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Business Model Canvas Application from A Peer-To-Peer Energy Transaction Service Provider Platform for Rooftop Solar Power Plant (PLTS) Customers

Zafya Nadhira Affiandi[1], Eko Adhi Setiawan[2]
[1,2]*Universitas Indonesia*
zafyanadhira5@gmail.com, ekoas@eng.ui.ac.id

Abstract

The electricity export-import scheme using rooftop solar PV by PLN customers, commonly known as net metering or net billing, was not attractive because it was only valued at 0, 65:1 for each price of electricity sold to the price of electricity in general. In mid-2021, the Ministry of Energy and Mineral Resources will revise the provisions on the export of electricity by valuing 1:1 for each electricity price sold. However, changing the export-import scheme can eliminate compensation for the cost of storing consumer electricity which PLN will bear in the future. At this time, the emergence of more proactive consumers with production and storage capabilities in the context of renewable energy, in other words, "prosumers", can bring new opportunities or challenges for the operation of energy systems in the electricity market environment. Recently, the Peer-to-Peer Energy (P2P) system has been one of the new recommendations for the design and operation of the electricity market. This mechanism allows customers to trade their electricity directly to their neighbours through a P2P service provider platform. The absence of research related to the elaboration of business models that can encourage the implementation of P2P and, in the future, the benefits of P2P itself to be channelled properly encourages this research to analyze the business model that will be offered from the side of P2P service providers in the form of startup companies. In this study, nine elements of the Business Model Canvas (BMC) are used as guidelines for implementing P2P platform service providers based on Rooftop Solar PVs for residential areas in Indonesia. Offered. From the consumer side, this research describes the Value Proposition Canvas (VPC), which can help consumers know when consumers will get what they want and what difficulties they will face with a P2P platform in the future. In addition, from the service provider's perspective, the application of BMC can help to produce a good business model translation which must have a balance between several requirements which are divided into three terms, namely feasibility (technical), desirability (customer) and Viability (economics) of the product.

Keywords
business model; application; service provider

I. Introduction

The rapid increase in energy demand and dependence on fossil fuels makes countries worldwide face major challenges in energy and environmental security (Avilés, HB, & Wattsa, 2019). In 2012, Indonesia, China, and India had the third-highest economic growth globally at 6.2%. According to the Coordinating Ministry for Economic Affairs of the Republic of Indonesia, Indonesia's economic growth in the second quarter of 2021 has increased by 7.07%. It is the highest increase in the last 16 years. The case growth was

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achieved when Covid-19 cases were active in the second quarter of 2021, which recorded 113,218 cases. Indonesia's oil and gas export performance in December 2021 decreased by 17.93%. The trigger for the decline in Indonesia's oil and gas export performance was the decline in gas and crude oil exports. On the other hand, Indonesia's energy (oil and gas) import performance in December 2021 increased by 10.51%. The increase in the value of imports in the energy sector was triggered by an increase in oil imports caused by the high level of domestic fuel consumption as opposed to the capacity of domestic oil refineries, which one day will no longer be able to meet domestic fuel needs.

Energy plays an important role in Indonesia's economic development. According to the Indonesian Ministry of Energy and Mineral Resources, the energy, mining and mineral sectors are the second-largest source of state revenue after taxes. The realization of Non-Tax State Revenue (PNBP) from the Energy and Mineral Resources sector in 2021 reached 189.2 trillion or 156% of the target of 121.1 trillion. On the other hand, the energy sector also provides a sizeable burden on state spending. From the projection of Indonesia's primary energy mix, the share of oil and natural gas in 2025 and 2050 is estimated at 49% and 39%, respectively, of the total national energy demand based on the Business as Usual scenario or 45% and 44% based on the Current Policy scenario. In addition, the primary energy mix in Indonesia is still dominated by fossil energy at 88.8%, while the availability of fossil energy sources is very limited. According to the Indonesian Mining Association Chairman, the Indonesian Ministry of Energy and Mineral Resources' coal production target in 2021 reaches 550 million tons. Under these conditions, it is estimated that Indonesia's coal resources will run out in the next 20-30 years. The increase in energy demand will be inversely proportional to the national production reserves, which will decrease. On the other hand, the continuous use of fossil energy can threaten the development of the Indonesian economy.

Reliance on the use of fossil energy can also put the government's fossil fuel production plans out of sync with the emission reductions needed to avoid global warming. Indonesia has committed to reducing emissions by ratifying the Paris Agreement as stated in Law no. 16 of 2016. Indonesia's target is to reduce GHG emissions by 29% unconditional (with its efforts) and 41% conditionally (with adequate international support) by 2030. Considering some of these problems, Indonesia needs to shift to renewable energy consumption to maintain energy availability and achieve energy security in the future.

The structure of the electric power system in the world is undergoing significant changes, in particular, the transition from the current energy distribution network to a more sustainable and efficient grid through the smart grid, which is expected to produce dramatic changes in the energy market in short to medium term from technological advancements, innovation of new business models, increased consumer engagement, and increased awareness in safeguarding climate change (Rodríguez-Molina, Martínez-Núñez, Martínez, & Pérez-Aguiar, 2014). The progress will benefit electrical energy business actors such as suppliers, consumers or customers, the government, and other business actors. The benefits that can be felt immediately will be seen from the development of more efficient technology services, increasingly affordable electricity prices, the emergence of consumer involvement in investment and management of new technologies, and the strengthening of the resilience of the electricity system. One example of technological developments in the electricity system is the development of distributed power plants, commonly called DG (Distributed Generators). Looking at the changing trend of the world's electrical energy system, the efforts made by the Ministry of Energy

and Mineral Resources in dealing with changing trends in Indonesia's electrical energy development in the future are the application of a smart grid and metering by utilizing the latest technology. The application of smart grids is very important in increasing energy security independence and the New Renewable Energy (EBT) mix and energy efficiency. According to the Ministry of Energy and Mineral Resources 2018, Indonesia has a fairly large New and Renewable Energy Potential, including mini/micro hydro of 450 MW, Biomass of 50 GW, solar energy of 4.80 kWh/m2/day, wind energy of 3-6 m/s and 3 GW of nuclear energy. With the abundance of renewable energy sources, Indonesia is a country that has the potential to develop a network of small-scale distributed generators or distributed generators from renewable energy sources.

The application of distributed power generation can change the overall electrical energy system from a business model to transaction regulations and energy management that adhere to a smart grid system. On the other hand, the market model will also experience changes with the spread of power generation technology. The shift in the role of the customer will occur in an integrated market model with dispersed generations. The role of the customer, which was initially only as an end-user, became a prosumer (seller-customer). Consumers can use DG for personal consumption or continue to consume part of it, whereas the other part of the supply is obtained from conventional electricity systems. Apart from the industrial sector, prosumers can also come from the residential sector.

In the 2021-2030 Electric Power Supply Business Plan (RUPTL), one of the implementations of the DG system that can be used as a new source of income for PLN is to implement peer-to-peer (P2P) energy trading. The emergence of more proactive consumers with production and storage capabilities in the context of renewable energy, in other words, "prosumers", can bring new opportunities or challenges for the operation of energy systems in the electricity market environment. The P2P energy system is the process of buying and selling energy (in the form of electric power) between parties, each of which will act as a producer as well as a consumer, known as a "prosumer" with energy management system techniques on a smart grid that allows prosumers to participate in the energy market actively, by selling their excess energy or reducing their electricity bill [8]. Recently, the P2P system has been one of the new recommendations for the design and operation of the electricity market. Conceptually, the P2P electricity market relies on a consumer-centric perspective by allowing consumers to choose how they buy their electrical energy source freely. A community can also be formed by "prosumers" who want to collaborate on managing or operating electrical energy.

P2P Energy is a concept developed from Feed-In-Tariff, currently used in Indonesia. Feed-in-Tariff is a scheme where the prosumer can resell the excess electricity generated from the power plant in his home to the electricity supply company. This is regulated in the Minister of Energy and Mineral Resources Regulation No. 12 of 2017 concerning the Utilization of Renewable Energy Sources for the Provision of Electricity [9]. Unfortunately, in the current Feed-in-Tariff scheme, the prosumer is not very profitable [10]. The Difference between P2P and Feed-In Tariff is the ability of prosumers to participate in arranging sales and purchase agreements and how to deliver energy and services [11], so it is hoped that prosumers will get better benefits and encourage participation in this P2P concept. In addition to benefiting prosumers, electricity companies including from the generation, transmission and distribution side (in Indonesia, it is PLN), also benefit because it will reduce demand during peak loads[12], reduce investment and operational costs[13], minimize the need for 'reserve'[14] and improve system reliability.

Researchers from various institutions working in various technical fields have generated innovative ideas and conducted research on P2P with the help of funding

agencies. In a previous study [15], the economic analysis of the P2P mechanism in the residential sector. By comparing the methodology of IRR, NPV, payback period, and also LCOE, it is concluded that the P2P mechanism is more attractive to customer participation in developing rooftop solar panels (PVC) for the residential sector. The switch from net metering to P2P causes the IRR of each prosumer to increase in the range of 1-4.5% and the NPV to increase in the range of USD 1800-2700 for prosumers with batteries and the range of USD 100-240 for prosumers without batteries. In addition, the payback period is 1-9.5 years faster, and the LCOE value of the electricity generated by rooftop solar panels is reduced by 3.1-9.8 Cusd/kWh. The P2P scheme can be more profitable than Indonesia's net metering scheme.

However, after conducting a feasibility study for the implementation of P2P, the implementation of P2P has not yet entered the Indonesian electricity market for the commercialization stage due to several factors such as lack of knowledge of business models in managing P2P startups no or little collaboration with industry, or too focused on technical research without knowing the market needs. On the regulatory side, various regulatory obstacles often occur, including the lack of regulation, clear connection rules, and electricity market regulations that do not yet support P2P services themselves.

To eliminate some of these obstacles, the thing that needs to be done after passing the design or design stage of the P2P implementation itself is to validate a business model that can encourage P2P implementation and, in the future, the benefits of P2P itself will be channelled properly. The success of the commercialization process is needed so that the research efforts carried out by researchers can be useful in the future. This research is useful for institutions or researchers researching an innovative project to gain further knowledge from the commercialization side of their research project.

II. Research Method

2.1 Basic P2P Scheme Design

The communication layer includes technology or software (smart meters) required in the P2P market mechanism. Both will generally be integrated into data processing, acquisition, validation, storage, resetting, and costing. The communication process will take place on several levels, from the smallest scope (home area network) to the neighbouring area (neighbourhood area network) to the scope of one market (wide area network). In the P2P market, there are four regulated transaction communication models, namely a centralized model, an unstructured spread model, a structured spread model and a mixed model of two or more of the three models (Marza, Salas-Puente, Figueres & Garcera, 2017).

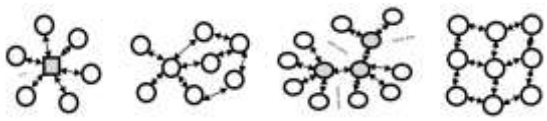

Figure 1. *Four Communication*

Models Centralized Model uses a centralized server that stores all resources and information from peers and can act as an agent that coordinates every action of each Peer by sending messages to a central server to determine the address of each Peer that contains data/ source. However, this type of Model only requires a single engine. The limitation in terms of capacity can reduce its performance, and it can experience a single failure to be less reliable.

III. Result and Discussion

3.1 P2P Pilot Project Trial

A pilot project trial for the mechanism of buying and selling electricity with a peer to peer system had previously been carried out by Aloysius Damar Pranadi (2019) in the North Jakarta area with a centralized market type with 159 households as the population so that the market was formed as follows:

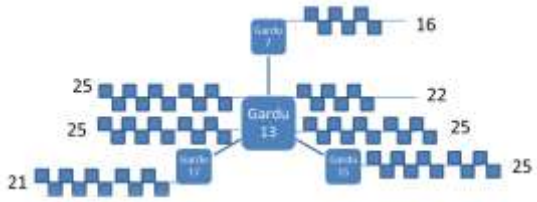

Figure 2. *Example of a Pilot Project in North Jakarta*

In this study, researchers divided consumers into three types, namely tier A, B and C, with the following information:
Type A: Households that have a solar panel system and energy storage
Type B: Households that have a solar panel system
: Households that do not have a solar panel system and energy storage

Based on this division, the Number of each Peer and the load profile described in the table below are identified:

Table 1. Number of Participants in the Pilot Project and Consumption-based on the load profile on weekdays and Weekends

Peer Type	Member	Weekdays			Weekend		
		Morning Evening Peak	Stay at Home	Nocturnal	Morning Evening Peak	Stay at Home	Nocturnal
Type A	8	3.38	0.94	4.08	4.14	0.64	4.94
Type B	111	0	0	0	0	0	0
Type C	80	0	0	0	0	0	0

Table 2. Consumption by Load Profile on Weekdays and Weekends

(kWh)	Weekdays	Weekend	Weekdays		Weekend	
	Members	Members	Solar Export	Solar Import	Solar Export	Solar Import
Morning Evening Peak	95	64	2.88	1.68	2.54	2.02
Stay at Home	8	72	0.94	2.79	0.64	3.09
Nocturnal	56	24	3.58	1.21	3.34	1.46

Based on the table above, the total generation and purchase results can be realized in the P2P market. The Difference between total exports and imports on weekdays and weekends where the results must be more than 0.

Table 3. Calculation table for Total Export-Import on P2P on Weekdays and Weekends

kWh	Weekdays	Weekend	Weekdays		Weekend	
	Number of Participants	Number of Participants	Total Export	Total Import	Total Export	Total Import
Peak Morning/Afternoon	95	64	274.752	107.511	161.544	97.553
Stay at Home	8	72	7,473	18,633	45,792	116,328
Nocturnal	56	24	199,227	79,659	79,659	56,793
Total	159	159	481,452	286,995	286,995	270,674

RSP and RPP from the Number of participants from the equation -2.26-2.31, the results obtained are RSP and RPP, which bring the following economic potential to the P2P market:

Table 4. P2P Economic Analysis Results Based on Pilot Project

Parameters	Amo unt	of Units
IDR (0.79 of Electricity Price)	0.080	USD/kWh
IDR (0.86 of Electricity Price)	0.088	USD/kWh
Electricity Sales	2.182	USD/year
Savings from Purchases Electricity	1,084	USD/year

Based on research conducted by Aloysius (2019), if there is a company that wants to manage *a pilot project*, based on P2P calculations, the company can benefit from network rental services of 50,897 USD for 20 years this market is running (see table below), based on the pilot project with a population of 159 households, it resulted in the addition of 139.2 kWp solar panels with the equation below.

$$Pp2p = Ppeer\ x\ nProsumer = 1.17 \frac{kWp}{houses} x\ 119\ houses = 139.2\ kWp$$

Pp2p = Number of Solar Modules installed in P2P system (kWp)
Peer = Number of Solar Modules installed in *Peer*, with 90% of the total maximum capacity being 1.17 kWp (kWp/house)
Nprosumer = Number of prosumers in the P2P system (houses), which is the sum of Type A Peers (111 houses) and Type B Peers (8 houses).

Table 5. Analysis of Electricity Company's Revenue Losses in the P2P Mechanism

Analysis of Electricity Company's Income Loss in the P2P Mechanism	Amount	of Unit
Cost Avoided to Build Solar Modules	178,765	USD
Profit from Selling Distribution Network Rental for P2P Mechanism	50,897.96	USD
Smart Meter Installation Services	2,206.95	USD
Loss of Customer Electricity Sales	-61,657	USD
Net Profit earned in 20 years of P2P period	170,212.69	USD
Net Profit earned in one year	23,126	USD/Year

Based on table 5, it can be seen that PLN will receive a loss of 61,657 USD with a fixed margin scheme at 20 the next year. However, on the other hand, the electricity company that operates as a platform will not suffer losses due to the income from network usage of 50,898 USD, including the sale of smart meters of 2,027 USD and the costs avoided from the construction of a net metering scheme such as the construction of 139 kW worth 178,765 kWp which obtained From the calculation of the cost of Rooftop Solar PVs for prosumers so that the figure is 23,126 USD annually, this result does not include additional benefits such as avoiding the effects of greenhouse gases and other environmental effects.

3.2 Business Model P2P Rooftop Solar Pv Residential Area

The business model is defined as a scheme of how companies create and deliver *value* to their customers and how customers can receive *value* offered by the company. A business model is a coordinated series covering the flow of costs, revenues, and benefits (Teece, 2018). The success of a business depends on the business model determined by the company. The company must consider how the company builds a business to be widely recognized. Steve Blank and Bob Dorf at Blank and Dorf (2012) provide knowledge of startups and step-by-step guidance to build a great company. The BMC used as the analytical framework was adapted from Osterwalder and Pigneur (2010).

3.2 Value Proposition Canvas

VPC can provide an overview on the researcher's side of how consumers think about the project being initiated (Ostelwarder et al., 2014). The Value Proposition in this study focuses on electricity distribution with a peer to peer scheme compared to net metering that is currently running. In this case, the Value Proposition Canvas illustrates the values that a project can offer and the types of benefits it generates for the customer and the major difficulties and hurdles they face, an important part of the Value Proposition Canvas is being able to know what point the consumer will get what they want and what the difficulty is. Faced with the existence of Peer to peer platforms in the future, After the Value Proposition was made, the researcher chose the target

3.3 Fit and Ranking Jobs, Pains, And Gains

After the value proposition, Canvas was created. The Customer Jobs, Pains and Gains have been ranked and chosen as a priority, a match is made whether the gains from the products offered are by the *customer's gains* as well as *Pains*, if The value proposition matches the needs of consumers, so the value proposition canvas is considered suitable to be continued as a business scheme, if the value proposition of the product made is not by the consumer's *gains* and *pains*, the researcher must make the product that is needed by the customer and not according to the wishes of the researcher.

3.3 Business Model Canvas

A good business model has a balance between several requirements which are divided into three terms, namely: F ease (technical), desirability (customer) and Viability (economics) of the product offered (Osterwalder & Pigneur, 2010). The Business Model Canvas consists of *key partners, key activities, key resources, value proposition, customer relationships, channels, customer segments, cost structure* and *Revenue Streams,* the key partners in this project are the Rooftop Solar PV Construction and Installation Business Entity, Electricity Company State, Residential Developers. In contrast, the key activities are P2P-Based Rooftop PLTS Management, Prosumer application-based platform

management in the P2P scheme and *maintenance* of these activities can be achieved with various resources consisting of Technicians, Servers, Applications, Integrated Online Transactions, Web Developers and Investors, *the business model canvas* explains how the project can be achieved and is explained more fully in **Figure 11. The** picture describes the initial design of the business model canvas to answer the hypothesis in this study.

3.4 Desirability (Consumers)

Desirability or desire can be known by comparing *Value Proposition, customer segment, customer relationship and channel* to form a product. Customers, based on customer analysis, the target customers for this product are:

1. Segment A: Households with a solar panel system and energy storage
2. Segment B: Households with a solar panel system
3. Segment C: Households without a solar panel system and energy storage

3.5 Feasibility (Technical)

Feasibility or feasibility tests are carried out to analyze the external feasibility of this Peer to peer project to be made, starting from infrastructure to applicable regulations, researchers analyze *key activities* on this project and the parties who will be involved as partners and parties who will assist Peer to peer platforms, Business Entities for the Development and Installation of Rooftop PLTS, State Electricity Company (PLN) and Residential Developers are considered as parties who can become influential partners to carry out *key activities* consisting of P2P-based Rooftop PLTS Management, application-based platform management prosumer in schematic P2P and maintenance, key activities, resources owned by the company and its business partners can be considered regarding the feasibility of this Peer to peer platform.

3.6 Viability (Economics)

The economic aspects of this Peer-to-peer platform can be identified through *Cost Structure* and *Revenue Streams* in the *business model canvas*. The cost structure for this platform includes Research and Development Fees, Development Process Costs and Operational Costs, Marketing Costs, Employee and Technician Fees, Rental Fees and Office Equipment. At the same time, income will be obtained from Rooftop PLTS Rental Income and Income from transactions between peers.

3.7 Design Criteria Canvas

Making a Design Criteria Canvas (DCC) can help determine a product development strategy or MVP [21]. In the end, DCC will explain the quality of the P2P platform as an improvement in the electricity market model based on rooftop solar PV for residential areas in Indonesia. In this study, DCC has 4 MVP features. The first features in DCC are "must-have" features such as an easy-to-use platform, a choice of power sources, network security, and reducing the use of non-environmentally friendly energy. The second feature is a "must-have an important" feature, such as the transition to EBT, which can be a business opportunity, a user-friendly platform, reducing bills and controlling electricity usage. The third feature is a "possessive and optional" feature, such as creating a new market concept, reducing the cost of the state's electricity infrastructure, increasing awareness of renewable energy, and providing transparency in selecting energy sources. In addition, the fourth feature is a feature that "wouldn't have", such as a platform that is not easy to understand, using energy sources that are not environmentally friendly, and there is no price competition.

Table 6. Design Criteria Canvas

Design Criteria Canvas			
Must-Have	**Should Have**	**Could Have**	**Will not Have**
Platform easy to use	Transition to renewable energy	As a new market model concept	The platform is not easy to understand
There is a choice of power sources	It can be a business opportunity	Reduce the cost of the country's electricity infrastructure	Using energy that is not environmentally friendly,
network security,	user friendly,	awareness of renewable energy	, no price competition
, reducing the use of non-environmentally friendly energy,	reducing electricity bills,	transparency in the choice of energy sources	
	Controlling electricity usage		

3.8 Pivot

This section describes how P2P platform products face future problems or obstacles with future marketing trends. Pivoting or pivoting in a startup is changing a strategy to direct the business to a favourable or desired situation. One of the problems that are likely to be faced is various regulatory barriers and electricity market regulations that do not yet support P2P services themselves. In addition, there is the possibility of the emergence of business competitors who could emerge from the government side in developing the P2P platform itself. In the future, there will also be concerns about the existence of renewable energy sources whose installation and production costs are lower than PLTS. Several trend issues, along with the pivoting details of each of these problems, are described in the following table:

Table 7. Pivot

Trend	Pivot
Are there new regulations that can hinder the distribution of the P2P electricity market?	Using the BACKUP (Baparekraf for Startup) program under the Ministry of Creative Economy of the Republic of Indonesia to explain the advantages of implementing the P2P electricity market at a residential scale to the government
What if PLN made a similar business model?	Continue to cooperate with PLN by emphasizing that this collaboration can help reduce the cost of electricity infrastructure
. What will we do if there is a cheaper renewable energy source than PLTS?	Incorporating these energy sources into the P2P

3.9 Story-Telling Canvas

The Story Telling Canvas (STC) was created to attract the attention of potential customers to the energy P2P platform that will be offered. In the STC, several sections are described such as the subject of the story, the purpose, and the story's audience. The subject of the story of the P2P platform that will be developed begins with the depleting fossil energy source reserves along with the potential for buying and selling electricity from rooftop solar power plants in residential areas in Indonesia for the transition needs of renewable energy. However, based on research results [15], the existing market mechanism for the buying and selling scheme was still unattractive because Indonesia's net metering tariff policy is only 65% of PLN's electricity tariff. This story aims to maintain the availability of energy reserves while tackling climate change. The hope is to create a decentralized generation and electricity market where the energy produced by PLTS can be sold 100% of the time. The audience for the story described is the residential area electricity users through housing developers' intermediaries.

The description of this story is made in 5 parts, including "before", "set the scene", "make the point", "conclusion", and "after the story". Before they felt the result of this story test, the audience thought that they could only sell electricity to PLN (net metering/net billing). In addition, electricity sales to PLN are only valued at 0.65:1 and are not in the form of cash flows. This story will create a scene with a P2P-based electricity buying and selling service provider platform. The audience can carry out electricity buying and selling transactions from the choice of electricity sources they will use.

Furthermore, the audience will experience an "A-Ha moment" when they can buy and sell electricity on a P2P basis with the freedom to choose the source of the electricity provider. In addition, they will also benefit from the electricity produced and can reduce the use of energy that is not environmentally friendly. From this story, it can be concluded that the P2P clean energy buying and selling mechanism can reduce dependence on the use of fossil energy. This will enable customers to participate in developing NRE technology with the concept of a new market model (open market electricity system). After this story is concluded, many customers will be interested in using this P2P platform because it can generate additional profits from the generated electricity.

Table 8. Story Telling Canvas

SUBJECT	**GOAL**	**AUDIENCE**
What is the story about?	What do you want to achieve with your story?	What is your story's audience? What are their needs?
1. Reserves of fossil energy sources will run out if they continue to be used, so alternative energy sources are needed that can replace fossil energy sources	1. Maintain the availability of energy sources reserves	Residential area electricity users through housing developers
2. The need for transition to	2. Overcoming climate change	

renewable energy				
3. The initial implementation of net metering/net billing was not attractive because it was only priced at 0.65:1	3. The energy produced could be sold 100% 4. Decentralized generation and electricity market			
BEFORE	SET THE SCENE	MAKE YOUR POINT	CONCLUSION	AFTER
What does your audience think, feel, know, or want, before they have experienced your story?	What do you need to introduce? What should be set up or explained?	The audience A-Ha moment	The end of your story? What is the conclusion? What is your call of action?	What does your audience think, feel, know, or want, after they have experienced your story?
1. Audience can only sell electricity to PLN (net metering/net billing)	1. Peer-to-peer-based electricity buying and selling service provider platform	1. You can buy and sell electricity on a peer-to-peer basis	1. Energy buying and selling mechanism clean Peer to Peer can reduce dependence on the use of fossil energy	1. Consumers will use this P2P platform because it can generate additional profits from the electricity produced
2. The application of selling electricity to PLN is only priced at 0.65:1	2. Can choose the source of electricity to be used	2. You get the freedom to choose the source of electricity supply	2. The concept of a new market model can be implemented so that electricity can be sold openly (open market electricity system)	2. Can be a solution in saving electricity bills
3. The initial application of net metering/net billing does not offer cash flow to customers	3. There are already several countries piloting platforms that help with trading schemes for peer-to-peer electricity generation	3. You get Profit from the electricity produced	3. Customers can participate in developing renewable energy, especially PLTS	3. Can monitor and control electricity usage directly
		4. You can contribute to reducing the use of non-environmentally friendly energy		4. Reducing dependence on non-environmentally friendly energy

3.10 Business Model for P2P Energy Implementation Case Study Residential Area

Indonesia's target of reducing GHG emissions by 29% unconditional (with its efforts) and 41% conditional (with adequate international support) by 2030. By looking at some of these problems, Indonesia needs to switch to renewable energy consumption in order to maintain energy availability and achieve energy security in the future. According to the Ministry of Energy and Mineral Resources, one of the factors driving the growth of renewable energy generation can be through solar power. However, the issue of electricity tariffs generated from EBT plants is also still a concern of the government, one of which is the electricity tariff from PLTS, which is considered not economical. One solution to accelerate the use of PLTS, which can later open up the market, is to implement a peer-to-peer (P2P) energy trading-based electricity trading system that can be used as a new source of income for PLN and consumers. In Indonesia, there is no P2P-based electricity buying and selling system implemented, especially in residential areas. In addition, there is still a lack of innovative study efforts and business model validation offered to implement P2P-based electricity buying and selling systems in residential areas.

Hypothesis-1. There is a need for a shift in fossil energy consumption to renewable energy.

Hypothesis-2. BMC as a guideline for implementing a P2P platform based on PV mini-grid for residential areas in Indonesia

Hypothesis-3. P2P-based service provider platforms can facilitate electricity buying and selling transactions.

IV. Conclusion

In the 2021-2030 Electric Power Supply Business Plan (RUPTL), implementing the DG system can be one of the efforts to accelerate the energy transition to renewable energy. One of the DG-based energy market models that can be applied is by implementing peer-to-peer (P2P) energy trading. The emergence of more proactive consumers with production and storage capabilities in the context of renewable energy, in other words, "prosumers", can bring new opportunities or challenges for the operation of energy systems in the electricity market environment. However, there are still no clear regulations and connection rules regarding the electricity market in Indonesia to support P2P services themselves.

To eliminate some of these obstacles, the researcher validated a business model that was able to encourage the implementation of P2P. In the future, the benefits of P2P itself will be channelled properly. From the consumer side, this research provides a description of VPC that can help consumers know at which point consumers will get what they want and what difficulties they will face with the existence of a P2P platform. In addition, from the service provider's perspective, the application of BMC can help to produce a good business model translation which must have a balance between several requirements which are divided into three terms, namely feasibility (technical), desirability (customer) and Viability (economics) of the product. offered.

To enter the commercialization stage of the platform to be developed, it is necessary to analyze the business model for the startup. However, the lack of research on startups engaged in the P2P-based renewable energy market in Indonesia makes this business model unable to be implemented due to the lack of experience, technical knowledge, and regulations regarding startups that provide P2P platform services. Further studies regarding the technical, regulatory, and business models need to be made. This can be done by conducting interviews with experts related to the energy sector from the government side and providers of PV mini-grid support services.

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