DRAFT 3

INTERNATIONAL EXPERIENCE WITH AUCTIONS FOR RENEWABLE ENERGY: LESSONS FOR CHINA[1]

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EXECUTIVE SUMMARY

Global installed capacity of non-hydro renewable energy has grown dramatically over the last decade from ~900GW to ~1.6TW, and mostly in the form of wind and solar power.[2] In terms of nominal U.S. dollars, global investment in the renewable energy sector has risen from ~$40 billion in 2004 to a record high of ~$330 billion in 2015. China is now the leading investor, accounting for ~$110 billion of last year's total.

When governments decided to stimulate the massive increase in renewable energy capacity, the policy tool of choice was the non-competitive allocation of administered feed-in tariffs (FITs). The decision to subsidize new capacity through the use of FITs reflected the desire to quickly spur the development of a new industry which lacked experience and hard data.

The absolute value of the subsidy has increased significantly with the rapid expansion of renewable energy capacity and depressed prices for conventional fossil fuel. In 2015 it is estimated that China's annual renewable energy subsidies were approaching ~$10 billion, while Germany's were as high as ~$25 billion.

Related to the dramatic increase in renewable energy capacity is a dramatic reduction in the cost of producing solar and wind power. This decline in unit costs is in response to technological change, leaner supply chains and mass production.

Globally, auctions are an increasingly popular alternative to FITs as a mechanism for allocating renewable energy subsidies and power-purchase agreements. However, auctions are still not widely deployed. It is estimated that they have contributed to less than 10% of the global renewable energy capacity in any one year.

The key reasons auctions are becoming more popular are the following:

- Reduces subsidy burden on governments – can target capacity at a lower price.
- Reduces government's risk associated with falling production costs and fossil-fuel prices.
- Decreases the chances of harmful retroactive changes to Purchase Power Agreements with electricity generators.
- Facilitates the transfer of lower production costs to consumers.
- Avoids excessive profits by project developers – equity concern.
- Allows the government to easily consider non-price objectives.

[2] 1 GW = 0.001 TW

There are various forms of auctions, including:

- Sealed pay-as-bid auction;
- Reverse Auction (also called Descending Clock or “Dutch”) pay-as-bid auction;
- Pay-as-bid periodical tender;
- Pay-as-bid one off tender; and,
- Sealed pay-as-clear tender.

The Sealed pay-as-bid auction is the most widespread and simple model, and is used mainly in Europe, Africa and Latin America (excluding Brazil).

In Brazil, India and South Africa, the introduction of competition through auctions led to an immediate average price decline of 29-50% for renewable electricity. Since then, the clearing prices of auctions have moved to reflect changes in the business cycle, the energy sector and the renewable energy project development process in these countries.

In Europe, the introduction of auctions has led to immediate tariff reduction of 6.5% to 27.5%. Budgetary pressure brought about by the global financial crisis and improvements in governments’ understanding of technology cost declines, meant that feed-in tariffs set in regulation were already declining quite aggressively in 2010-2014.

Auctions can favor existing or larger developers, while feed-in-tariffs have spurred the broadening of generating capacity in many countries (e.g., Germany). With an auction system the winners can benefit from a learning effect and optimize their supply chain, allowing them to be more effective in future rounds. If financial deposits or guarantees are required to participate in the auction, it is also easier for established players to meet the requirement.

Our review of successful international auctions reveals a series of best practices in the design of auctions. These are identified and discussed in the body of the paper.

When it comes to implementing an auction process, it is recommended that each auction consist of three stages:

1. A **Request for Expressions of Interest (REOI**), a discretionary stage where the auctioneer can gauge interest in participating in the competition;
2. A **Request for Qualifications (RFQ),** where bidders submit their qualifications including their project proposals; and
3. A **Request for Proposals (RFP)**, where bidders qualified in the preceding stage confirm no changes to their bid teams or their projects and submit a final offer for support.

Two payment mechanisms could be used to incent the development of renewable electricity generation.

- A **Fixed Renewable Energy Credit (Fixed REC)** mechanism, whereby the winning bidders are paid a $/MWh payment as bid, for electrical energy and the renewable attributes produced. Countries which currently use the Fixed REC mechanism include: Brazil, South Africa, India, Australia and Italy.

- An **Indexed Renewable Energy Credit (Indexed REC)** mechanism, whereby winning bidders are paid a $/MWh payment for renewable attributes produced. The payment to winning bidders is calculated as the difference between the strike price as bid and a reference price (e.g., pool or benchmark price). This mechanism is sometimes referred to as a “contract for differences” structure in countries like the United Kingdom. Aside from the UK, the Canadian province of Alberta is proposing to use this mechanism as it adopts an auction approach to setting the price for renewable power.

The choice of payment mechanism, particularly during times of high price uncertainty, can have a significant and prolonged effect on Program cost. The Indexed REC minimizes the cost of the Program, especially during times of significant structural change in the energy markets.

Based on our international review of best practices, if an auction process is to be used we recommend that the first competition have a series of features which are identified at the end of the paper.

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1, Context

Global installed capacity of non-hydro renewable energy has grown dramatically over the last decade from ~900GW to ~1.6TW, and mostly in the form of wind and solar power.[3] In terms of nominal U.S. dollars, global investment in the renewable energy sector has risen from ~$40 billion in 2004 to a record high of ~$330 billion in 2015. Renewable Energy now accounts for ~50% of all new global additions of power capacity. China is now the leading investor, accounting for ~$110 billion of last year's total.

Despite the upward trend, the total value of global investments in renewable energy is expected to be significantly lower in 2016 due to a combination of:

- Slowing economic activity,
- Reductions in public sector support and greater regulatory uncertainty; and,
- Sharply falling unit costs for solar panels and wind turbines.

Regarding the latter point, it is estimated that from Q3/2015 to Q3/2016 the average capital equipment cost at the global level:[4]

- Dropped 33% for Solar PV - down from $1.8 million/MW to $1.2 million/MW
- Dropped 16% for Wind power:
  - ✓ Down from $1.8/MW to $1.5 million/MW for On-shore wind; and,
  - ✓ Down from $4.4/MW to $3.7/MW million for Off-shore wind.

When governments decided to stimulate the massive increase in renewable energy capacity, the policy tool of choice was the non-competitive allocation of administered feed-in tariffs (FITs). A FIT program typically guarantees that customers who own a FIT-eligible renewable electricity generation facility, such as a wind farm or solar farm, will receive a set price from their utility for all of the electricity they generate and provide to the grid.

Historically, FITs have been associated with a German model in which the government mandates that utilities enter into long-term contracts with generators at specified rates, typically well above the retail price of electricity. The decision to use the FIT reflected the desire to quickly spur the development of a new industry which lacked experience and hard data.

[3] 1 GW = 0.001 TW

[4] For China, BNEF estimates the capital equipment cost for utility-scale Solar PV (no-tracking) in Q3/2016 to be $0.98/MW, with a range of $0.95-$1.02 million/MW. For onshore wind equipment, the midpoint is estimated to be $1.18 million/MW, with a range of $1.08-$1.25 million/MW.

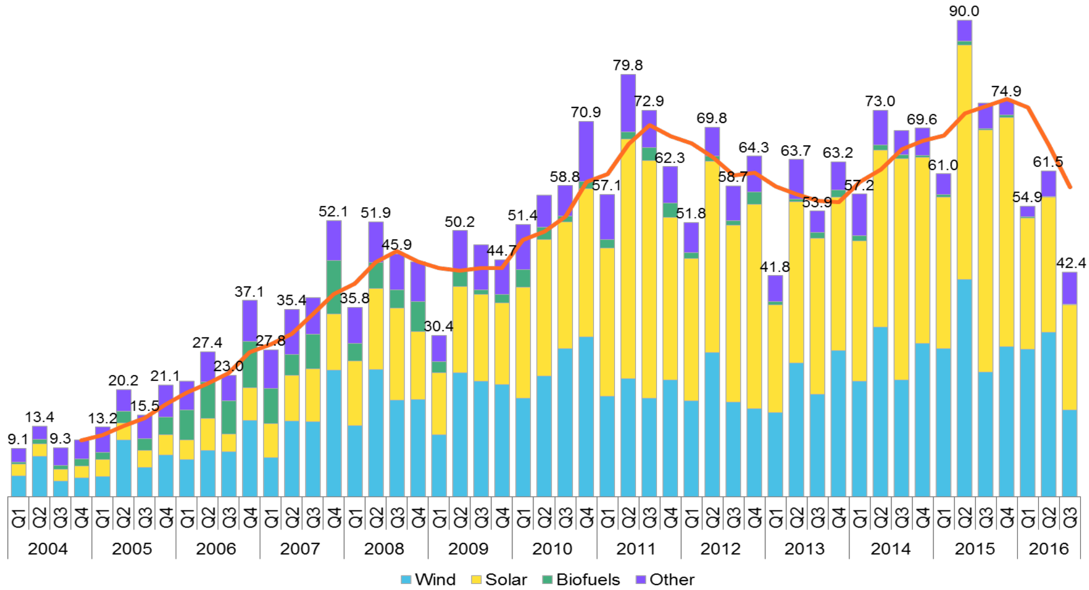

Figure 1: Global New Investment in Renewable Energy by Sector:

Q1 2004-Q3 2016 ($BN)

Source: BNEF, Nawitka Capital Advisors

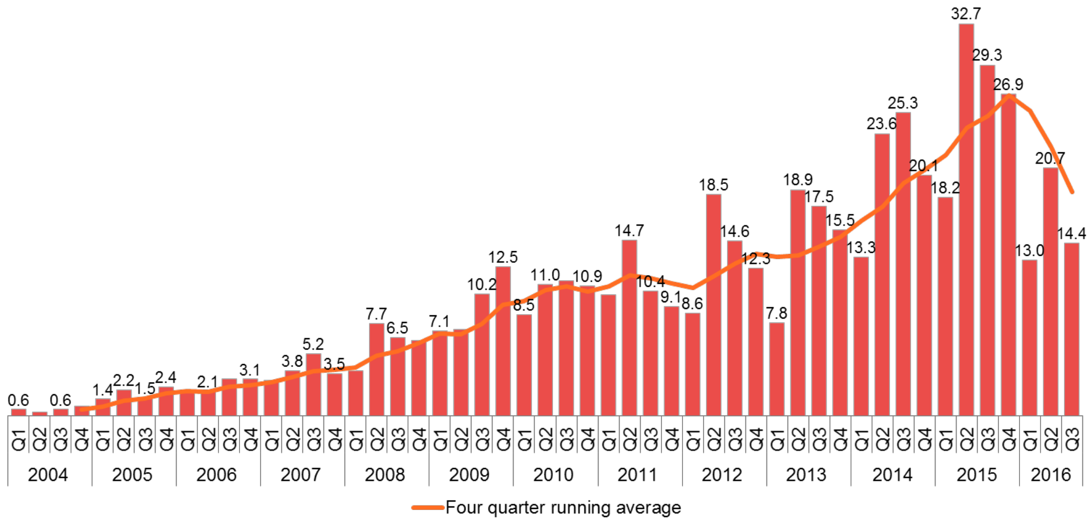

Figure 2: New Investment in Renewable Energy in China:

Q1 2004-Q3 2016 ($BN)

In some cases, the subsidy was absorbed by the public treasury (e.g., Spain and China), while in others it was passed onto electricity consumers in the form of higher prices (e.g., Germany). In Germany, “green levies” associated with the FITs now account for more than 20% of the typical retail customer’s power bill.

The absolute value of the subsidy has increased significantly with the rapid expansion of renewable energy capacity and depressed prices for conventional fossil fuel. In 2015 it is estimated that China’s annual renewable energy subsidies were approaching ~$10 billion, while Germany’s were as high as ~$25 billion.

2, Why Auctions?

The rising cost of renewable energy subsidies is coming at a time when the rate of economic growth is slowing and the financial burden of other public services is also rising (e.g., health care due to aging populations). This combination of factors is creating the impetus for many governments - including China's - to scrutinize their budgets. They are searching for new ways to manage their spending while continuing to stimulate the transition to a cleaner economy. One of these ways is to switch from FITS to Auctions as a means of setting the long-term price of renewable energy.

Related to the dramatic increase in renewable energy capacity is a dramatic reduction in the cost of producing solar and wind power. This decline in unit costs is in response to technological change, leaner supply chains and mass production.

The decline in costs is illustrated in Figure 3 which shows the Experience Curves for Solar and Wind power. The clear log-linear relationship between the unit cost and the cumulative capacity in both industries underscores the transformative changes that have been occurring in the cost structure of the renewable power sector. From Q1/2009 to Q3/2016 the Levelized Cost of Electricity from On-shore wind has dropped ~50%, and the Cost/watt of Solar PV modules has fallen ~90%.

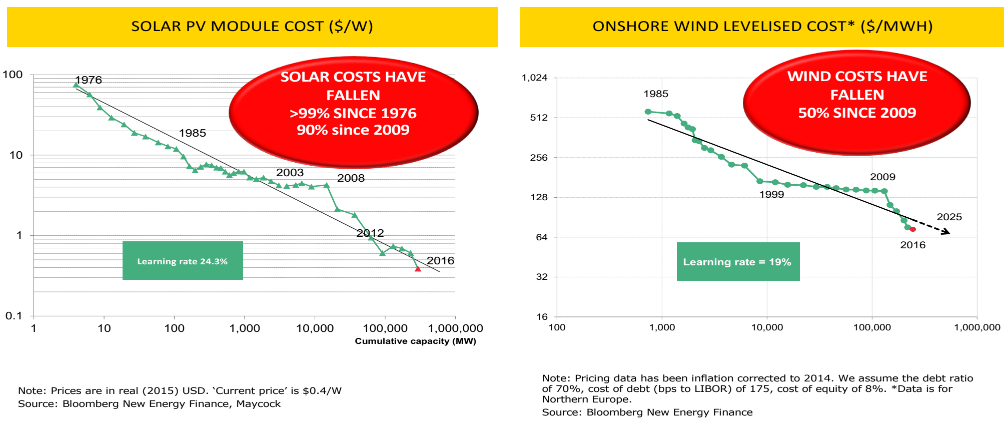

Figure 3: Solar and Wind Experience Curves

Unit Cost Vs Cumulative Industry Capacity

Given the asymmetry of information between governments which set the FITs and developers which use the new equipment to build their projects, electricity consumers have often not enjoyed the full benefit of the cost declines. In some cases, it has been captured by developers in the form of unusually high profits.

As a price-setting mechanism, competitive auctions can address the issue of information asymmetry between renewable project developers and the government that otherwise can lead to sub-optimal tariff setting.

Globally, auctions are an increasingly popular mechanism for allocating renewable energy subsidies and power-purchase agreements. However, auctions are still not widely deployed. It is estimated that they have contributed to less than 10% of the global renewable energy capacity in any one year.

The key reasons auctions are becoming more popular are the following:

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- Decreases the chances of harmful retroactive changes to Purchase Power Agreements with electricity generators.
- Facilitates the transfer of lower production costs to consumers.
- Avoids excessive profits by project developers – equity concern.
- Allows the government to easily consider non-price objectives:
    - Impact on GHG emissions
    - Local content rules for equipment.

3, Types of Auctions

There are various forms of auctions, including:

- Sealed pay-as-bid auction;
- Reverse Auction (also called Descending Clock or "Dutch") pay-as-bid auction;
- Pay-as-bid periodical tender;
- Pay-as-bid one off tender; and,
- Sealed pay-as- clear tender.

Key features of each of these types of auctions is provided below.

Sealed Bid Auction

This is the most widespread and simple model, used mainly in Europe, Africa and Latin America (excluding Brazil). In terms of process:

- Bidders submit a capacity offer (in MW) and the tariff ($/MWh) they require to deliver a project.
- All bids are then ordered by price, starting with the cheapest bid.
- The auctioneer selects the most price-competitive offers until the cumulative amount of bid capacity reaches the target.

There are alternative approaches for determining the specific price paid.

- The "pay-as-bid" design gives each successful bidder the tariff offer they submitted. This is by far the most common price-setting mechanism, and has the advantage of being clear and reducing incentives for strategic bidding.
- The "pay-as-clear" design gives all successful bidders the tariff offer submitted by the last successful bidder, also known as the clearing price. Germany has kept the "pay-as-clear" model for its solar auctions, having tested others. It has delivered lower prices and works well in the liquid and mature German PV market which is less vulnerable to strategic bidding.
- The "Vickery auction" design pays all successful bidders the tariff offer submitted by the first unsuccessful bidder.

Reverse Auction

This is used primarily in Brazil. However, it is increasingly being experimented with in other countries (e.g., India). In terms of process:

- The auctioneer announces an initial tariff to which bidders respond with the capacity they can deliver at that price.
- The tariff is lowered as long as the cumulative capacity of all the bids exceeds the auctioneer's target.

Periodic Auction with Ascending Prices

This is the least common of the main auction models in the renewable energy sector. In terms of process:

- The model consists of a series of descending clock auctions with ascending prices.
- The fact that bidders know that there will be several tariff periods, but that winning bids are capped by the capacity target affects their bidding behavior.
- A bidder might want to hold back to place his/her bid in the highest tariff period, but faces the risk of losing out completely if the target capacity is reached in the lower tariff periods.

Tender

"Tender" refers to a one-off contract allocation process, to differentiate it from an "auction" which refers to a systematic and repeated allocation process. They tend to have much longer bid processing times and governments may use factors other than price to pick a winner.

The U.S./Canada have been limited to one-off tenders, but various provincial governments in Canada are now considering auctions.

4, International Experience

The international experience with auctions has varied.

Brazil has contracted more than 20GW of renewable energy capacity from 2006-2015 using the Reverse Pay-as-Bid Auction. In terms of types of energy that have been contracted:

- 12.3 GW of on-shore wind
- 2.3 GW of solar PV
- Lesser proportion of biomass and small hydro capacity.

South Africa, has contracted more than 7 GW of Onshore Wind capacity since 2011 using the Sealed Pay-as-Bid Auction.

India has contracted 4.5 GW of primarily solar capacity from 2010-2015, mainly using the Pay-as-Bid periodical tender. However, in October 2016 the Indian government announced its intention to hold a Reverse Auction for 1,000 MW of inter-state connected wind power.

Latin America (excluding Brazil) has contracted almost 1 GW of renewable energy, primarily through the use of Pay-as-bid one-off tenders. However, the once-a-year real-time online auction in Mexico is one of the most modern examples of Sealed Pay-as-Bid auctions.

All EU members will introduce competitive mechanisms starting 2017 for larger mature technologies (i.e.,> 1 MW for on-shore wind and solar PV) to comply with EU state aid guidelines.

China used Sealed Pay-as Bid auctions to procure 8 GW of on-shore wind between 2003-2010, but then adopted a FIT mechanism in order to more aggressively stimulate investment in renewable energy. However, starting from June 2016, some provinces in China have already moved from FITs to auction mechanisms for solar farms.

4.1 Impact on Prices

A key empirical question is – what has been the Impact on prices of moving from FITs to auctions?

In Brazil, India and South Africa, the introduction of competition through auctions led to an immediate average price decline of 29-50%. Since then, the clearing prices of auctions have moved to reflect changes in the business cycle, the energy sector and the renewable energy project development process in these countries.

In Europe, the introduction of auctions has led to immediate tariff reduction of 6.5% to 27.5%. Budgetary pressure brought about by the global financial crisis and improvements in governments' understanding of technology cost declines, meant that feed-in tariffs set in regulation were already declining quite aggressively in 2010-2014.

The experience in specific countries is provided in more detail below.

Brazil

In 2004, the Proinfa feed-in tariff was granted to 1.4GW of onshore wind developed over 2004-11. The introduction of auctions as an allocation mechanism prompted tariffs to be cut in half in 2009. Thereafter, auctions have acted as a price discovery mechanism and have led to the award of tariffs to around 13GW of onshore wind. Prices have moved in both directions reflecting, for example. the impact of movements in the foreign exchange rate, turbine shortages and local content rules.

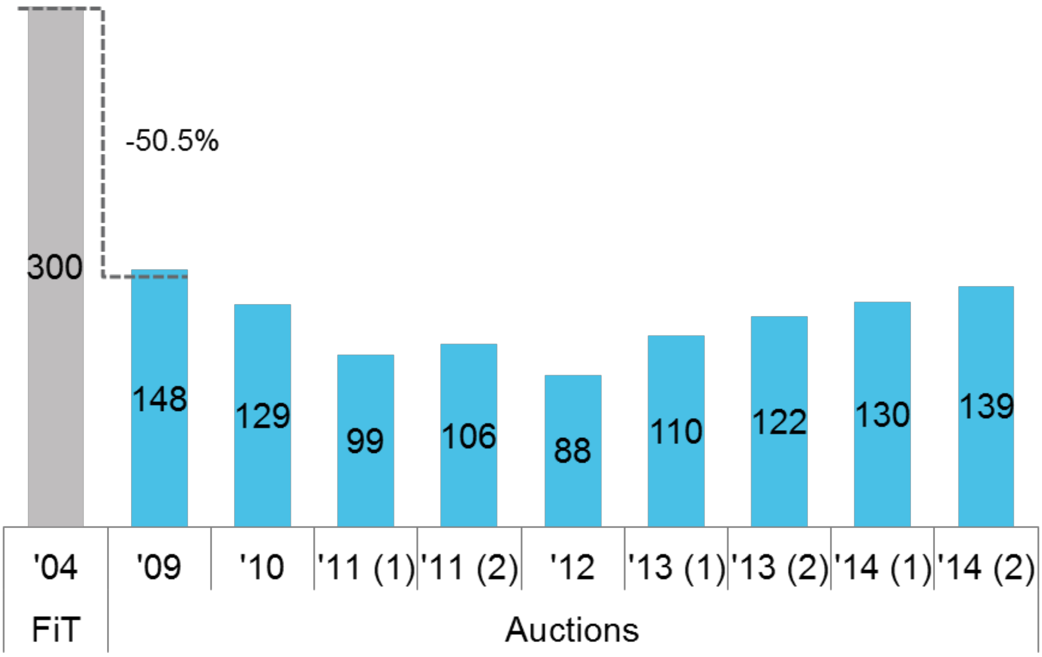

Figure 4: Brazil Onshore Wind (BRL/MWh, nominal)

India

In India, the first "Solar Mission" auction in 2010 granted 150MW of solar PV tariffs on average a third below the country's regulator benchmark feed-in tariff. Subsequent federal and state-level auctions have awarded almost 6GW of solar PV tariffs and continued to capture cost reductions but also revealed differences in development costs and risks across the country. The average winning bid in the state of Uttar Pradesh was about a fifth higher than in the country overall over 2013-14.

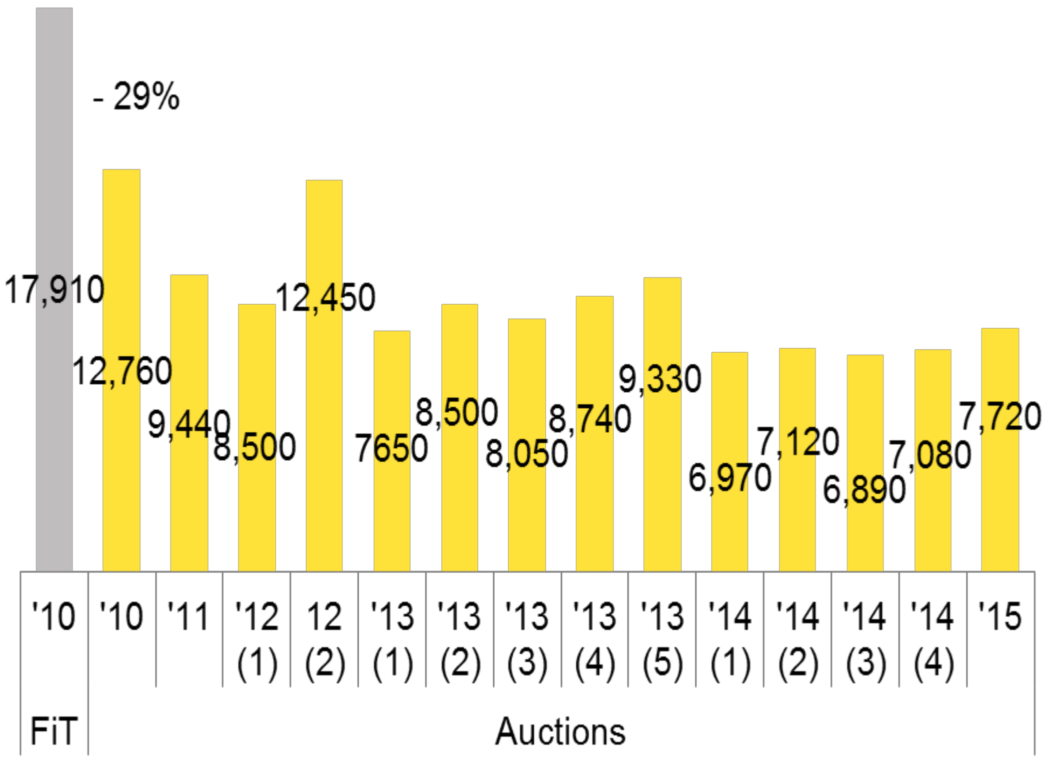

Figure 5: India Solar PV (INR/MWh, nominal)

South Africa

South Africa only had a single commercial grade onshore wind project (5MW), commissioned in 2008, before launching its first auction. Unsurprisingly, the first auction round awarded 634MW of onshore wind projects at a tariff that was half as costly as that on the original project. A more remarkable achievement came from future rounds. As the renewables sector responded to the stability provided by the auction programme with increased competition and higher participation, tariffs in 2015 were 40% lower than in 2011. In total, South Africa's auctions have awarded tariffs to 7GW of onshore wind.

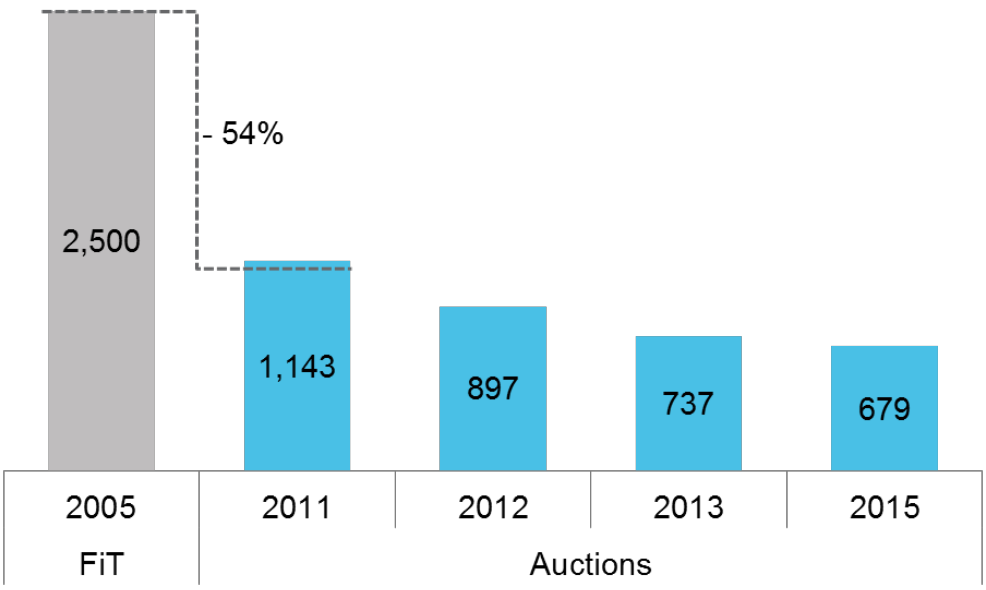

Figure 6: South Africa Onshore Wind (ZAR/MWh, Nominal)

Italy

Italy is one of Europe's countries that has had the most experience with auctions. In 2012, as the country's finances were battered by two financial crises, the government reformed its green certificate policy and decided to award support through auctions. The first auction was a success and allowed for a tariff reduction of just under one third. Unfortunately, the success of Italy's auctions was short-lived as budget issues have prevented the organisation of auctions since 2014.

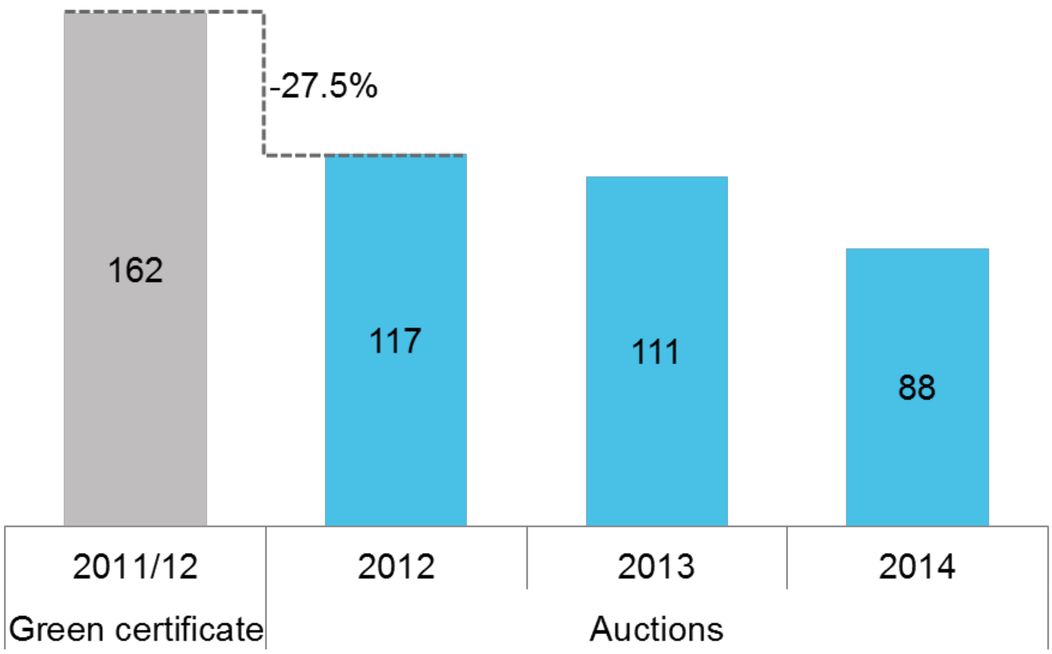

Figure 7: Italy Onshore Wind (EUR/MWh, nominal)

Germany

Germany initiated its switch from a first-come-first-served, capped feed-in tariff allocation policy to auctions with two pilot rounds, for 150MW each, in 2015. The first round revealed that the monthly reduction applied to Germany's feed-in tariff since the 2014 reform of the EEG was quite aggressive. The first pay-as-bid pilot auction in April cleared EUR 1.7/MWh higher than the feed-in tariff applicable that month, showing once again that auctions do not necessarily result in lower tariffs. The "second pay-as-clear" pilot auction saw more aggressive bidding and resulted in a tariff reduction of 7.5%.[5]

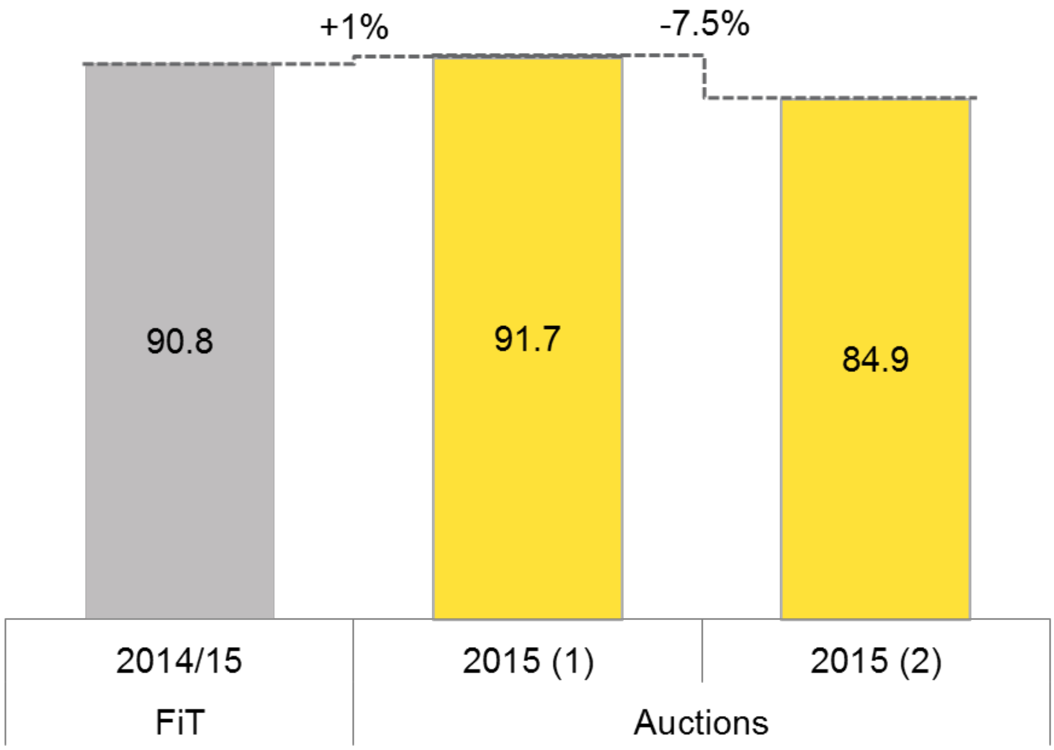

Figure 8: Germany Solar PV (EUR/MWh, nominal)

[5] Test auctions Poland in September 2016 put a high price on PV. Bids of $105-121/MWh are well above what we see in other markets and will likely drop significantly in the first official utility-scale auction. The initial disappointing results reflect little experience among industry players and moderate irradiation potential in Poland

United Kingdom

The UK's Contract for Difference auction was one of the most complex designs to date, awarding contracts with a neutrality in time across four delivery years and with cross-technology competition. On 25 February 2015, the results of the first round showed it was a success. Solar PV tariffs were a third below average remuneration rates under the Renewables Obligation (RO) policy in the year before. Onshore wind rates were only 11% below, reflecting the lower support levels awarded to the technology under the RO. Similarly, to Italy, poor budgeting by the government led to a freeze in the auction programme.

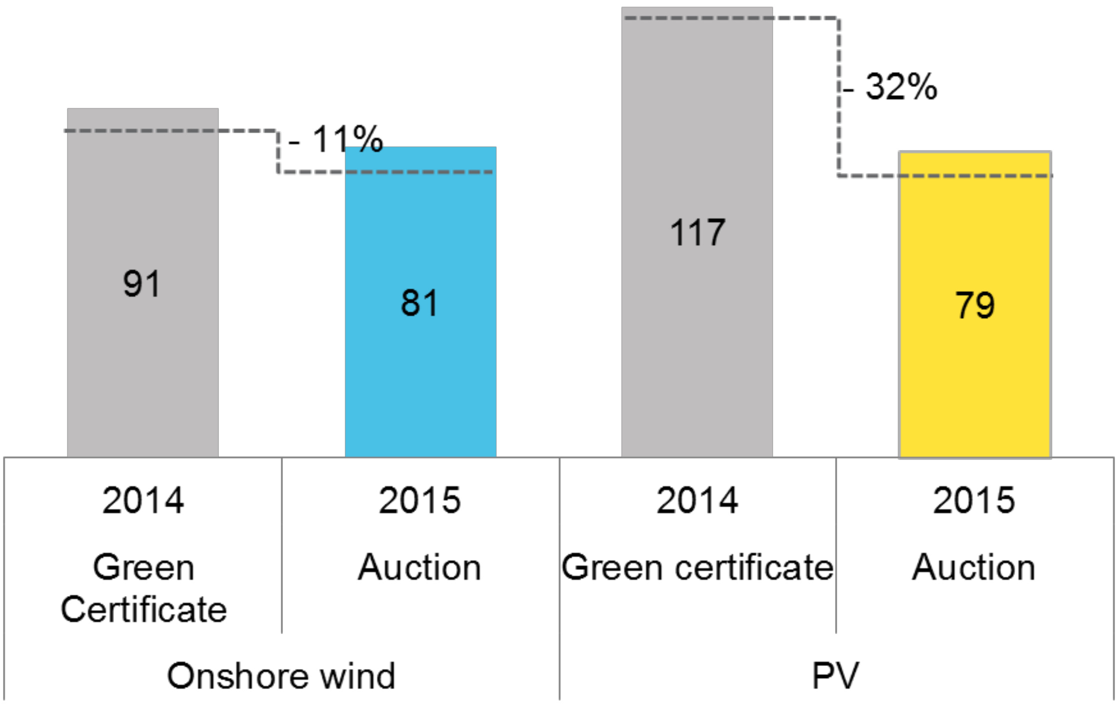

Figure 9: United Kingdom (GBP/MWh, nominal)

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4.2 Implications for Industry Structure

Auctions can favor existing or larger developers, while feed-in-tariffs have spurred the broadening of generating capacity in many countries (e.g., Germany). With an auction system the winners can benefit from a learning effect and optimize their supply chain, allowing them to be more effective in future rounds. If financial deposits or guarantees are required to participate in the auction, it is also easier for established players to meet the requirement.

Auctions have helped develop "national champions", and helped global players to expand their portfolios and emerging market exposure. For example:

- Enel (Italy) has been the most successful company in using auctions in numerous countries.
- Mainstream Renewable Power (Ireland), Actis (UK), Engie (France) and Total (France) are also in three or more countries.
- Gestamp (Spain) is heavily involved in Brazil, and is moving into S. Africa.
- Brookfield Renewable (Canada) is the most noteworthy company from North America, with capacity in Canada, United States and Brazil.

The potential "national champions" which are likely to emerge in China are listed in Table 1, which ranks the largest owners of renewable energy capacity in the country by MW. Note that China Guodian already has two projects outside China – both in S. Africa

Table 1: Chinese Renewable Energy Companies,

Ranked by MW of Renewable Capacity in 2015

Renewable Energy Company	Renewable Energy Capacity (MW)
China Guodian Corp	20,404
China Huaneng Group	14,679
State Power Investment Corp	14,239
China Datang Corp	12,110
China Hoadian Corp	10,387
China General Nuclear Power Corp	10,286
Shenhua Group Corp Ltd.	6,031
China Three Gorges Corp	5,783
China Resources Natural Corp	4,682
GD Power Development Co. Ltd.	4,537

A brief overview of the structure of China's power market is provided in Appendix 2.

4.3 Proper Auction Design

Our review of successful auction processes reveals that they generally follow two guiding principles.

Firstly, they **establish an overall target as well as interim targets** with respect to the ultimate penetration of renewables they are looking to achieve in their jurisdiction. These targets are frequently imbedded into legislation so as to provide clarity and greater assurances to the market. Developers and investors also prefer programs where there are multiple opportunities to participate and be successful. However, in order to provide flexibility for the government, it is not necessary or beneficial to legislate the frequency of procurements.

A second guiding principles is to **be transparent with industry** regarding the competitions. Even if the specific details of each competition over the next several years have not yet been determined, there may be themes or comments of general application that can be made available to provide greater certainty to both potential renewable and non-renewable developers to assist with their short-term and long-term investment decisions.

The following are some specific considerations in designing auctions for renewable energy?

- **High participation rate and regular scheduling** are two essentials for the success of an auction policy. The former provides sufficient competition to drive down prices. The latter provides the visibility & stability needed for the renewable energy sector to develop a sustainable and competitive supply chain.

- **Stable policy environment required to attract high levels of participation**.

- **Capacity targets for an auction should reflect the industry's ability to deliver projects**. A series of smaller auctions or rounds with increasing capacity targets are generally more successful than a single large sale. This approach, combined with local content rewards (rather than requirements) can help develop a domestic supply chain if so desired.

- **If transmission needs to be developed, it is preferable to include it in the bid evaluation process.** This will allow the overall cost of developing the interconnected renewable energy project to be fairly compared. Alternatively, it makes sense to require projects to demonstrate their ability to interconnect.

- **Generally easier to implement with mature technologies like on-shore wind**

and solar PV. However, the success of off-shore wind auctions in Denmark show that a well-organized contest – in which the government takes on some of the risk and project development – can engender competition among potential suppliers and reduce project costs.

- **Country-specific risk, such as over the credit-worthiness of the off-taker or policy instability, reduce the attractiveness of an auction and result in higher prices.** Sovereign guarantees and a clear definition of liabilities can reduce the impact of this type of risk.

- **Successful auction schedules include measures aimed at minimizing the danger that a winning project is not delivered**. For example, project bonds, grid connection agreement, digression in the subsidy over the life of the project. Note that some countries continue to have problems with winning projects not being commissioned. In Italy, the auctioneer expects that 25-30% of winning bids will not be able to deliver on their projects.

- **Time and technology neutral.** Auctions can be designed to maximize the potential gains from cost developments over time and across technologies.
  - ✓ If an auction allows bidders to submit capacity offers for delivery within a wider time window (e.g., five years), then gains can be expected from future cost reductions, as technologies and developers move down their learning curves.
  - ✓ The longer the time horizon, the greater the risk of awarding contracts to unrealistic bids, given the potential uncertainty around future market conditions
  - ✓ Auctions can also be designed in a technology-neutral way to maximize the gains from competition across technologies.
    - ▪ This can only be applied to technologies that deliver a similar output. (e.g., intermittent technologies should not compete with those that deliver baseload power).
    - ▪ Neutrality across time and technology also enables the operator to increase the volume of bids, contributing to the correct functioning of the auctions.

- **The bid evaluation criteria can be adjusted to account for a variety of project attributes that may be important to the auctioneer.** Using assessment criteria other than price will have a distortive effect on the auction as a price-setting mechanism, and may impair its capacity to deliver the least-cost options or best available technology. Examples of non-price variables include:
  - ✓ Contributions to GHG emission reductions;
  - ✓ Environmental impact assessments;

- ✓ Local content requirements to drive the development of a domestic renewable energy industry

4.4 Stages of the Auction Process

When it comes to implementing an auction process, it is recommended that each auction consist of three stages:

4. A **Request for Expressions of Interest (REOI**), a discretionary stage where the auctioneer can gauge interest in participating in the competition;
5. A **Request for Qualifications (RFQ),** where bidders submit their qualifications including their project proposals; and
6. A **Request for Proposals (RFP)**, where bidders qualified in the preceding stage confirm no changes to their bid teams or their projects and submit a final offer for support.

Successful auction processes generally ensure that all stages of each competitive process are overseen by a Fairness Advisor. This provides confidence to participants that they are engaged in a fair competition, and ensures the auctioneer has the right to disqualify anyone engaged in anti-competitive behavior. It may be necessary to recruit and leverage expert evaluators where appropriate (e.g., capital markets and technical expertise).

1. Key points to note about the Request for Expressions of Interest (REOI) stage are:
    - The principal objective is to attract interest in the competition, and inform the market of key aspects of the competition.
    - Provides the auctioneer with insight regarding the market's interest in the competition.
    - The information provided generally give a sense of timing of subsequent competition stages, assist potential participants in determining whether they wish to participate in the competition, and give an indication of the level of commitment likely to be required at subsequent stages of the process.
    - This stage supports competition best practices by minimizing the potential for bilateral negotiations during later stages of the procurement.
    - The REOI is non-binding, and is most helpful for less mature competitions.
    - This stage generally takes 4-6 weeks

2. Key points to note about the Request for Qualifications (RFQ) stage are:
    - The principal objective is to identify, from among those participants

who responded, the participants and project eligible to participate in the RFP.
- This stage allows the auctioneer to evaluate financial, technical and other eligibility requirements of participants and their proposed projects, and ensures that the project being bid is likely to be completed by the specified in-service date.
- The RFQ stage is generally the most resource-intensive stage for both participants and the auctioneer. Appendix 1 highlights the information requirements in a typical RFQ.
- This stage generally takes 4-6 months

3. Key points to note about the Request for Proposals (RFP) stage are:
   - The principal objective is to select the winning bidder from the group of qualified bidders.
   - Bid security must be provided in conjunction with RFP submissions – security is returned either when a bidder is not selected or a successful bidder achieves financial close
   - Bidder must confirm that the composition of its project team is unchanged since RFQ submission. This helps minimize "gaming" whereby a qualified project team is changed during the RFP stage, and is one of the ways that non-competitive behavior is discouraged.
   - Bidder must provide updated financial undertakings to demonstrate that no event has occurred (or is reasonably expected to occur) since the RFQ submission that could have a material adverse impact on its financial standing.
   - Stricter financial commitments are required in respect to all (or a material portion of) the proposed equity contributions.
   - Bidder must provide a binding offer (i.e. bid price).
   - Bidders who remain qualified will be selected based on lowest price (subject to any affordability ceiling);
   - This stage generally takes 2-3 months

A competition comprised of all three stages would normally take approximately 7-11 months.

The recommended staged competitive process is typical to most major procurements in the countries examined The process offers benefits to both the auctioneer and the potential bidders. For the auctioneer, it provides greater oversight, and opportunities to respond to the needs of bidders or the government as the competition progresses.

Breaking up a competition into three stages also offers efficiency benefits. Managing a competition requires a significant investment of time and resources by both the authority and bidders, particularly at the RFQ and RFP stages. It is helpful to have a process that continues to screen parties from all those who may be interested (gauged through an REOI) to only those who are qualified to provide pricing and be awarded a final support agreement (at the conclusion of the RFP stage).

From the auctioneer's perspective, a staged process will provide a greater number of opportunities to communicate competition expectations to the market and to seek meaningful feedback from potential participants and their lenders.

A better understanding of expectations on both sides will:

- Allow the auctioneer to better gauge market interest and draft competition and agreement documentation with appropriate risk allocations.
- Allows participants to more effectively scope their projects and draft their submissions, in each case increasing the likelihood potential participants will submit qualified proposals. This increases competition and the likelihood of achieving success. For participants, a staged process also permits sufficient time for interested parties to obtain the resources they may require to participate.

4.5 Payment Mechanism

Based on our international review of best practices, two payment mechanisms could be used to incent the development of renewable electricity generation.

First, a **Fixed Renewable Energy Credit (Fixed REC)** mechanism, whereby the winning bidders are paid a $/MWh payment as bid, for electrical energy and the renewable attributes produced. Countries which currently use the Fixed REC mechanism include: Brazil, South Africa, India, Australia and Italy.

Second, an **Indexed Renewable Energy Credit (Indexed REC)** mechanism, whereby winning bidders are paid a $/MWh payment for renewable attributes produced. The payment to winning bidders is calculated as the difference between the strike price as bid and a reference price (e.g., pool or benchmark price). This mechanism is sometimes referred to as a "contract for differences" structure in countries like the United Kingdom. Aside from the UK, the Canadian province of Alberta is proposing to use this mechanism as it adopts an auction approach to setting the price for renewable power.

With the Indexed REC mechanism:

- When the bid price exceeds the benchmark price, bidders are paid the difference for the renewable energy attributes. When the benchmark price exceeds the bid price, bidders would pay the Government of China (i.e., GoC) the difference.

- Given that new renewable generation projects face financing challenges in the current market environment, the difference is intended to close the gap between the benchmark price and the cost of the renewable project. Winning bidders will not face benchmark price risk, nor will they benefit from benchmark price opportunity.
- The consideration for the support payment is the renewable attribute. The support payment is not consideration for the underlying commodity, namely the electrical energy.

Table 2 provide a comparison of the pros and cons of the Fixed REC and Indexed REC mechanisms in relation to a range of objectives.

Table 2: Comparison of Fixed REC and Indexed REC

Program objectives and important outcomes	**Fixed REC $/MWh**	**Indexed REC +/- $/MWh on Difference**
• Maximize number of bidders • Maximize competitive pressures • Drive prices down	• May limit the number of bidders based on financeability. This mechanism is unlikely to provide sufficient revenue certainty for project financing schemes unless the Fixed REC is uncapped.	• Will likely attract the greatest number of bidders based on financeability (e.g., will encourage financial innovation and allow project financed solutions versus just balance sheet solutions) and competition will drive prices down. • In other jurisdictions, a large portion of renewable developers rely on project finance as the financial structure underpinning renewable energy projects
• Allocation of risk[6] • Recognition of temporary period of significant uncertainty as electricity industry transitions	• Expected to significantly alter the allocation of risk between a generator and the GoC; however, it depends on bid pricing.	• Allocates benchmark (market?) price risk and opportunity to the GoC. • Development risk (including siting), construction risk and ongoing operations and

[6] For purposes of any specific competition, the principle of allocating risk to those best able to manage it minimizes the inclusion of significant risk premiums in bid prices. Given the significant uncertainties in China's electricity market today, a payment mechanism that allows the transfer of this risk may result in the lowest cost solution.

	• In a low-priced and uncertain pricing environment, the REC value as bid may be driven up, reflecting the transfer of benchmark price risk held by the GoC to generators. • Development, construction, operations and maintenance risk, in addition to the benchmark price risk, will reside with the developer.	maintenance risk continue to reside with the developer.
• Easily understood by the public	• Approach is easily understood by public.	• Since the GoC already assumes the benchmark price risk under the current FIT structure, the approach is easily understood by the existing generators. Approach may be more difficult to understand by public.
• Fixed funding requirements	• Funding requirements are generally fixed and easily identifiable. • Funding levels can be managed through the procurement process of specific volumes in each competition	• Funding requirements are capped at the strike price, but will vary year-to-year as the benchmark price changes. • Funding requirements can be forecast by GoC 1-2 years in advance.
• Misaligned with market	• May get misaligned as benchmark price rises over time and may drive up the aggregate cost of support associated with each procurement.	• Will not get misaligned as support payment adjusts with changes in the benchmark price. As the benchmark price rises, support payments fall and this could result in a net payment to the GoC.
• Alignment with Government objectives	• Aligns with the GoC objectives, unless cap is removed.	• Partially aligns with the GoC objectives as it provides compensation for the production of renewable energy attributes.

		• Allocation of benchmark price risk may differ.
• Cost of the program to the Government	• The impact of price uncertainty will be more strongly reflected in a Fixed REC mechanism and the levels of support will include potentially significant risk premiums to reflect the fact that the developer bears the risk of benchmark price uncertainty.	• The Indexed REC minimizes the cost of support for renewables under current market conditions. (See discussion below)
• Moving to an alternative payment mechanism	• Movement to an Indexed REC from a Fixed REC at a future point will likely not result in resistance.	• Movement to a Fixed REC from an Indexed REC in the future may encounter more resistance.

As noted in Table 2, each mechanism has strengths and weaknesses relative to the Program objectives and other outcomes that may be important to the GoC.

Given the current uncertainty in China's power market, an assessment of the suitability of the payment mechanism for the Program should consider the potential outcomes and impacts of a Fixed REC which is either capped or uncapped. Table 3 provides an illustration of the possible outcomes of choosing a capped or uncapped Fixed REC in light of the current power market in China.

Table 3: Capped and Uncapped Fixed REC Comparison

Fixed REC	Key Risks
Scenario 1: Capped Fixed REC	• Cap chosen is too low given benchmark risk (i.e., uncertainty about benchmark price risk may cause lenders to value at near zero) and no/few bidders participate in the auction • Advancement toward target is significantly hindered

Scenario 1: Uncapped Fixed REC	• Fixed REC value is very high (e.g., >70 per cent of long-term leveilized costs) relative to GoC's expectations. This may limit the volume of renewables the GoC can procure during a competition, given the GoC may have a cap on budget dollars allocated to the Program and may hinder advancement toward target. • GoC may be unable to procure the necessary volumes of renewables so that there is an alignment with economic growth and retirement of older coal-based capacity. • It will likely result in windfall profits to winning bidders as benchmark price rises.

4.6 Program Cost Considerations.

In assessing the potential cost of an auction program, it is useful to examine both the cost of renewable electricity generation projects and the impact of the selected payment mechanism.

Bloomberg New Energy Finance estimates that the Levelized Cost of Electricity (LOCE) [7] in China as of H2/2016 is:

- In the range of $60/MWh to $90/MWh for onshore wind projects, with an expected value of approximately $70/MWh.
- In the range from $80/MWh to $155/MWh for utility scale solar Photo Voltaic (PV) projects, with an expected value of approximately $90/MWh.

For comparative purposes, Figure 10 illustrates the estimated range of the LCOE for various sources of power in both China and the Asia Pacific Region (APAC).

[7] The definition of Levelized Cost of Electricy (LCOE) is the long-term offtake price required to achieve a required equity hurdle rate of return for the project. The LCOE represents the cost of building, operating and financing electricity generation technologies. All subsidies and incentives are excluded from the calculation (eg., grants, accelerated depreciation, production tax credits), as well as the cost sofa grid connection and transmission. However, carbon prices are reflected where schemes are already in place. A key driver of the LCOE of all renewable energy technologies is the cost of finance, and specifically the cost of debt finance. The cost and availability of debt is a function of project risk and market conditions - the higher the perceived risk, the higher the cost of debt.

Although power from Onshore wind is cheaper than that from natural gas Combined Cycle Gas Turbine, it is still more expensive than coal-fired power.

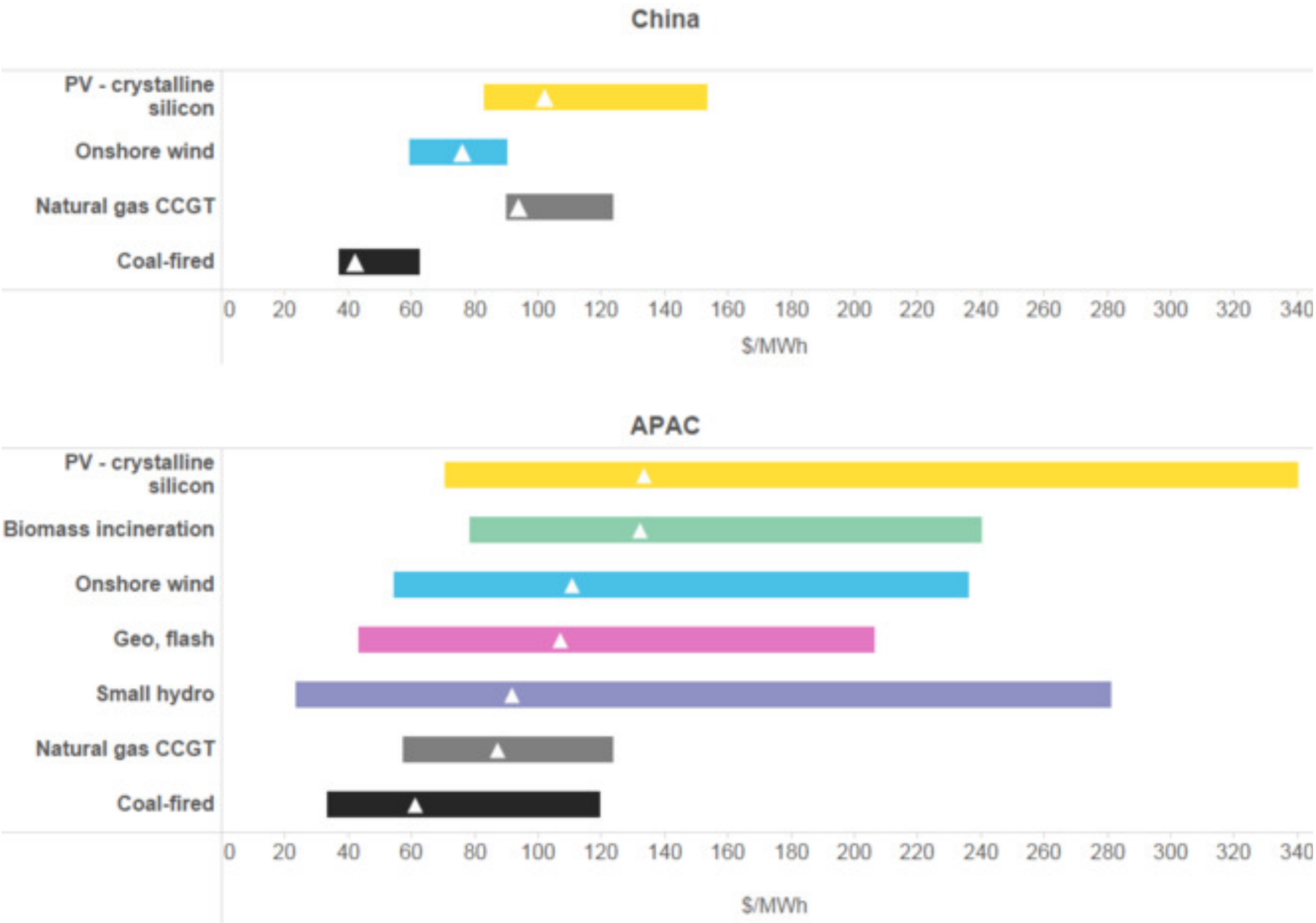


Figure 10: Levelised Cost of Electricity in Q3/2016, China vs Asia Pacific

Source: Bloomberg New Energy Finance, Nawitka Capital Advisors

A renewable investor/developer will only invest if they expect to recover the cost of its renewable project over the life of the agreement (which is typically 20 years). Costs are expected to be recovered from two main sources:

- The benchmark price at the time the project is producing electricity; and
- The support that is provided as a result of being a winning bidder in the Program.

This would be the case regardless of the payment mechanism selected (i.e. Fixed or Indexed REC). The choice of payment mechanism will, however, affect how a developer views overall project risk, and therefore how it will calculate the level of support that it requires. This can impact the overall cost of the Program to the GoC.

Impact of Payment Mechanism on Cost

A key driver to minimizing costs as part of an auction process is to maximize the number of competitors, which in turn increases competitive pressures on bid pricing.

A feature of the renewables market is that a large proportion of developers rely upon project financing to fund their projects. Therefore, it is important to consider potential payment mechanisms that provide opportunities for developers to propose different financial structures - including project finance capital structures - on competitive terms.

Key to attracting project finance on competitive terms (i.e. relative to balance sheet financing) is to ensure that project risks are allocated to the party (or parties) best able to manage them. Risks such as construction cost risk are best managed by the developer – an approach that is well established in project finance markets. However, based on the experience in other countries, developers and lenders feel strongly that the risk associated with the current benchmark price uncertainty cannot be managed, mitigated or effectively forecast, and is best retained by the public authority (e.g. the Government of China).

If a payment mechanism is adopted that exposes developers to movements in the benchmark price, then, given the price uncertainty prevailing today, it is anticipated that competition will be reduced and that significant risk premiums are likely to be included in bid prices by those who do participate.

As described above, a developer's revenue is mainly derived from both the benchmark price and support payments. However, under the Fixed REC mechanism the developer is ultimately exposed to the consequences of movements in the benchmark price. Comparatively, under an Indexed REC mechanism the developer is not exposed to movements in the benchmark price; price volatility is absorbed by the GoC. The impact of price uncertainty will be more strongly reflected in a Fixed REC mechanism and the levels of support will include potentially significant risk premiums to reflect the fact that the developer bears the risk of benchmark price uncertainty.

This risk premium will likely be modelled by developers as a discount to their assumed benchmark price for the duration of the agreement term. The higher the benchmark price uncertainty experienced by developers, the higher the discount that will be applied to the benchmark price.

For example, assuming a levelized cost of $70/MWh, if Fixed REC bidders assume a benchmark price for wind of $40/MWh, then they would need to receive a support payment of $30/MWh. However, if bidders discount the benchmark price for wind (e.g. to $20/MWh) because of their inability to accurately forecast the benchmark price, they would require a higher support payment of $50/MWh. This would translate into a bid price of $90, which is higher than the true levelized cost of wind.

Alternatively, under an Indexed REC mechanism, the strike price would be $70/MWh regardless of a bidder's assumption with respect to benchmark price, and the public authority (in this case, the Government of China) would bear the consequences of movements in benchmark price.

Furthermore, when sizing project debt under a Fixed REC mechanism, a benchmark price of near to zero may be assumed by developers because they do not feel they can forecast the benchmark price given current uncertainties – thereby passing all price risk to the GoC.

Yet another consequence of a Fixed REC mechanism is that any additional revenue that accrues from a higher-than-expected benchmark price (i.e. the benchmark price that was assumed when they determined their bid price), is retained by the developer to the detriment of consumers. Under an Indexed REC mechanism, a higher benchmark price offsets the support payable by the Government of China to the benefit of Chinese tax payers.

Our conclusion is that the choice of payment mechanism, particularly during times of high price uncertainty, can have a significant and prolonged effect on Program cost. The Indexed REC minimizes the cost of the Program, especially during times of significant structural change in the energy markets.

4.7 The First Competition

Based on our international review of best practices, if an auction process is to be used we recommend that the first competition:

- Be open to all renewable energy technologies (i.e., fuel neutral)[8]
- Be applicable to new and expanded renewable energy projects;
- Require projects to be greater than or equal to 5 MW;
- Include selection criteria that focus on financial and technical considerations only;

[8] Note that this is despite the fact there are differences in Carbon Intensities across renewable energy technologies. See Appendix 3 for a documentation of these differences.

- Be governed by an affordability threshold[9] in order to manage costs;
- Have a contract term of 20 years to support financeability of the projects.
- Be planned for areas where there is enough capacity on the transmission or distribution system to accommodate the generation from these projects; and,
- Utilize an Indexed REC payment system. This mechanism is recommended because it is most likely to draw the highest number of competitors and minimize the total cost of the first competition.

[9] An affordability threshold identifies the threshold above which the value of bid prices may be determined to be unaffordable. The threshold can be expressed as a $/MWh and/or the total costs that may be allocated to each procurement. An affordability threshold that targets total cost will need to work in concert with volume targets.

APPENDIX 1:

REQUIREMENTS IN A TYPICAL *REQUEST FOR QUALIFICATIONS*

Bidders must pay a non-refundable qualification fee to participate – this deters frivolous bids and provides a strong indicator of bidder commitment. Requiring this upfront financial commitment is a best practice for larger competitions, helping to ensure the RFQ process is a meaningful and effective one, by qualifying only those bidders likely to successfully participate in the RFP stage.

Bidders must describe the composition of their project teams.

Bidders must demonstrate their qualifications in the following three categories (at a minimum):

1. Project eligibility,
2. Financial strength and capability, and
3. Technical capability.

The more straightforward the qualification process, the more likely projects will be able to meet the thresholds set out in the evaluation criteria. The experiences of other jurisdictions (such as the Canadian province of Ontario) have indicated that increasing the complexity of qualification criteria (specifically as they may relate to meeting certain socio-economic criteria) also increases the complexity and cost of monitoring successful projects once the RFP stage has been completed.

Project Eligibility: the bidder's proposed project must meet the prescribed eligibility criteria for the procurement, including criteria such as:

- Is the project developed using technology that meets the prescribed definition of renewable;
- Is the project a new or expanded development (i.e. existing projects are not eligible);
- Is the project situated in the desired province;
- Is the project utility-scale (≥5 MW);
- Is the project likely to achieve a specified in-service date (e.g. 2019) based on activities completed to date and a demonstrated understanding of activities yet to be completed; and
- Does the project require new transmission system or distribution system investment?

Financial Strength and Capability: the bidder must demonstrate that it has the financial strength to develop the project, consisting of:

- Sufficient net worth relative to the proposed project size by reference to current and historic financial statements;
- Confirmation that no event is ongoing or reasonably foreseeable that could have a material adverse impact on the bidder's current financial standing;
- Confirmation from any financial sponsor or guarantor of its willingness to provide such support; and
- Confirmation of the equity contribution and a description of how the bidder intends to secure the equity contribution necessary to construct the project.

Technical Capability: the bidder must demonstrate that it has the technical capability and capacity to develop its proposed project, consisting of:

- Involvement in a number of recent projects of similar size and/or complexity;
- Experience in each stage of project development (e.g. siting, stakeholder consultation, land acquisition, etc.), construction and operation; and
- A narrative description of the relevance of the bidder's experience to its proposed project.

Qualified bidders will be required to achieve a pass in each qualification criterion in order to proceed to the RFP stage. A pass/fail approach is an evaluation standard that:

- Recognizes that a minimum standard is appropriate for each evaluation category and that excellence in one category cannot compensate for weakness in another;
- Is easily understood by the market; and
- Is relatively simple to administer.

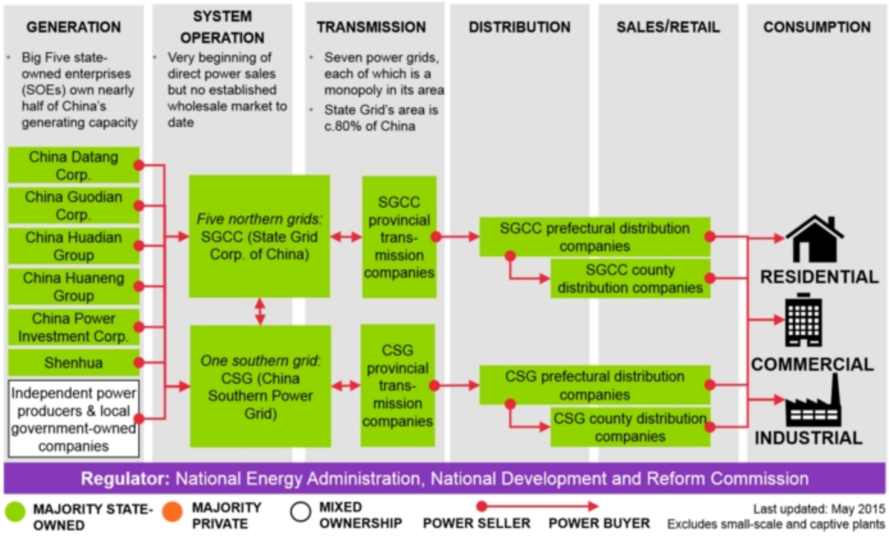
These features are important elements of a transparent and objective evaluation approach, which past experience in other jurisdictions has recognized as being best practices.

The duration of the RFQ stage will range from 4–6 months, with the critical element being providing enough time for bidders to prepare a robust response. In other jurisdictions, timelines have been adjusted depending on the maturity of the process and bidders, generally shortening with each subsequent competition.

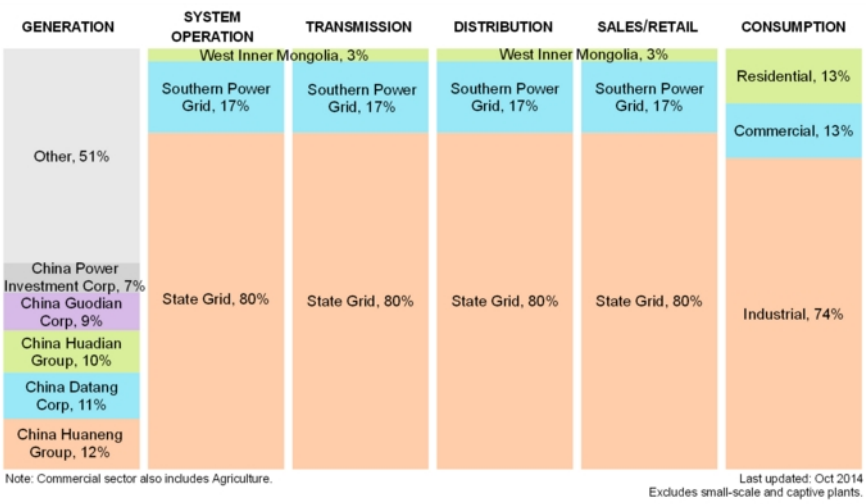
APPENDIX 2:

STRUCTURE OF THE POWER MARKET IN CHINA

Power Market Structure in China



Power Market Players in China



APPENDIX 3:

Life Cycle CO_2 Equivalent from Selected Sources of Electricity

Arranged by decreasing median (gCO_2eq/kWh) values

Source of Electricity	Min	Median	Max
Coal	740	820	910
Natural Gas-combined cycle	410	490	650
Biomass-dedicated	130	230	420
Solar PV-utility scale	18	48	180
Solar PV-rooftop	26	41	60
Geothermal	6.0	38	79
Concentrated solar power	8.8	27	63
Hydropower	1.0	24	2200
Wind offshore	8.0	12	35
Nuclear	3.7	12	110
Wind onshore	7.0	11	56

Source: 2014 IPCC, Global warming potential of selected electricity sources