

The Opportunity of Corporate PPA (CPPA) Implementation in Indonesian Electricity Market to Increase Renewable Energy Penetration

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Abstract - One of the main challenges in developing renewable energy (RE) power plants is the selling price of the electricity produced. Indonesia has constraints in increasing the capacity of renewable energy generation: the cost of producing clean energy electricity is often higher than the tariff that PLN gets from selling electricity to consumers. The availability of RE subsidies in Indonesia still does not exist. To overcome the issue, this study was conducted to evaluate the opportunity of Corporate Power Purchase Agreement (CPPA) as a solution to increase the capacity of renewable energy generators in Indonesia. The application of the CPPA requires IPP as a power producer to find its off-takers. PLN only provides electricity transmission networks and supporting facilities. Thus, PLN and the Government are not burdened with large capital costs for investment. The main advantage of IPP is that it is more flexible to negotiate with corporate off-takers in determining electricity production rates and seeks cooperation with other countries to generate additional income from the sale of renewable energy certificates.

Keywords – Renewable energy, tariff, capacity.

I. INTRODUCTION

Power plants, as one of the main sources of carbon emissions, are required to reduce the emissions produced. The use of environmentally friendly fuels for old power plants and increasing renewable energy generating capacity are targets to curb global warming. To meet the target of achieving clean energy, is not an easy thing. This is because electricity tariffs from renewable energy plants tends to be more expensive than electricity tariffs for fossil generators, such as coal and natural gas. Furthermore, only a few locations have such large-scale clean energy production capacity. Thus, to encourage RE project, advanced countries provide financial support for the RE project, so that the electricity selling rates produced can compete with fossil energy. Among them are providing tax breaks, issuing special tariffs for RE electricity or so-called feed in tariffs, or issuing clean energy certificates that can be traded so as to increase financial income for RE project owners. In year 2017, European Union (EU) which have a large capacity of MW of renewable energy electricity, provide the largest subsidies for energy production, more than 70 billion USD [2]

However, subsidies for RE in these European countries do not last forever, only for a certain period. There is concern among clean energy project developers

that in the future the clean energy subsidy facilities will be reduced. From the analysis conducted by IRENA[2], countries such as the UK, Netherlands, Ireland, America, China and Japan, did not provide clear certainty, for the extension of subsidies, after the end of the current renewable electricity subsidy program. The uncertainty of the long-term

subsidy program has an impact on the long-term financial income performance as well.

The downward trend in the selling price of electricity from RE will also put pressure on electricity producers in countries that implement electricity sales through a bidding system or an unregulated market. So that it suppresses revenue when the project is built with a more expensive old investment cost. Therefore, the big players in renewable energy projects in Europe and America are looking for a way out, so that income from the sale of RE electricity is maintained.

In Indonesia, the problem with using clean energy is that the selling price of electricity from RE for small and medium scales tends to be more expensive than the selling rate for electricity from PLN to consumers. The Government has not been able to provide tariff subsidies to cover the difference between the selling price of RE electricity and the selling rate of PLN to consumers. Another obstacle in Indonesia is the risk of fluctuations in the exchange rate of the Dollar against Rupiah which can cause greater losses for PLN. The process of procuring an IPP model contract, which requires a lot of time and effort, is an additional obstacle for the development of renewable energy in Indonesia.

One way to overcome this issue is by implementing Corporate PPA, a type of electricity sales contract. Corporate PPA is an agreement between a private power plant and an interested private buyer to purchase renewable electricity, where in the business, both parties agree to purchase the power generated from the agreed project for a fixed period. The electric utility company receives the electricity generated from the power plant and manages the balance between supply and demand for electricity and the daily needs of the parties.

II. METHODOLOGY

The methodology used in analyzing opportunities for implementing CPPA is:

1. To review the problem conditions of the development of renewable energy power plants.
2. Find out the solutions of renewable energy acceleration from other countries
3. Identify opportunities for CPPA to be applied in helping increase renewable energy penetration.

The first step in evaluating the growth conditions in the use of renewable energy as fuel is to look at the results of the report from EBTKE on the Study of Renewable Energy Achievements in 2020. In addition, it also collects information from several sources about the conditions and constraints of developing renewable energy plants in Indonesia. Then, referred to other countries solution to solve RE issues. The next step is to evaluate the potential for CPPA to be implemented in the electricity market in Indonesia, as well as under what conditions this type of contract can be applied.

III. RESULTS

A. Renewable energy target and obstacles

From the Performance Report of the Directorate General of Energy and Mineral Resources in 2020[5], it is known that the achievement of the use of new and renewable energy in the electricity sector is 11.2% (ref EBTKE). When compared with the Government's target of 23% in 2025, there is still a large enough difference to meet the target. However, it is not impossible to achieve if implementing certain strategies to overcome the problem of achieving the renewable energy target.

There are several main obstacles in increasing the capacity of renewable energy power plants. These problems include the electricity tariff from new renewable energy plants, for a scale of up to 100 MW, is higher than the electricity tariff produced from coal-fired power plants. For example, the 75 MW wind farm produces electricity at a rate of 11 cents USD/kWh, more expensive than coal-fired power plants which are less than cents 10 USD/kWh.

Although RE power plants provide benefits in the matter of clean environment, but at the end, PLN customers want the electricity tariff as low as possible and the clean environment impact due from RE is not the main concern so far.

According to a study conducted by the House of representative's Budget Review Center (Ref)[6], other obstacles to developing RE power plants are

- a. Business schemes and incentives are not optimal
- b. Limited RE storage,
- c. Types of RE plants are still small-scale, scattered, and interconnection systems are still limited,

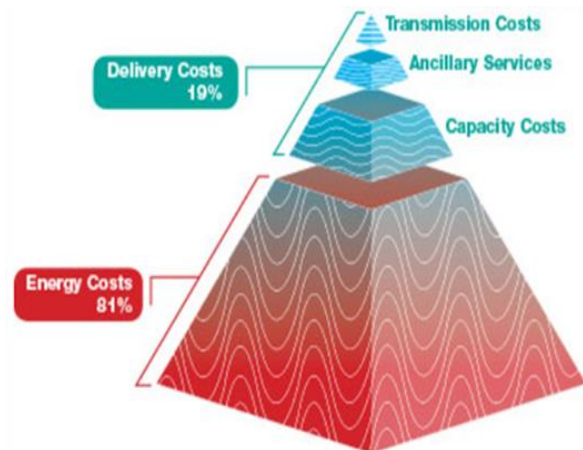


Fig. 1. General illustration of electricity cost components delivered to customer [7]

- d. Differences in perception between the government and the House of Representatives regarding the terminology of subsidies, technological innovation
- e. The capacity of human resources in mastering technology are still limited.

The government has not been able to issue regulations on subsidies for RE power plants, because the law as the legal action for doing so is not yet available.

B. Renewable energy power plant capacity

In the electricity tariffs, there are two main components, namely tariffs for generating electrical energy and tariffs for maintaining the operational stability of the electrical system, which is commonly called ancillary service.

In Indonesia, the ancillary costs are fully borne by PT. PLN (Persero), as the state electricity company. Ancillary service costs will be large if the power system receives electricity supply from power plants with intermittent energy such as solar energy, wind and ocean currents. Figure 1 can be seen in general illustration of the components of the overall electricity cost required to supply electricity to consumers. Another factor that could increase ancillary service cost is the level of penetration of that intermittent energy. The higher penetration level, the higher the cost will be.

According to EBTKE report's 2020[5], total capacity of renewable energy power in operation is 10.400 MW, as can be seen in the table 1. To reach 23% new and renewable energy target by 2025, the new capacity should be at least 12.000 MW new power plant built during the next 4 years. Considering the progress during the last 4 years, from 2017 - 2020, there are only 1788 MW new signing contract of renewable energy power plant owned by private, or called IPP (Independent Power Producer).

TABLE 1.
 THE CURRENT CAPACITY OF RENEWABLE ENERGY POWER PLANT

Type of Renewable Energy Power Plant	Capacity (MW)
Hydro	6.121
Bioenergy	1.903
Geothermal	2.130
Wind	154
Solar	153
Hybrid	3
Total	10.400

urge to find out new solution to accelerate the increment of new RE power plant capacity.

C. Government subsidy to accelerate renewable energy

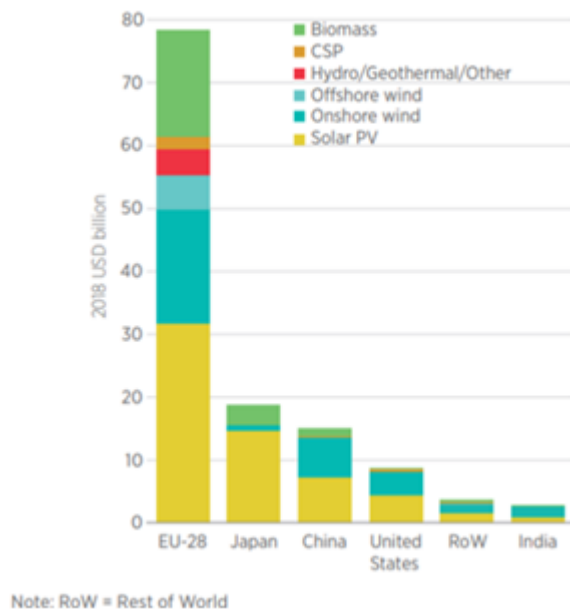


Fig. 2. Subsidy for Renewable energy[1]

One of solution to accelerate RE power plants is by providing subsidy. As seen from fig 2, illustrates the amount of subsidy provided by Government in the countries where they have high RE penetration. From this figure we can learn that, by providing financial subsidy, 18 of the EU-28 Countries can reach renewable target by 20% in 2020[14]. However, this subsidy will not last forever. The trend of subsidy reduction in Europe has been started, in order to set up energy market fairness. Thus, RE Developers should find out alternative ways to create bankable RE projects.

IV. DISCUSSION

A. Corporate PPA: an alternative solution to accelerate RE

One of the solutions that can accelerate RE power plant is by implementing CPPA (Corporate Power Purchase Agreement). As seen in the fig 3, the trend of

CPPA increases significantly. In 2016, the capacity of RE power plant contracted with CPPA is about 1000 MW, and 4 years later, in 2020, the total capacity has reached 6.750 MW. The rapid increase in the capacity of Corporate PPA in Europe is due to the continued decline in renewable energy electricity tariffs feed-in-tariff based fiscal incentives in several specific regions in Europe. Meanwhile from the buyer side, the main drivers for companies choosing to buy electricity under a Corporate PPA contract are:

Corporate PPAs by country

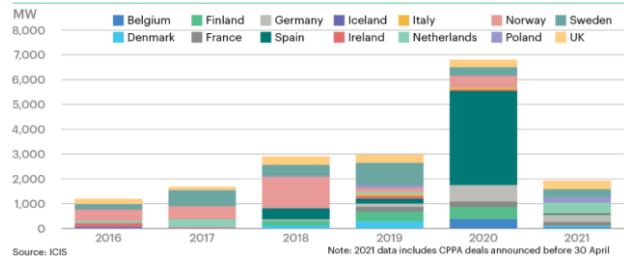


Fig. 3. CPPA trend in the EU Countries [8]

- Increase in electricity purchase rates for corporate customers, such as the trend of increasing electricity rates in the UK, France and Sweden.
- Guaranteed of renewable energy electricity supply.

CPPA is an agreement for the sale and purchase of electricity between a producer of electricity from renewable energy and an off taker (the end buyer) who purchases electricity for their own use (not as a supplier or retailer who intends to sell electricity to other parties). In Corporate PPA, the corporate buyer signs a contract with an IPP company and commits to purchase a certain amount of renewable electricity at an agreed price and for an agreed period of time. The term of the Corporate PPA contract is ten years or more. The contract period varies depending on the business and legal agreement. In Corporate PPA, the owner of the power plant does not directly sell the electricity produced to the buyer, but through an electric utility company that has a parallel contract with the electricity end user. The user or the final purchaser of electricity has the right to consume 100% of the electricity generated from the IPP generator.

CPPA is an advanced format Power Purchase Agreement (PPA). The PPA is a power purchase agreement which is a contract between a buyer (off taker) and an electricity producer (Independent Power Producer, IPP). The buyer's goal is to buy from the producer of electricity at a certain price for a certain period. The PPA allows the facility owner to secure the revenue stream from the project, which is required to finance the project. Typically, the PPA contains agreements such as the length of the agreement, commissioning process, purchase and sale of energy and renewable energy attributes, prices, restrictions, achievements and failures, credit and insurance.

The things that differ CPPA over standard IPP contract are:

- CPPA is not a substitute for the standard IPP PPA contract in Indonesia, but can only be applied in certain areas
- In the CPPA, PLN is not required to absorb electricity production from the IPP, while in the PPA standard, all electricity production must be absorbed by PLN
- In CPPA, PLN does not need to find a buyer. IPP RE companies are looking for buyers themselves, namely corporate companies.
- The CPPA price is not bound by Government regulations, but is in accordance with the agreement between IPP and the Corporate Company
- PLN does not need to be responsible for the risk of power majeure generation or changes in the dollar exchange rate. The end buyers can consist more than one company

Electrical energy transacted through the CPPA, has two types:

1) Sleeved/Physical CPPA, which sells electricity to the buying company using the same electrical system. The electricity produced by the IPP plant is not sold directly through the electricity network connected to corporate buyers, but is still in the same electricity system. The corporate purchaser when processing a PPA, may appoint an electric utility company to act as an intermediary through a parallel contract, simultaneously with the CPPA process with the IPP generator. This electric utility company handles the transfer of electricity, including providing balancing power, from the IPP to the buyer company, by paying a certain fee. The balancing power provided by the company includes handling intermittent electrical energy generated from wind farm and photovoltaic power plant. This process can be seen in the fig 4.

Physical CPPA guarantees a long-term hedge (typically more than 10 years) for electricity tariffs, offering the opportunity to have access to and competitive offsite projects developed in an optimized location and resource area. In this model, the company's off-taker relies heavily on suppliers who provide the power supply balancing function. The more variables in buying and selling electricity, it will increase the complexity of energy supply agreements and reduce the flexibility to change suppliers.

2) Virtual/Synthetic CPPA, is only a financial transaction, without any transfer of energy between the IPP generator and the buyer.

In each case, the generator and the end consumer are contractually linked, so that power can be distributed. Virtual PPA has similarities with Physical CPPA. The similarity between Physical CPPA and Virtual CPPA is

that electricity is generated from renewable sources, customers receive REC (Renewable Energy Certificate) and the end result is long term stability of electricity prices.

Virtual CPPA has several differences with the Physical PPA. First, there is no physical delivery of energy to the customer, instead the power generated by the IPP generator is sold to the electric utility company.

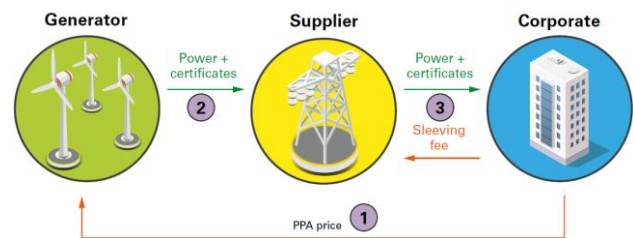


Fig. 4. Physical PPA Structure (with Green Certificates)[9]

Second, customers receive renewable energy certificates related to the sale even though they do not receive energy directly. Third, generators and customers influence ongoing financial “swap” transactions based on the difference between the contractually agreed power price (as if the customer had purchased electricity) and the spot market price.

Virtual CPPA is a purely financial transaction (not a contract for the sale of electricity), and the corporate buyer does not acquire and is not responsible for receiving the electricity generated by the IPP generator. The Virtual CPPA system is commonly applied in America, which consists of states, and many electricity markets.

Virtual CPPA is basically a form of financial hedging in which there is still a payment for a fixed amount of costs for renewable energy and variable costs in the transaction.

Figure 5 describes the Virtual CPPA process. The main difference with Physical CPPA is that the IPP generator sells the electricity it produces to the electrical energy market located where the power plant is located and the buying company buys electrical energy from the electrical energy market where the buyer is located. These two markets often occur differently. However, the parties signed the virtual CPPA to provide price guarantees based on the agreed structure and to sell the REC to corporate buyers. In this way, Virtual CPPA separates the physical flow of electricity from the financial flow.

B. The Most Suitable CPPA Model to Apply in Indonesia

Physical CPPA is the most suitable physical type to be applied. This is because this type of CPPA can work even though there is only one buyer and one seller. For other types of CPPA, namely Virtual CPPA can only be applied in the electrical system market where there are multi buyer and multi seller.

The application of Virtual CPPA in the complex electricity system market in several countries, aim to maximize the absorption of electricity production as well as to minimize potential financial risks. In the Virtual CPPA system, electricity transactions use a derivative trading system, where the price of electricity at one time can change immediately following several parameters. The high complexity of the Virtual CPPA system without being accompanied by a multi seller and multi buyer system makes it difficult to implement in Indonesia. Another reason is that it is difficult to implement a derivative trading system in Indonesia. This is because derivative product instruments have not become common practice for electricity transactions.

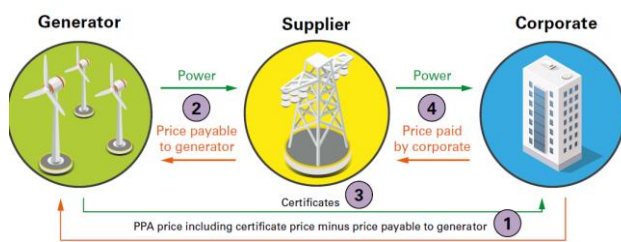


Fig. 5. Virtual/Synthetic CPPA Structure (With Green Certificates)[9]

C. The prospect condition for CPPA in Indonesia

The implementation of the CPPA power purchase contract in Indonesia requires preparation of several things, which cannot be applied to all electricity systems. CPPA can be useful to implement, under the following conditions:

i) Areas with high reserve margin

It is difficult for IPP power plants to obtain contracts if the targeted area has a reserve margin of above 50%. The construction of power plants with standard IPP contracts in areas with high reserve margins carries the risk of PLN paying a take or pay fine. However, with CPPA, the electricity produced by IPP is distributed entirely to off takers who have contracted with IPP. PLN is not at risk of having an excess supply of electricity.

ii) low electricity cost of production

Building new NRE power plants in areas with high coal power plant penetration with low cost of production is challenging, if the contract used is a standard IPP. For example, if there is a RE plant with a capacity of 10-15 MW, with a selling rate of 8 cents USD/kWh, will be difficult to get the PPA contract in Java or Bali, with production cost 7 cents USD/kWh, However, with CPPA, electricity sales can occur, because CPPA Off takers can get additional benefits from REC (Renewable Energy Certificate) transactions.

iii) The planned capacity of the IPP is greater than the load on the electrical system

An example of this case is for example, there is a customer who needs 10 MW of electricity supply in Eastern Indonesia, while the local system capacity is only 8 MW. Customers consider that if they use a diesel engine, will produce electricity at 18 cents USD/kWh. Another option is for the customer: buying RE electricity from IPP, who is able to build a 10 MW biomass plant, at an electricity rate of 14 cent USD/kWh. With CPPA, it is possible to transact with RE generating capacity larger than the electricity system, and higher tariffs than local production cost, via the PLN electricity network.

iv) IPP brings unproven technology

Sometimes it is difficult for PLN to accept electricity sales from IPP plants that use technology that has not been proven (proven reliable). An example of a case that might occur is if there is a 2 MW PLTSa (waste to energy power plant) in an area that plans to sell the electrical energy produced to PLN. Because PLN is not sure about the reliability of the technology, PLN will likely refuse. With CPPA, the risk of reliability of generating technology is in the hands of IPP and off taker producers.

v) Areas with inadequate analysis of NRE potential

If the analysis of the adequacy of renewable energy sources in a project plan is deemed less convincing, so that it has the potential to disrupt the stability of PLN's electricity supply to customers, the project can be transacted with CPPA So that PLN does not have to bear the potential risk of a shortage of electricity supply to consumers due to insufficient IPP electricity production.

D. How PLN may support CPPA

Because RE plants with CPPA contract pass through the PLN transmission network, PLN needs to evaluate the electricity system network to distribute electricity. The selection of locations to open the CPPA option needs to evaluate the capacity of operating power plants. If the electricity on the CPPA contract is firm Capacity, then it is easier to receive it. However, if the generator is intermittent capacity, such as photovoltaic or wind, the availability of power plants with high ramping rates needs to be evaluated.

A power wheeling scheme can be implemented to support this CPPA. In the transmission network where there is still capacity to distribute electrical energy, it can be leased to CPPA generators at a certain cost. If the capacity of the existing transmission network is full, then PLN can build a new network, by riding on the existing transmission tower, for capacities below 10 MW.

E. Potential location to implement CPPA contract

CPPA can not be deployed in any electricity power system, without assessing the grid prudently, due to the already high complexity of electricity grid in the certain cities. However, there are several potential location and customers that have good prospect to set up CPPA:

- Industrial area and tourist island area.
- Companies that are members of RE100, namely companies that are committed to using 100% clean energy. Several companies which are subsidiary companies of RE100 members, have operation base in Indonesia, such as Accenture, Ajinomoto, Asahi, BMW, Cocacola, Danone, Nestle and many more.

V. CONCLUSION

As what have occurred in the European Countries, CPPA will benefit either PLN (as the electricity grid operator), IPP (as the owner of power plant), or corporate off taker. The higher electricity cost generated from RE can be compensated by selling carbon emission reduction through RE certificates. There are several benefits for those parties in the CPPA contract, such as:

- For RE generator owners (producers)/IPP
 - The selling price of electricity production is based on an agreement with the off taker, in this case a corporate company, and independently from Government regulation.
 - RE power producers can get a bigger margin, if they build a generator with a larger MW capacity.
 - Off taker can be more than one
 - Gaining certainty of income from the sale of electricity at a fixed price.
- For corporate companies (off takers)
 - The purchase price of electricity is stable or fixed in the long term
 - More secure supply of clean energy. Off taker supplied from a single generating location is easier to monitor the supply of clean energy, without being mixed up by electricity from fossil plants.
 - Off takers have the option to purchase electricity from IPPs and utility companies, so that electricity supply security is guaranteed.
- For electric utility companies (such as PLN)
 - Ancillary or balancing service fees can be calculated and billed more easily to off takers. This cost is quite large, especially if the electricity is generated from intermittent generators such as photovoltaic or wind farm.
 - New revenue, from electricity transmission toll fees, without the need to provide large investment funds to build power plants.
 - Increase the contribution of RE to the energy mix without having to take big risks investment.

- When the off-taker corporation is unable to absorb RE electricity from the producer, the utility company can buy it at a lower selling price, especially if the electricity is generated from an RE generator without fuel.
- There is no need to look for consumers who buy electricity, because this has been done by the IPP generator.

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