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RENEWABLE ENERGY AUCTIONS TOOLKIT

STAGES OF AUCTION DESIGN

DESIGNING RENEWABLE ENERGY AUCTIONS: FOUR COMMON STAGES

Following 800 renewable energy (RE) auctions in 61 countries, some common stages of design and implementation that auction programs move through as they mature can be observed. These 800 include 50 in China since 2003, 63 in Brazil since 2006, and 257 in India since its first in 2012.[1] Although the number of auctions in each country varies, and not all countries move through all stages, there are notable patterns.

FIRST STAGE: SIMPLE ENERGY-ONLY AUCTIONS

Many auction programs begin with simple, energy-only auctions, where the award of a power purchase agreement (PPA) is based on the lowest offer for energy (kilowatt or megawatt hours). Early auctions often do not have features aimed at optimizing grid integration, such as a requirement for forecasting and reactive power compensation equipment. **In these early auctions, the designers' initial objective is to demonstrate market interest and to begin the process of price discovery.** Investors are interested in seeing that the buyer fulfills its obligations.

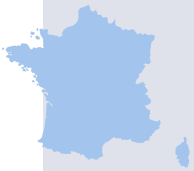
Markets that are still vertically integrated often use auctions to attract investment into the power sector when state utilities lack the funds to invest. In contrast to negotiated PPAs, auctions increase transparency, attract multiple bidders, and increase price competition. Many countries have also used simple early-stage auctions to make the transition from administratively set feed-in tariffs (FiTs) to competitive bidding. When this transition happens, auction prices offered are commonly 30 percent to 50 percent lower than the last FiTs.

A notable feature of the early stage is that many countries start with small capacity quotas (see Box 1). **Often, countries will drastically increase their quota sizes for later auctions as they see further price reductions and gain confidence in the auction mechanism.**[2]

SECOND STAGE: GRID INTEGRATION CHALLENGES

In many countries, the challenges of grid integration and where to best locate renewables are only recognized after some generation capacity is commissioned. **Many countries find that as renewables are introduced at a significant scale, grid integration concerns change from theoretical challenges to immediate practical problems.**

BOX 1. CAPACITY QUOTAS IN EARLY-STAGE AUCTIONS



FRANCE

88 MW quota for its first year of solar PV auctions

INDIA

208 MW quota for its first recorded auction

GREECE

40 MW quota for its pilot solar auctions

POLAND

First auction quotas of 8 MW for wind and 70 MW for solar

Figure 1. Overview of common auction design stages

EARLY AUCTIONS

- Simple energy-only auctions
- Test investor interest and risk allocation approaches
- Set a baseline for price discovery

ADDRESSING GRID INTEGRATION

- Improving dispatchability and value of energy to the system
- Assigning selected integration responsibilities to RE generators
- More sophisticated approaches to project location

ELECTRICITY MARKETS INTEGRATION

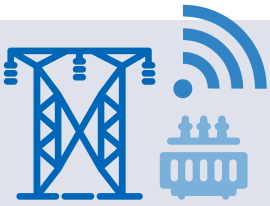
- Requiring direct sales into wholesale markets with feed-in-premium supplements
- Enabling RE to sell into ancillary services, peaking and balancing markets

COMMERCIAL AND INDUSTRIAL PPAS

- Commercial and industrial consumers procuring power directly
- Meeting corporate climate commitments, hedging against wholesale market fluctuations, or securing supply
- Can be combined with other "value stack" services, such as ancillary services

Countries often try to address these challenges in the second stage of auction design by adding requirements related to grid integration, the timing of energy output, and the desired locations for renewables. Many countries identify specific geographic zones where they want renewable capacity, and in some cases, new transmission capacity is added to serve these zones. Countries such as Brazil, Kazakhstan, and Turkey have used more sophisticated auctions that specify the locations and capacity caps in small zones that fit the capabilities of the existing transmission grid.

A typical approach in recent years has been to auction energy supply during particular times of the year and particular hours of the day. In countries that use a single buyer rather than a wholesale market, the single buyer pays an additional amount for energy in certain time blocks. In countries with wholesale markets, an entity (market operator, distribution utility, etc.) will make additional payments for energy at a certain time.



The second stage is also a time when many countries begin to make significant investments in modernizing and digitizing their distribution and transmission grids. For example, countries such as India, Pakistan, and Ukraine are aggressively digitizing and automating their transmission substations.

RE-plus-storage is another increasingly popular strategy to address the timing of energy output. **Numerous countries are now using RE-plus-storage, which enhances dispatchability and improves the value of energy.** For example, in December 2019, the Solar Energy Corporation of India (SECI) held an auction for 1.2 gigawatts (GW) of dispatchable RE-plus-storage capacity. The plants must be available during peak hours, which are specified by SECI as 5:30 to 9:30 a.m. and 5:30 p.m. to 12:30 a.m. daily.

THIRD STAGE: ELECTRICITY MARKET INTEGRATION

In the third stage of auction program design, officials seek to integrate renewable energy into electricity markets. The most common innovations used to accomplish this are the feed-in premium (FiP) and contract for differences (CfD), which require that renewable generators sell directly into the country's wholesale market. In addition, RE generators are also allowed to participate in ancillary services and balancing markets. Since 2015, some bidders in FiP or CfD auctions bid zero premium payment, which essentially made them full market participants with no public subsidy.

A recent example of this type of auction, which uses bidding on premiums to renewable generators selling into the wholesale electricity market, is the successful technology-neutral auction held in Finland in 2019. In this auction, 1.36 terawatt hours (TWh) of energy was contracted at an average premium of €2.51 per TWh. Renewables developers competed through a "pay-as-bid" auction for an FiP, paid on top of the three-month average wholesale market prices for a 12-year period.[3]

The use of FiP and CfD auctions minimizes public subsidies for renewables and provides renewable generators strong signals regarding the value of their energy in the market. **However, for this approach to work, there needs to be a reliable wholesale market in operation.** In addition, depending on program design, the off-taker or government may still be responsible for subsidies in the form of the cost of new transmission facilities.

This is the case, for example, in German and Dutch offshore wind auctions, where an FiP auction design is used, but the national power system pays the cost of required new transmission.

FOURTH STAGE: COMMERCIAL AND INDUSTRIAL POWER PURCHASE AGREEMENTS

Many countries are currently in this fourth stage of auction program design, where commercial and industrial (C&I) consumers procure power from RE plants or virtual power plants directly instead of via wholesale markets or utilities. Between January and March 2020, corporations worldwide signed PPAs to purchase 2.4 GW of clean energy. This is slightly more than the first three months of 2019, when 2.1 GW was signed.

STAGES OF RENEWABLE ENERGY AUCTION DESIGN

The total capacity of corporate PPAs signed in 2019 was 19.5 GW, comprised of almost equal shares of wind and solar PV. Buyers in 2019 were concentrated in the technology, communications, government, and metals and materials industries. This trend is strong in the United States; the Nordic countries, especially Norway and Sweden; and Latin America, including Brazil, Panama, Mexico, and Costa Rica.[4]

In many cases, buyers are using auctions to obtain the best prices. The C&I buyers' reasons for procuring renewables through PPAs could be corporate climate commitments (as in the United States and Europe), hedging against wholesale market fluctuations (mostly Europe, but starting also in India and Latin America), or security of supply (developing countries, often for manufacturing sites or critical public facilities such as hospitals). In these cases, auction designers benefit from technical assistance on corporate auctions and regulatory enabling environments.
In countries where state utility and corporate auctions run parallel to one another, there may be competition between private and public auction schemes and consequently an impact on the competition level in auctions by state utilities.

CONCLUSIONS

While these are common patterns of development, the four stages are not experienced by all countries. Each country approaches auctions in ways that allow innovation, change, and adaptation to emerging objectives. **Countries that are most successful at performing auctions embrace change and allow for constant adaptation.**

The general objectives that many countries pursue as their auction programs evolve include reducing subsidies and integration costs, increasing the value of energy for their particular power system, ensuring generation adequacy, and improving the effectiveness of the technical integration of renewable energy.

This analysis suggests several useful recommendations for auction program design:

1 Auction programs need to be flexible and allow for changes in design as results are reviewed and objectives evolve. The laws and regulations establishing auction programs should allow for evolution in auction designs and approaches.

2 Country officials should clarify objectives related to grid integration, ensuring the maximum value of energy (time of day, time of year, and times of surplus and deficits in energy supply) and where renewables are best located in the country.

3 Auctions should start with small ceilings to help countries test the market, establish clarity on pricing, and avoid stranded high PPA costs that are often associated with early auctions.

4 Auction designers should be aware that there is occasionally a risk of auction failure as new approaches are tested. For example, early auctions in Colombia, Poland, and Turkey encountered problems in their first auctions and needed redesign before the auctions were successful.

5 Auction designers should view auction program evolution as a long-term process that responds to changing priorities and opportunities. Examples of this include adopting FiP and CfD approaches when wholesale markets are introduced and combining storage with renewables as the price of storage declines.

[1]BloombergNEF, Bloomberg New Energy Finance Database, https://about.bnef.com. This is the first auction recorded in the Bloomberg New Energy Finance auctions database; [2] https://www.e-education.psu.edu/ebf483/node/720; [3]BloombergNEF; [4]BloombergNEF, "Homerun for Onshore Wind in Finland's First Auction," March 29, 2019; [5]BloombergNEF, Corporate PPA Deal Tracker, March 2020.

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SCALING UP RENEWABLE ENERGY

SARAH LAWSON SENIOR ENERGY SPECIALIST, USAID
SLAWSON@USAID.GOV
ARAI MONTEFORTE CHIEF OF PARTY, TETRA TECH
ARAI.MONTEFORTE@TETRATECH.COM