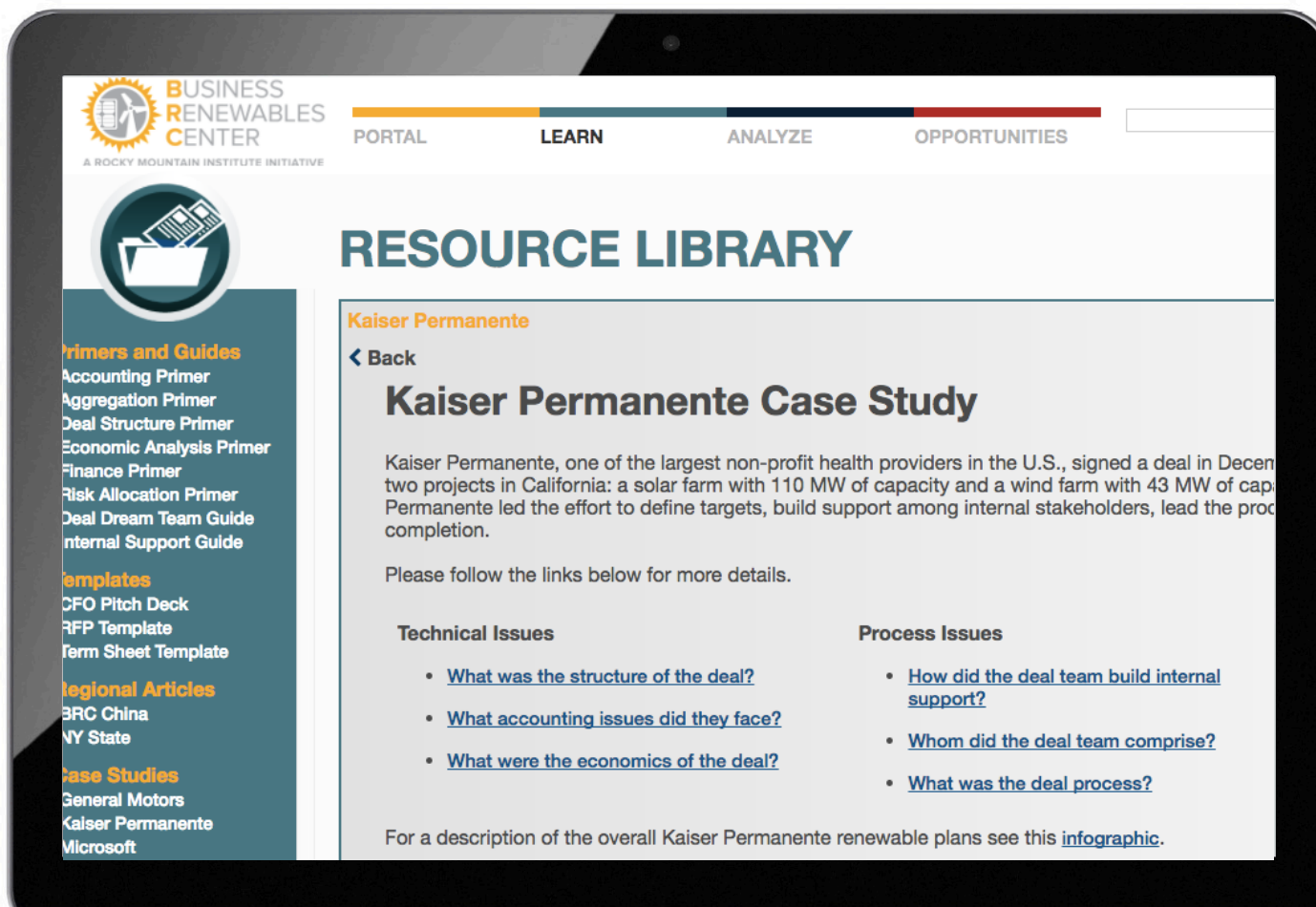
BRC US Buyer's Roadmap walks new and experienced buyers through the entire procurement process, directing buyers to relevant resources.



Buyer's Roadmap

- Breaks down procurement into nine steps
- Lays out resources and actions for each step, based on the membership's collective experience

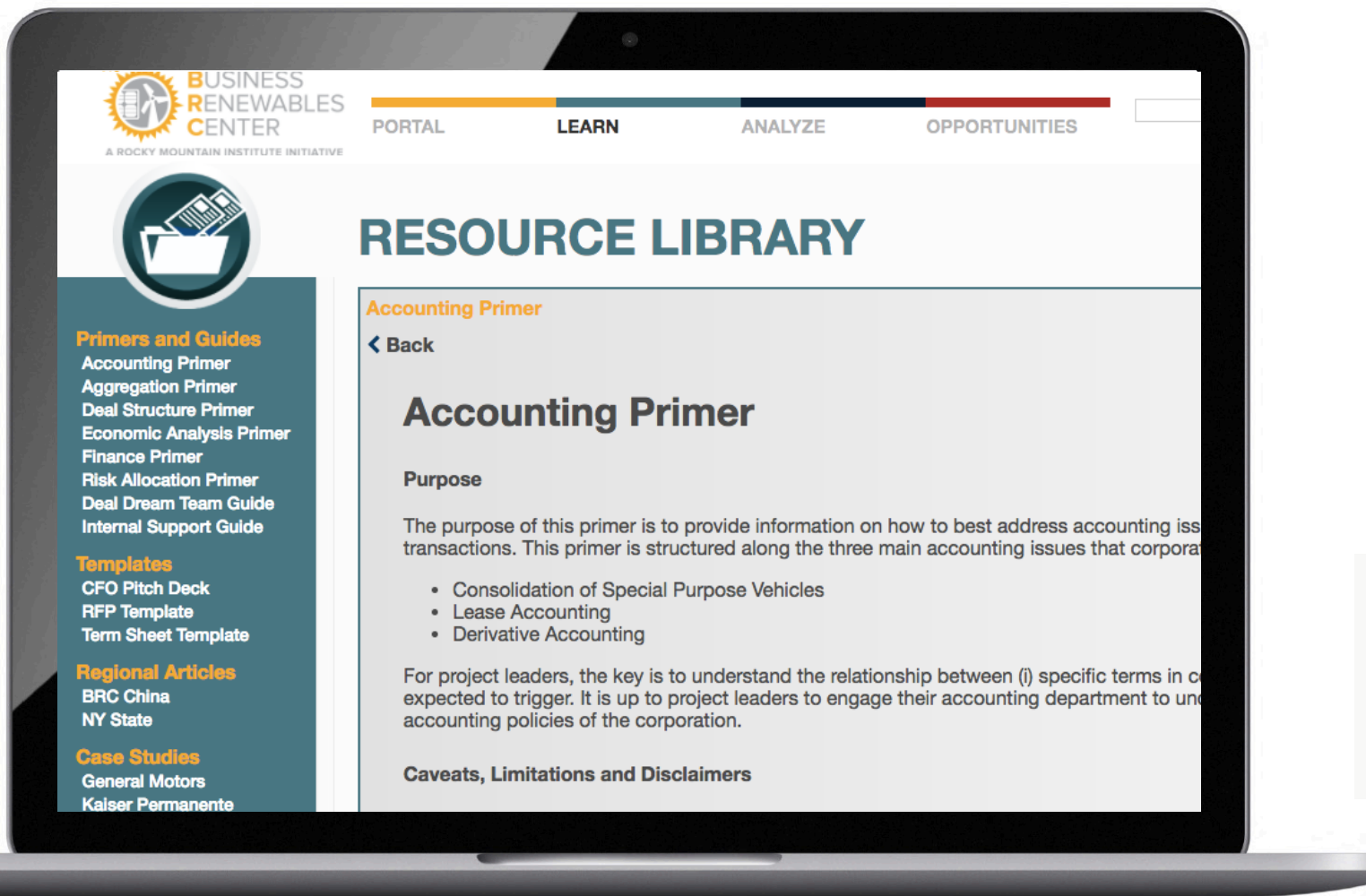
BRC US works with corporations to document best practice and distribute learnings across companies, making each deal a collective success instead of a competition.



Case Studies

- Document best practices
- Share learnings

BRC US develops primers on crucial aspects of a deal – from economics and risk, to deal structure and finance.



Primers

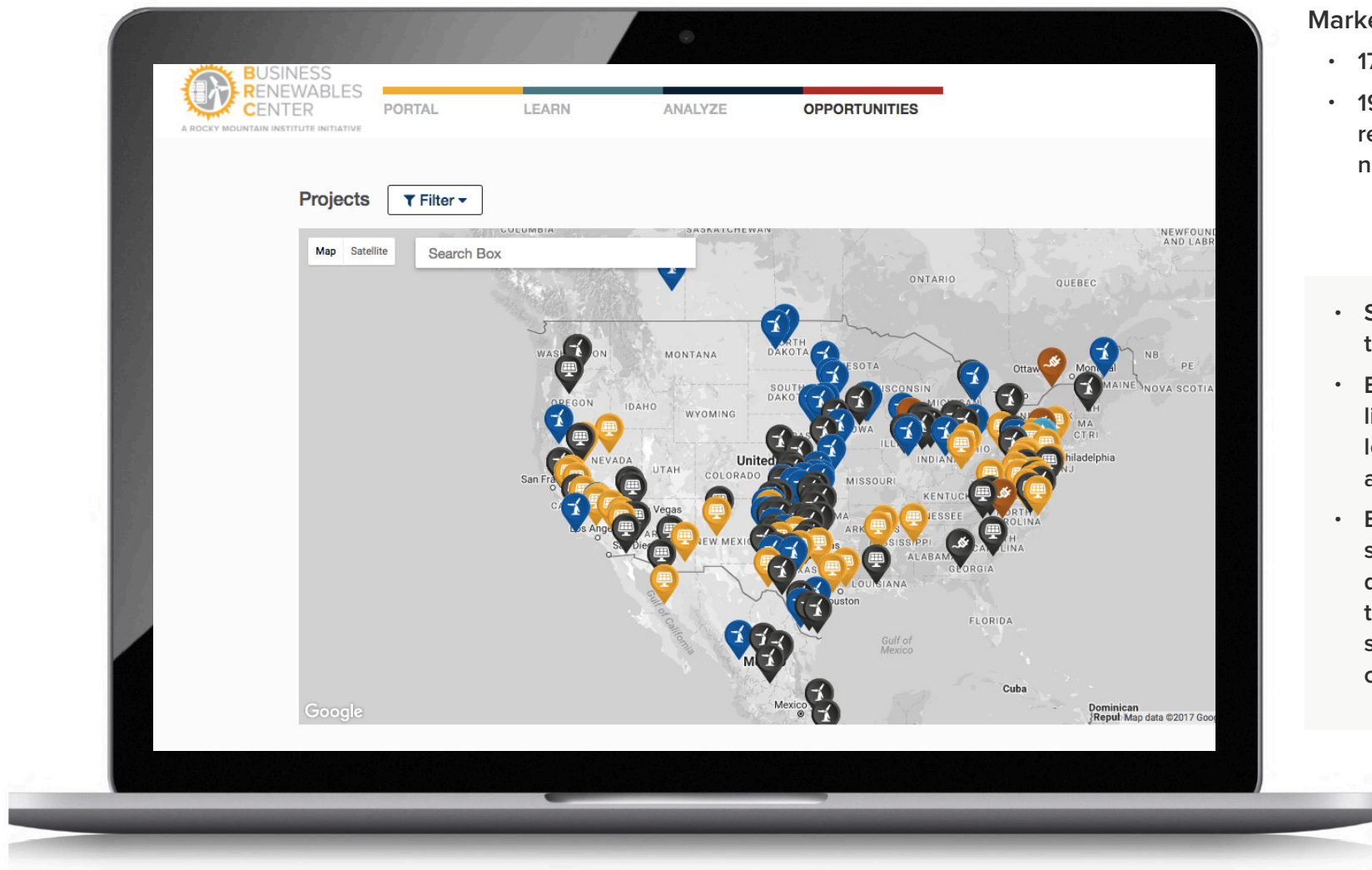
- Support with difficult areas of the deal process
- Codify best practices

BRC US Online Marketplace creates a platform to match buyers and sellers

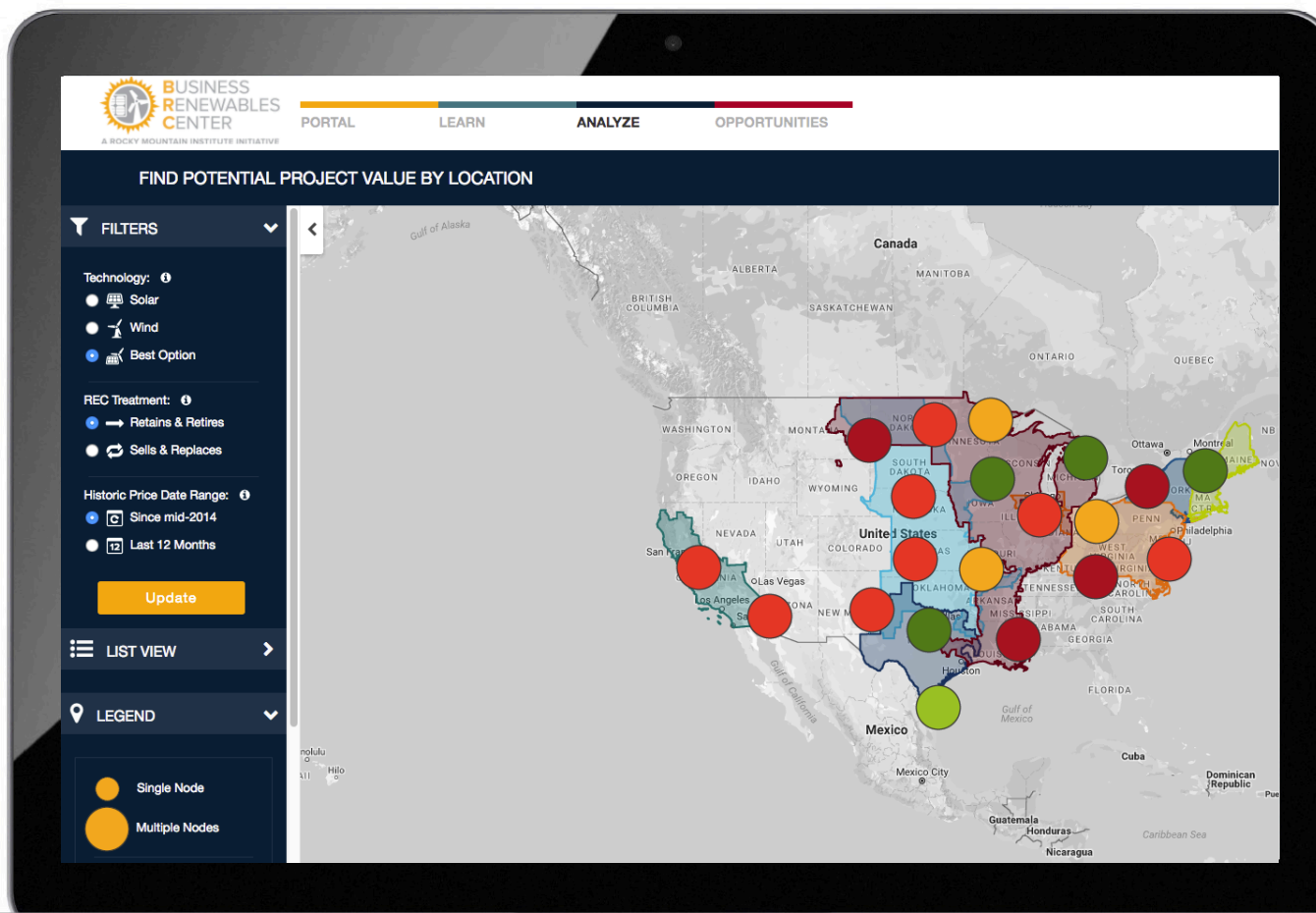
Marketplace statistics

- 173 buyers and 67 sellers
- 192 listed projects representing 27 GW of new capacity

- Sellers list projects in the BRC Marketplace
- Buyers search the listings based on size, location, technology, and other factors
- Buyers also can submit requests: descriptions of the types of projects they seek, to which sellers can then respond



The BRC US Market Analysis Platform (MAP) also provides market data and tools, so buyers and sellers better understand the competitiveness of a deal



- Buyers can understand how project revenues and costs vary across the US; this helps buyers identify where they are likely to find projects with good economics
- Sellers can quickly identify the locations where electricity's value exceeds estimated project costs, meaning merchant plants should generate profits
- Future tools will analyze grid congestion to identify locations where curtailment is more or less likely.



Questions or Comments?

Interested in catalyzing China's corporate renewable procurement market?

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