A Resource Curse for Renewables?
A Case Study of the Indonesian Solar Energy Sector

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Abstract

Indonesia has an extensive history with extraction of fossil fuels. However, with a growing population and an increased international pressure to move to renewable energy, the Indonesian government has initiated several "green" projects. Much of the new potential energy stems from solar energy, particularly photovoltaic (PV) cells. This study uses a qualitative research design to investigate if the new solar PV sector is suffering from a resource curse. An extensive literature review of literature covering the fossil resource curse and other symptoms thereof revealed some useful variables, which were isolated and utilized as indicators for the analysis of the solar PV sector. The variables are Dutch disease, rent seeking, and economic volatility. Through analysis of the pre-determined variables, there was found no evidence to support a current curse. However, there was found extensive signs of an impending resource curse, which may become a reality if certain features of other energy sectors, including corruption and bureaucratic fragmentation, are not eliminated from the solar sector.

Keywords: *Renewable resource curse, solar PV, Indonesia, Dutch disease, economic volatility, rent seeking, renewable energy development*

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List of abbreviations

ADB	Asian Development Bank
BAU	Business as usual
BAPPENAS	State Ministry of Development Planning
BPPT	Agency for Assessment and Application of Technology
DG EBTKE	Directorate General for New and Renewable Energy and Energy Conservation
DG Electricity	Directorate General for Electricity
EIA	U.S. Department of Energy Information Administration
EU	European Union
FDI	Foreign Direct Investment
FiT	Feed-in Tariff
GHG	Greenhouse Gas
GoI	Government of Indonesia
GW	Gigawatt
ICP	Indonesian Crude Price
IEA	International Energy Agency
IPP	Independent Power Producer
KPK	Corruption Eradication Commission
kWh	Kilowatt per hour
LCOE	Levelized Cost of Electricity
LP gas	Liquid Petroleum gas
MEMR	Ministry of Energy and Mineral Resources

MoF	Ministry of Finance
MoI	Ministry of Industry
MW	Megawatt
NRGI	Natural Resource Governance Institute
PLN	Perusahaan Listrik Negara
PV	Photovoltaic
PVSF	Solar Photovoltaic Rooftop Support Fund
SEA	Southeast Asia
SHS	Solar home systems
SOE	State owned enterprise

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1.0 Introduction

Historically, fossil fuels such as oil and coal have been the mastodons of most energy sectors. The extraction, distribution and sales of these resources have built a multi-trillion dollar industry involving millions of people. Some nations have centered the domestic economy around the extraction of fossil fuels, thus often leaving them to be extremely affected by international trading prices. Indonesia is one of those nations.

The oil boom of the 1970s was an economic boost for Indonesia in the form of vast amounts of new oil revenue and oil taxes (Usui, Dutch Disease and Policy Adjustments to the Oil Boom, 1998, p. 887). However, as a middle-low income economy (International Energy Agency, 2015, p. 22) with a great deal of ethnic diversity amongst the citizens and unrest in the political sphere at the time, the boom-revenue created a scenario with potential for disaster. The presence of vast amounts of natural resources combined with turbulent administration can form the basis for development of a resource curse, by which is meant an abundance of natural resources but a stagnation of growth. The idea of a resource curse is neither new, nor completely accepted amongst academics. Nonetheless, multiple studies (e.g. Acemoglu & Robinson, 2013; Brueckner, Durey, Mayes, & Pforr, 2014) of nations and cases around the world have shown that an abundance of fossil natural resources can potentially lead to conflict. For this project, the set definition of the resource curse will be adapted from the Natural Resource Governance Institute (NRGI), which states the definition as *"the paradox of plenty, or the failure of resource-rich countries to benefit fully from their natural resource wealth, and for governments in these countries to respond effectively to public welfare needs"* (Natural Resource Governance Institute, 2015). Despite the NRGIs statement that the term encompasses challenges unique for nations rich in fossil fuels, for the purpose of this thesis the term will also cover nations developing their renewables sector.

As the international political community intensifies the focus on renewable energy systems, the development of such systems has taken off in many parts of the world. As such, it is increasingly acknowledged that modern energy is crucial for development (International Energy Agency, 2015, p. 119). Despite being one of the few regions in the world projected to increase the usage of coal (International Energy Agency, 2015, p. 31), Southeast Asia (SEA) has seen a rapid increase in foreign direct investment (FDI) in the renewable energy sector (The Insitute of Energy Economics, 2016, p. 11). As the biggest and most populous nation in

the region, Indonesia represents an enormous market for both energy production and consumption. However, the continuous rise in living standards offers a challenge. The Indonesian government plans to diversify the energy mix by increasing the amount 'new and renewable energy' in primary energy supply to 23% by 2025 and 31% by 2050 (International Energy Agency, 2015, p. 16).

The ambitious schemes became a top priority after the prolonged period of high international energy prices between 2010 and 2014, and are primarily fuelled by government plans designed to boost a number of renewable energy electricity generation projects (e.g. thermo, wind and solar) to secure energy diversity and security. Examples of government-initiated programs include the biofuel enhancement program, which has increased the biodiesel subsidy and raised the biodiesel blending mandate to 15% mandated to be produced domestically (International Energy Agency, 2015, p. 18), and a rural provision of solar home systems (SHS) (Asian Development Bank, 2016, p. 27). In addition to the government-sponsored programs, the government relies on international assistance to strengthen the effort to decrease greenhouse gas (GHG) emissions (International Energy Agency, 2015, p. 17). A number of the investors and donors have spotted the potential for renewable energy development in Indonesia (The Insitute of Energy Economics, 2016, p. 11) and particularly the solar energy sector is projected to reach record growth (The Insitute of Energy Economics, 2016, p. 11).

Indonesia, as other SEA nations, is often referred to as having strong potential for solar development (International Energy Agency, 2015, p. 44). The solar energy sector, including photovoltaic (PV) and other solar energy systems, is slowly developing with help from both government initiatives and external investors. However, an influx of capital in a specific sector must be supported by continuous development of legislation and regulation in order to avoid recreating symptoms similar to those seen in the 1970s. The paradox between the enormous potential and the lack of development leads to the problem formulation for this thesis:

"Is there a resource curse in the renewables sector, specifically the solar energy sector, in Indonesia? What are the factors that shape the institutional framework that surrounds the development of the sector?"

Prior to beginning the analysis, there are some basic assumptions, which must be acknowledged in order to obtain the most objective analysis possible. The first assumption is that the definition of 'resource curse' set forward as the accepted for this thesis is generally accepted as the acceptable description of the resource curse. Though the definition chosen for this thesis does not constitute the most controversial version one can find, it frames the common principles for fossil and renewable energy effectively. The second assumption is that for this thesis, the principles true for the fossil resource curse are equally true for renewables. The conditions will be stated in the subsection of "Theoretical Perspectives" titled "Resource Curse".

2.0 Literature Review

This section seeks to provide an overview of the literature relevant for this project. The review was conceptualized as a non-linear process, where the initial searches lead to a deepened understanding of the topic, which in turn caused to the ability to conduct more specific research. Due to the diversity of overlapping areas, which all influence the study of resource curses, considerable room was given to the literature review. The decision to devote several subsections to the literature review is intended to create a clear and concise overview of each of the perspectives the analysis will cover.

As the idea of a 'renewable resource curse' is relatively unexplored, particularly by large studies, the vast majority of the chosen available literature focuses on the conventional resource curse in Indonesia, and some "symptoms" deducted therefrom. A number of search words provided the limit for the initial search. The search phrases included "resource curse renewables", "resource curse Indonesia". As the search progressed, it became evident that Indonesia had previously been under extreme conditions where a resource curse seemed likely, but managed to avoid the curse all together. It was therefore a necessity to investigate each of the parameters used in the analysis – Dutch disease, rent seeking, and trade volatility – to fully understand previous conditions and the literature surrounding each phenomenon.

Renewable Resource Curse

All in all, there were located four useable articles and papers currently written and published on renewable resource curse. The earliest mention of the phenomena was found in 2011

(Gennaioli & Tavoni, 2011) in a working paper published by an Italian research facility. The paper attempts to investigate the potential for a resource curse in the Italian wind energy sector. It concludes that based on an increase in criminal association activity and the expansion of the wind energy sector, there is reasonable cause to believe that there was a resource curse in the Italian wind energy sector (Gennaioli & Tavoni, 2011, p. 36).

In 2013 came another two papers (Menegaki, 2013; Bae, 2013) dealing strictly with the possibility of a resource curse for renewable energy. Menegaki sets out to empirically verify the validity of a resource curse for renewables in Europe (Menegaki, 2013, p. 321). Though a policy review and economic modeling, the author concludes that a resource curse, defined as the phenomena where growth stagnates in countries with rich natural resources (Menegaki, 2013, p. 329), for renewables does not exist in European Union (EU) at the given time (Menegaki, 2013, p. 329). In contrast to Menegaki's quantitative economic modeling, Bae uses a qualitative approach in his attempt to analyze the potential for a renewable resource curse in the solar energy system industry in five Northern African nations. By comparing institutional qualities, he concludes that solar energy is not projected to become a new curse due to the fairly small size of the projected solar energy rent (Bae, 2013, p. 159). However, the institutional qualities found in the five nations present potential to suffer from solar energy resource curse if the rent in the sector should increase (Bae, 2013, p. 181).

As shown, the earliest work on the topic is extremely widespread in terms of geographical placement of cases and numerous different methods and focal points. Furthermore, until 2013 the majority of work done on the phenomena was made by master and Ph.D. students, meaning that is was not published by an academic journal. Therefore, although the phenomena had been described in several different contexts, there was little conceptualization and systematic run-through of the concept. The lack of usable data and the spread of areas of interest in the different papers continued to make the area little explored. Due to the scattered information any verification of direction of causality in each case is difficult to secure; an issue Gennaioli and Tavoni raised already in their 2011 paper (p. 36).

In 2015 André Månsson (Månsson, 2015) provided the first peer-reviewed original research article dealing with the paradoxical issue. In his paper, Månsson explores how renewable energy systems can interact with conflicts and to what extend the risk of different conflicts may change (Månsson, 2015, p. 1). Through a systematic analysis of primary resources, international trade, conversion and distribution, and end use Månsson points out

that renewable resources provide less of an incentive to secure control by starting conflict due to the more even distributed flow of renewable resources as compared to fossil fuels (Månsson, 2015, p. 6). Månsson concludes, "… distribution and use of renewable energy resources can be designed to have a low risk of interacting with conflict, but the success depends on the technologies implemented and other sustainability policies" (Månsson, 2015, p. 1).

In short, it is clear that the current state of literature dealing strictly with the concept of a renewable energy resource curse is limited and lacking. There has been little conceptualization, coherent analysis or larger studies done. However, some common denominators can be withdrawn from the relatively narrow dataset. Firstly, it seems, as each case study is extremely individual in methodology, ontology and epistemology of the authors. It is clear that there are no "schools" or a priori directions yet clear in this academic field. Secondly, all authors conclude that a renewable resource curse, whether existing or not, is closely connected with institutional qualities and the state of government control, which correlates well with results from research on fossil research curses. Lastly, there seems to be some agreement that a resource curse for renewables is an overhanging danger in the future, if not dealt with correctly (Månsson, 2015; Gennaioli & Tavoni, 2011; Bae, 2013).

Due to the complexity of the concept "resource curse" and the small dataset located on renewable resource curses, this literature review also includes literature not dealing specifically with resource curses for renewable energy, but previous analysis of fossil resource curse and Dutch disease, rent seeking and volatility, all specific to Indonesia.

2.1 Fossil Resource Curse and Dutch Disease in Indonesia

Due to the specificity of the literature review, the number of usable literature about resource curses and Dutch disease in Indonesia accumulated to a small handful of articles. However, despite the relatively few papers published on the topic, the ones located for this project proved to be of a considerable quality. In total there were found two texts directly related to the resource curse (Sovacool, 2010; Rosser, 2007) and two dealing with the Dutch disease (Usui, Dutch Disease and Policy Adjustments to the Oil Boom, 1998; Usui, Policy Adjustments to the Oil Boom and their Evaluation, 1996), both focused on Indonesia. For this thesis, Dutch disease will be defined as "part of the boom revenues is spent on the non-tradable goods

which leads to an appreciation of the real exchange rate, which in turn draws resources out of the tradable sector and in to the non-tradable" (Usui, Dutch Disease and Policy Adjustments to the Oil Boom, 1998)

All four texts are interesting, because they deal with a resource curse that did not occur. The oil boom Indonesia experienced in the 1970's presented optimum circumstances for a resource curse to occur, but it never unfolded. The articles focused on the Indonesian resource curse (Rosser, 2007; Sovacool, 2010) both acknowledge this fact, but also uses it as a basis for why the field must be studied further. Sovacool, the most recent of the four, explores whether the resource curse is occuring with respect to the oil and gas sector in SEA (Sovacool, 2010, p. 225). In his analysis, Sovacool proposes metrics usable when identifying the presence of the resource curse (Sovacool, 2010, p. 228), which he applies to different SEA nations, OPEC and the BRICS. Sovacool points out the importance of differentiating between 'point' resources, by which he refers to spatially concentrated resources that are easy to monitor, versus 'diffuse' resources, meaning resources of a more distributed nature (Sovacool, 2010, p. 229). According to him, 'point' resources are more easily controlled and countries that posses these types of resources are therefor more exposed to a potential resource curse (Sovacool, 2010, p. 229). This point is also described by André Månsson in direct relation to a ressource curse for renewables.

Andrew Rosser takes his parting point in the same place as Sovacool in his analysis of the Indonesian case, as he describes how the Indonesian government avoided the resource curse and Ducth disease during the oil boom in the 1970s. However, in contrast to Sovacool, Rosser puts emphasis on the historical background and development of the political and institutional situation in Indonesia. Furthermore, Rosser attributes the success in overcoming a potential resource curse to two main factors. Firstly, the political victory of countrer-revolutionary social forces over radical nationalists and communist forces in the 1960s, and secondly, the country's strategic geographical Cold War location and proximity to Japan (Rosser, Escaping the Resource Curse: The Case of Indonesia, 2007, p. 40). Ultimately, Rosser concludes that "… the efforts made to overcome the resource curse will be difficult to replicate … because the internal political landscape is different today and … due to the fact that the current global political economy does not seem to offer the same opportunities as it did to Indonesia" (Rosser, Escaping the Resource Curse: The Case of Indonesia, 2007, p. 54). Rosser points out that although the conditions to overcome the resource curse were once

present, they may have changed since then and this is an important point in the further analysis of the current state of the potential for a renewable resource curse.

Usui, who have written both the articles on Dutch disease in Indonesia (Usui, Policy Adjustments to the Oil Boom and their Evaluation: The Dutch Disease in Indonesia, 1996; Usui, Dutch Disease and Policy Adjustments to the Oil Boom: A Comparative Study of Indonesia and Mexico, 1998) supports Rosser and Sovacool in their observations and concludes that there has not been cases of either resource curse or Dutch disease in Indonesia, because of certain policy and monetary adjustments made by the government. Due to the closeness of the texts publishing dates and origin of the same author, the literature on Dutch disease in Indonesia is realtively unanimous in observations and conclusions. Usui defines Dutch disease as the ”negative effects an increase in export may have on traditional export sectors” (Usui, Dutch Disease and Policy Adjustments to the Oil Boom, 1998, p. 151). More specifically, the problems around Dutch disease occur when parts of the new revenue is spent on non-tradable goods. This is an issue, because it can twist and depreciate the real exchange rate, thereby drawing resources out of the tradable sector and into the non-tradable sector (Usui, Dutch Disease and Policy Adjustments to the Oil Boom, 1998, p. 151). Usui shows in his studies how the devaluation of the Indonesia exchange rate and accumulation of budget surplus enabled the government to stear the economy around the symptoms of Dutch disease (Usui, Dutch Disease and Policy Adjustments to the Oil Boom: A Comparative Study of Indonesia and Mexico, 1998; Usui, Policy Adjustments to the Oil Boom and their Evaluation: The Dutch Disease in Indonesia, 1996).

This section of the literature review has shown that there is an extremely limited amount of viable data directly discussing a renewable resource curse and Dutch disease in Indonesia. Furthermore, it showed that the data available is pliant and not consistent in methodology, theoretical assumptions or conclusions. However, there are some key aspects of previous literature that this project will bring further into the analysis. Firstly, there is probable cause to believe that a renewable resource curse can exist. Gennaioli and Tavoni (2011) analyze a case of a renewable resource curse in the Italian wind sector, whilst Bae (2013) show probable cause for concern in the case of solar energy in Northern Africa. Secondly, any resource curse for renewables will start top-down, similarly to resource curses for fossil fuels. Månsson (2015) concludes in his study that renewable energy sources can be designed for low risk interaction with potential conflicts. However, the success of avoiding

these resource conflicts is highly dependent on policy and implementation procedure (Månsson, 2015, p. 1). Furthermore, despite previous success in steering clear of Dutch disease, changes in the international aid structure makes it unlikely for such a thing to happen in precisely the same manner as it previously has for Indonesia. Indonesia had success with adjusting the exchange rate and accumulated budget surplus, but due to changes in the international community the same mechanism may not be affective in their current situation. Lastly, a nation cannot rely exclusively on previous experiences in dealing with resource curses. As Rosser concludes, despite previous Indonesian success the international community has changed and conditions are now different compared to those the nation faced in the 1960s and 1970s (Rosser, Escaping the Resource Curse: The Case of Indonesia, 2007, p. 54).

2.2 Rent seeking In Indonesia

In contrast to other areas of the literature review, rent seeking is a heavily studied area, not exclusive of the SEA region and certainly not Indonesia. Following the Asian economic crises of 1997-1998, the economic and institutional behavior of east Asian nations drew attention, meaning that by the millennial change there were a number of articles on the collapse and possible future of the affected nations. However, the attention academic scholars had previously given to economic development slowed down in the following decade. In total, this review covers a handful of books, some very specific to rent seeking in Indonesia and others more general, a few academic articles and a small number of newspaper articles.

From the early 2000s to 2010, a number of books, many of them featuring Indonesia, were published on rent seeking and corruption. These books, along with newspaper articles, provide most of the contemporary literature on rent seeking specifically in Indonesia. At the time of the collapse of many Asian economies in 1997-1998, Indonesia was still under leadership of Suharto. The majority of scholars differentiate between the time before and after the crisis, which de facto becomes the time before and after Suharto, due to the resignation of Suharto in 1998. In general, Suharto was considered to be extremely popular and good for both economic and political life in Indonesia. However, it is also considered to be a time where nepotism and corruption grew rapidly within government (Jomo & Khan, 2000, p. 273). An example of this was seen when Suharto appointed family and friends to be part of

the cabinet that were left in charge when he was forced to resign after the crisis (Wells & Ahmed, 2007, p. 162).

The definition of rent seeking is extremely dependent on the context in which one finds it. Not all rent seeking is negative, however, for this thesis it will be characterized as "using resources to earn income or rent for people through political power, and which constitutes income above the normal in some sense" (Poluan, 2013; van Klinken, 2007, p. 49). It is important to note that the type of rent seeking being discussed in this thesis creates no value-added and this is the reason why it is seen as destructive.

The origin of government rent seeking in Indonesia is little disputed. The consequences and current state of rent seeking, however, is more debated. Although the literature on the topic has different approaches to the topic, there is an overall set of common ideas. Firstly, rent seeking is detrimental to institutional efficiency. Two main reasons for this inefficiency are overly centralized center of power and misallocation of funds. The centralization can be caused by either an extremely small number of individuals with executive power over a large number of decisions, or control physically centralized in a certain area or group of the population (Mehmet, 1994, p. 60). Misallocation of funds happens in several ways. One characteristic for the Indonesian economy is informal spending activities (Davidson, 2015, p. 33; Wells & Ahmed, 2007, p. 177). This includes secret projects or spending activities, kept from public records and often only discovered after any transaction.

Secondly, institutional transparency is key. Informal and off budget spending murk the water and makes placing accountability impossible for any revision authority. Longstanding Indonesian traditions dictate gifts and other lavish gestures to higher ranked people, making the system somewhat static (Mehmet, 1994, p. 61). This practice can prove difficult to uphold with no issues, due to the subjective and ambiguous boundary between bribery, rent seeking and gift-taking (Mehmet, 1994, p. 64). Whereas other nations, such as the United States, have oversight institutions, the Indonesian government struggled with lack of oversight for decades. Albeit there has been improvement, rent seeking in public energy development projects was extremely lucrative, precisely due to lack of oversight that often follows foreign investments (Mehmet, 1994, p. 84).

Lastly, the existing social contract and societal hierarchy plays an important role for rent seeking. Since the foundation of the Corruption Eradication Commission (KPK) in 2002 there have been notable arrests, including court judges, ministers and chairmen of SOEs.

Despite some public turmoil, local businesses in general accept and work around rent-seekers and corrupt members of government (Poluan, 2013). The patrimonial structure of the Indonesian system (Mehmet, 1994, p. 61) and the firm hierarchy of the overall social contract minimize the resistance to rent-seekers, causing enormous transaction costs in the system. In addition, little pre-emptive action from the government to stop this behavior creates ideal conditions for continuing rent seeking (Hamilton-Hart, 2007, p. 110).

In sum, the literature on rent seeking in Indonesia points to three main conclusions. Firstly, rent seeking in an institutional system, when defined as not providing any value-added is highly ineffective. This can emerge from, but not limited to, overly centralized power and misallocation of public funds. Secondly, institutional transparency is key. If there is a shadow economy of off-budget spending accountability for any wrongdoings may be extremely difficult to place, and more importantly, persecute. Lastly, the social contract between local businesses and government personal is crucial for the development and maintenance of rent-seekers. If the rent seeking behavior is accepted as a part of business as usual (BAU), rent seeking will increasingly become part of the established institutional conduct.

2.3 Trade Volatility in Indonesia

Trade volatility is a global phenomenon, which refers to the elasticity of prices and exchange rates across the world. Oil prices have in the past showed extreme price volatility, having serious consequences for the national economies reliant on oil-based income. The Indonesian economy has for decades consisted largely of energy-related income, such as oil, coal and to a lesser extent gas.

In general, there are large amounts of work done every year on trade and exchange rate volatility, due to its key role in trading. Especially within the energy field, volatility makes a crucial difference between ‘buy’ and ‘sell’. Volatility in Indonesia is a studied subject, albeit to a much lesser extent than the total amount of literature. In comparison to the literature on both fossil resource curses, Dutch disease and rent seeking, this collection of data was much newer. Multiple studies have been done since the Asian financial crisis in the late 1990s and many of the included articles are less than 10 years old. With respect to the type of article, those that describe volatility differ vastly in nature. A few scholarly articles

directly related to trade volatility in Indonesia were found, whereas subsections on volatility were found more frequently as a part of larger studies. Lastly, working papers and newspaper articles were also found on the topic.

The general literature on trade volatility in Indonesia primarily investigates whether there is a link between fluctuations in exchange rates volatility and the trade balance (Siregar & Ramkishen S., 2003; Pasasa, Fetcher, & Bustaman, 2010). Unsurprisingly, all the studies found on the topic concluded that exchange rate volatility highly affects both import and export performance in Indonesia (Siregar & Ramkishen S., 2003, p. 237; Pasasa, Fetcher, & Bustaman, 2010).

The main body of literature dealing with price volatility in Indonesia points to the subsidy program as the most noticeable subject of study (Mourougane, 2010; Pagliarulo, 2014; Budina, 2012; Resosuduarmo, Alisjahbana, & Nurdianto, 2012). The main concern is that the global volatility on energy prices poses a serious problem for the Indonesian government subsidy program, which although it is being phased out, must be done so in a responsible way so the poorest section of the population is not abandoned with high energy prices (Mourougane, 2010, p. 2; Resosuduarmo, Alisjahbana, & Nurdianto, 2012, p. 170). Due to high volatility in energy prices, the government shields the consumers from large fluctuations in prices by increasing spending when prices are higher than average. Furthermore, the high reliance on fossil fuel to supply electricity causes the Indonesian government to furthermore control end-use prices of electricity to consumers (Resosuduarmo, Alisjahbana, & Nurdianto, 2012, p. 170). As a consequence, both fuel and electricity prices are an enormous burden to the government budget when oil prices are high (Resosuduarmo, Alisjahbana, & Nurdianto, 2012, pp. 170-171).

In sum, the literature on trade and price volatility shows some common key points. Firstly, the energy sector is highly volatile and national economies relying on energy-based income are more susceptible to comparable fluctuations in the fiscal balance. Secondly, there is a link between exchange rate volatility and trade-balances. High volatility will in most cases show a negative link, whereas low volatility will often show a positive link. Lastly, the Indonesian subsidy program is extremely vulnerable under high volatility. This is due to the enormous economic shelter the government must provide to its citizens, who are dependent on the subsidies for both fuel and electricity.

3.0 Methodological Considerations

This section will describe the methodology used to create this thesis. It will include the general subsections Data and Data Collection, Research Design, Theoretical and Methodological Choices, and Values and Delimitation for choice of topic. Data and Data Collection will provide an overview of the data reviewed and the collection process. The subsection Research Design contains the relevant methodology for case study analysis and a brief case description. Choice of Theory explains some of the ontological and epistemological thoughts behind the thesis and an overview of the theoretical choices, including some rejected theories. Lastly, Values and Delimitation provides an introduction to the personal motivation and values, which are the essential drivers for the thesis. Furthermore, it will touch upon some delimitation for the scope of this thesis.

3.1 Data and Data Collection

The data for this thesis consisted of a wide range of types of text. Due to the callow nature of research on the topic there has been little peer-reviewed academic work done on the topic and none on a potential resource curse in Indonesia. Therefore, the data had to consist of all the text available on the topic of a resource curse for renewables, despite the fact that they all deal with other regions or types of energy systems. All the initial data was, however, all focused on the resource curse for renewables. This data was supplemented with additional data dealing with the fossil resource curse specifically in Indonesia and Dutch disease specifically in Indonesia. This prioritization was done in order to create a somewhat enlightened picture of a poorly described field of study.

In addition to the literature on specific and limited parts of the project, more general literature was also utilized. Reports from international agencies, such as the U.S. Energy Information Administration (EIA), the International Energy Agency (IEA), the Asian Development Bank (ADB) and literature from Indonesian government agencies, provided a vast resource for data on the country's energy mix and policies. Lastly, books and articles, both domestic and international, about the Indonesian government and society provided crucial insight need for further analysis.

As far as collecting the data, the primary technique used was online searches for specific search phrases connected to different areas of the overall topic. A search on the main

search engine, Google, reveals that *"resource curse for renewables"* brings up the handful texts described in the literature review, as well as many other texts dealing with the fossil resource curse. As previously described, it was necessary to collect smaller pieces of information on different topics and through different texts in order to create a full image of the current situation. There is currently no one report or book that can provide such an answer. However, despite there being no "holy grail" book on the topic, books such as *"Why Nations Fail"* by Acemoglu & Robinson, and *"Resource Curse or Cure?"* by Brueckner, Durey, Mayes & Pforr have proved important for the foundation of knowledge on resource extraction in general.

3.2 Research Design

There are a multitude of approaches when it comes to research designs for academic work. The choice of research design depends on the nature of the data collected and the style of analysis. The small amount of research already conducted on the renewables resource curse has in the majority had overwhelming quantitative components to their research design, often in the form of economic or statistical modeling. However, the approach for this thesis will be slightly different due mainly to two reasons. Firstly, the academic background of the author does not permit for an extensive quantitative model, such as economic or statistical modeling. Secondly, the intention of this paper is not to create a model, but to analyze the relevant institutional framework. This thesis is an attempt to investigate the issue from a qualitative standpoint, which embraces the challenges this might bring. It is the goal that this research and this new approach can enlighten the subject in a new, but comprehensive, way. For these reasons, it was assessed that a qualitative research design would be appropriate.

The research design in this paper will consist of a case study design of the Indonesian state and the current situation for renewables, more specifically the development of solar energy systems. The case study design was chosen based on the generally diverse application range of the method (Yin, 2009, p. 1; Flyvbjerg, 2011, p. 302). Furthermore, it will contain a literature review of any preexisting data on the field. The following chapter will include a description of the case study methodology. More specifically, it will describe the methodology and conditions for conducting the review, and a run-through of the concrete literature found.

3.21 Case Study Methodology

There is not one commonly accepted definition of a case study (Gerring, 2004, p. 342). However, in order to solidify what role the research design has for any academic work, one must firstly define the term for the specificity of each paper. For this thesis, the definition of a case study is adopted from Yin (2009) where he defines a case study as "… an empirical inquiry about contemporary phenomena (e.g. a 'case'), set within its real-world context, especially when the boundaries and phenomena are not clearly evident" (Yin, 2009, p. 18). For the purpose of this paper, the case is defined as a community (the Indonesian Solar Energy Sector) and the phenomenon is defined as a resource curse, or symptoms thereof. The symptoms could include, but is not limited to, reallocation of money or increased corruption. The specific details of what the term 'resource curse' entails will be described in the "Theory" section of the thesis.

The conditions described by Yin in his definition match well with the situation observed in the Indonesian energy sector and is the primary reason for the choice of this specific research design. Yin's point that boundaries and phenomena may not be clearly evident suits the research question, which asks if a certain phenomenon is present within a somewhat, but not completely, defined area of boundaries.

The nature of this thesis and the main research question poses a methodological challenge, due to the apparent openness of both the question and the boundaries involved. When posing the question "Is there?" one leaves a seemingly simple question open for a complex answer. However, the exploratory nature of the question matches well with the natural advantages of a case study and Yin's definition of a case study. John Gerring (2004) points out that case studies are not a way of defining causal relationships (Gerring, 2004, p. 341), because the type of causality suitable for studies in ceteris paribus has an easier time addressing some causes than others (Gerring, 2004, p. 349). He also argues that case studies have an "easier time addressing invariant causes" (p. 349), rather than probabilistic, although proving any causality generally requires cross-unit cases (Gerring, 2004, p. 349). Ultimately, the loose structure of the research question and the openness of the boundaries of which the research is being done within, provides a well-established match for the case study research design.

A reoccurring criticism of the case study design is that there is little or no use for the generalizations deducted from a single-case study. Generally, the criticism states that case

studies cannot contribute to scientific development, because one cannot generalize based on an individual case (Flyvbjerg, 2011, p. 304). However, a number of scholars (e.g. Flyvbjerg 2011; Yin 2009; Gerring 2004; Bryman 2012) have all argued that the knowledge derived from a singular case can be extremely useful in a more general setting.

As table 1 illustrates, there are a number of observable variables present in each case study. According to Gerring, some affinities match a single case study more appropriately than a cross-sectional study and vice versa. However, case study research does not cover merely a single type of case. There are a wide variety of different types of designs, which depend on the individually found affinities. Identifying the nature of a case can help with the validity and reliability of the work, because it allows others to replicate the conditions under which the case was analyzed more accurately (Bryman, 2012, p. 69). Yin and Bryman describe five types of cases: the critical case, the unique or extreme case, the representative or typical case, the revelatory case and the longitudinal case. Each case type differs from the others on crucial aspects, however, one is not limited to merely one classification per case. Nor is the analyst locked to a specific type of case identification, if the later results show the appropriation of another classification (Bryman, 2012, p. 71).

		Affinity	
		Case Study	Cross-Unit Study
1. Type of inference	(a) Descriptive	+	
	(b) Causal		+
2. Scope of proposition	(a) Depth	+	
	(b) Breadth		+
	(c) Boundedness		+
3. Unit homogeneity	(a) Case comparability (internal)	+	
	(b) Representativeness (external)		+
4. Causal insight	(a) Causal mechanisms	+	
	(b) Causal effect		+
5. Causal relationship	(a) Invariant	+	
	(b) Probabilistic		+
6. Strategy of research	(a) Exploratory (theory generation)	+	
	(b) Confirmatory (theory testing)		+
7. Useful variance	(a) For only a single unit	+	
	(b) For many units		+
8. Ontology		Indeterminate	

Table 1. Single-unit versus cross-unit research design: tradeoffs and affinities. Gerring, 2004, p. 346.

The unit of analysis for this thesis is defined as a unique case, which is quite common in clinical studies. A unique case holds a certain interest, which makes it unique (Bryman, 2012, p. 70). In the chosen case for this study, the circumstances being investigated have never before been publicly researched and are therefor quite unique. Furthermore, the archipelago layout of Indonesia and the nations role as the leading coal exporter in the region leaves them in an extremely unique situation.

In sum, we can say that the open structure of a case study fits this study extremely well. The exploratory nature of the research question and the broad range of diverse literature needed to complete the a priori knowledge of the subject suit the described frame for case study work well. The case description in the following section will illustrate why an open research design, such as a case study, was chosen.

3.22 Case description

The boundaries for the examined case in this research are wide and cannot be conclusively defined, as it is possible with many other case studies. This is primarily due to the large scale of the case. Since this case encompasses an entire sector of a country, the range of the case extends far beyond a case of, for example, a single business or person. There are a high number of stakeholders, complex legal and regulatory considerations, which is all spread across a large geographical area. These features all complicate the definition of boundaries.

The geographical borders of Indonesia constitute the first boundary. This thesis is an investigation of the domestic solar energy market of Indonesia, naturally limiting research to activities happening within the country borders. Secondly, there is a limit of three individual theoretical frameworks used. These were chosen on the a priori knowledge of the writer, which has been accumulated through previous visits to Indonesia and academic analysis of Indonesian policies related to energy and grid expansion. The third outer boundary is the government bodies involved. The processes being analyzed in this thesis has some process guidelines, which are administered by certain political bodies, as seen in Figure 2.

The “inner boundaries”, or the context of the case, is more challenging to predetermine due to the large amount of variables and stakeholders involved. The origin of the domestic solar sector in Indonesia is extremely young, effectively nullifying the previous history of solar power – because there is none. In addition, despite certain established policy procedures it is not taken as a guarantee that all officials follow these.

In sum, the case is a study of domestic solar energy development in Indonesia. The determined boundaries of the case are the geographical borders of Indonesia, three predetermined theoretical frameworks, and the established overview of involved stakeholders. The context within these boundaries is difficult to describe further, due to the infancy of the sector so far and insecurity about the behavior of the Indonesian bureaucracy.

3.3 Theoretical and Methodological Choices

The theoretical and methodological choices for this thesis proved challenging to determine, due to the little research previously done on the topic. A well-studied research area often provides one or more widely acknowledged approaches that have often been tested multiple times by previous researchers. However, in this case the variety of approaches, interest areas and a priori assumptions provided no clear theoretical basis for this particular research paper.

Due to these reasons, the research design and approach was highly based on the researcher's previous experience with analytical work paired with some observations about common traits from previous work on the topic. As much of the previous work on the topic has contained economic analysis in the form of models and simulations, it was important for this thesis to approach the phenomenon 'resource curse' from a slightly different angle. Whereas previous work has presented evidence of a positivistic nature, this thesis assumes the parting-point of interpretivism. By assuming that no data is value-free and asserting the importance of interpreting the phenomenon as well as the context (Walsham, 1995, p. 376), this thesis provides an unexplored framework for analyzing the resource curse. Furthermore, by following a hermeneutic process, which allowed continuous interpretation and reinterpretation of the data, the development of the thesis content aligned well with the openness of the research question and the "softer" nature of the research in this thesis.

The theoretical framework set-up for this thesis consists of theory covering fossil resource curse, fragmented bureaucracy, and the nature of institutions. Whereas the theoretical work on fossil resource curses seems like an obvious basis for further analysis of a renewable resource curse, fragmented bureaucracy and the nature of institutions might not seem equally as obvious. However, they both serve the purpose of covering the immense amount of facets involved in the research question. Domestic energy security is a matter for a national administration and its institutions. At the time of writing, the Indonesian administration is not completely in sync with its institutions. The gap between coordination and motivation between the central government and the involved institutions is typical for fragmented bureaucracies, which is why theory on the area must be included. In addition, the nature of institutions plays a vital role for the development of a specific sector. If an institution proves to support development and free-market economy, it will co-operate very differently than an institution with none or little of these traits. Extraction and fragmentation

are often two sides of the same coin, but institutions can also be inclusive and fragmented. This condition is important to highlight, because it relates to the situation in Indonesia. Indonesia is not a failed state, but there is some fragmentation in and between institutions. Although it may seem like an unnecessary overlap, the interplay and connection of bureaucratic fragmentation and the nature of the involved institutions is crucial to understand and underline for this thesis.

3.4 Values and Delimitation

During a 6-month study in Iceland, the potential value of abundant renewable energy resources became obvious. The small island nation has specialized in geothermal energy extraction and is producing some of the cleanest and cheapest energy in the world (OECD, 2014, p. 3). Iceland has developed techniques and technology to maximize their extraction success and make the most of their large amounts of resources. However, through light research it became clear that very few nations in the world are using their full potential with respect to renewable energy development. Furthermore, as a student of development and international relations I speculated why a large amount of scholars emphasize the importance of developing renewable energy resources, but not the dangers of creating a new, and in some areas extremely unregulated sector. Renewables constitute a large part of FDIs (International Energy Agency, 2015, pp. 111-112), yet there is little attention given to the mechanisms that surround and control the investments. As the literature review revealed, only a small handful

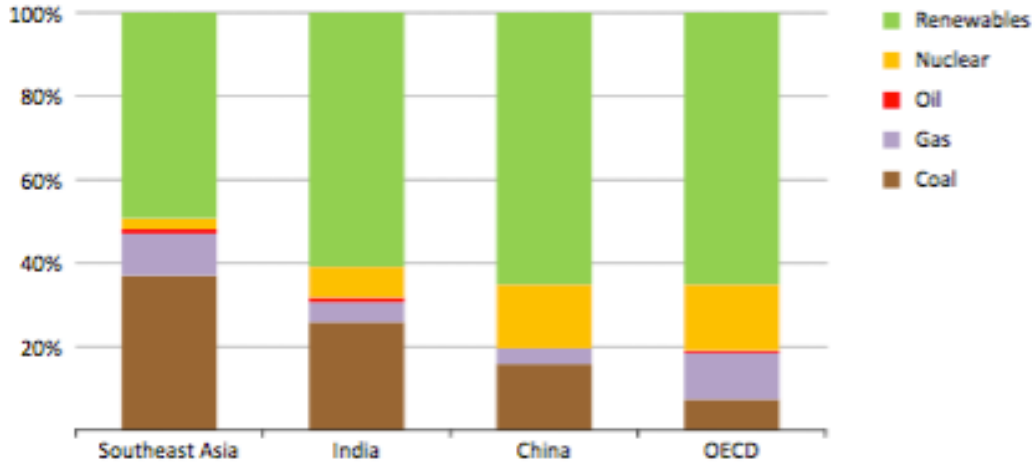

Figure 1. Share of cumulative investment in power sector by source and region, 2015-2040. International Energy Agency, 2015, p. 115

of scholars have thought about a potential resource curse for renewables, which is somewhat surprising since the fossil resource curse is a widely discussed subject.

Through previous academic work on the Indonesian electricity infrastructure, the enormous potential for development of renewable energy systems in the archipelago nation clear (International Energy Agency, 2015, p. 44). However, since there has been some research done on the geothermal potential of Indonesia, I wanted to explore the solar energy industry. Solar energy represents a potential of 560 GW (ASEAN Center for Energy, 2016, p. 31) and constitutes a sector that cannot be ignore. Simultaneously, small solar PV panels have the potential to revolutionize the situation for off-grid households in smaller islands (Mailoa & Pradipta, 2016). There is a need for a conceptual framework that can be useful in pointing out trends in renewable energy development. In the end such a framework may potentially save millions of dollars from entering the "rent-cycle". There is an unfortunately discourse in the literature around renewables development, which points to the fragmentation of "weak" states as the main issue. However, the safe development of renewable energy is not merely a difficult task for developing nations. A comprehensive, flexible framework, which can be adapted to a multitude of situations will enable most nations, also those who have gone through industrialization, to plan innovative developments of renewables in a transparent global environment. Albeit, this thesis is not the venue to venture into a brand new theory generation, it is the clear goal that it contributes to the basis for such a development in the future

This curiosity about the financial and institutional situation in Indonesia combined with the potential for development of solar energy systems lead me to ask the research question *"Is there a resource curse in the renewables sector, specifically the solar energy sector, in Indonesia?"* and as a follow-up *"What are the factors that shape the institutional framework that surrounds the development of the sector?"* It is important to stress that the research question deals directly with domestic energy development and is therefor non-compatible with any of the large international relations schools usually utilized to enlighten international energy issues.

Although the research question seems rather simple, the underlying research area is enormous. The question must be enlightened from a number of angles, which are not all well documented. This proves a limit, many of which are connected to the data quality and collection, for the development of this thesis. Despite there being large amounts of general

information on the general status of global and regional energy development, the specific literature is extremely limited. Furthermore, much of the data available from the government of Indonesia (GoI) is in Bahasa Indonesia and not translated to English. The lack of available data can be a hindrance for the scope and validity of the end-result if not taken into consideration. Another limit is the amount of human resources available for the development of the thesis. The current research design is a case study based on second-hand sources and documents gathered for large institutions. However, it would be preferable to collect data directly from the government bodies. Such information would be more current and directed directly at the research question and underlying problem. The limited amount of man-hours and access to informants connected directly to a government body prohibits this type of research. The last immediate limit is the lack of theory developed for the specific area of interest explored in this thesis. With the data available, the overall theoretical framework utilized to analyze the situation of the solar sector in Indonesia is combined of several theories, each making up a component important to the final analysis. An established theory, which encompasses all areas of the research field, could possibly be beneficial for the analysis and overall structure of the thesis.

4.0 Theoretical Perspectives

This section will present an overview of the theoretical perspectives, which will be utilized in the analysis of the research question. It includes subsections on Resource Curse, Fragmented Bureaucracy, and Institutions. The section on Resource Curse is intended to gather the many conflicting views on resource curses and put them into perspective to the Indonesian case, effectively forming a theoretical framework, which can support the analysis. The subsection on Fragmented Bureaucracy is meant to provide brief insight into the consequences of fragmented governance in relation to resource extraction. Lastly, The subsection on Institutions will give an introduction to the nature of institutions with special attention to the Indonesian institutions involved in the renewables sector.

4.1 Resource Curse

There are a multitude of ideas about what a resource curse is and how the presence of natural resources affects governance. Although somewhat controversial, this is not a new development. Differences over cause and causality have existed since the beginning of research on the connection between economic performance and natural resource. Early researchers within the area have suggested that the most causal mechanism between abundance of natural resources and economic performance were economic in nature, however most recent research has put more emphasis on the political variables (Rosser, The PE of Resource Curse, 2006, pp. 13-14). It is important to recognize that a resource curse is not inevitable (Natural Resource Governance Institute, 2015, p. 5). Resource-rich countries do not all suffer from a resource curse, but all of those suffering from the resource curse are in some way resource rich.

Despite being a disputed phenomenon, the notion that natural resources are potentially harmful for development is accepted by a large number of researchers (Rosser, The PE of Resource Curse, 2006, p. 7). Specifically, it was after the resource boom of the 1970s that the resource curse theories, which are still dominant today, came into light (Brueckner, Durey, Mayes, & Pforr, 2014, p. 5). However, as Rosser points out, the resource curse theory is by no means conclusive, nor is there a set definition of causality (Rosser, The PE of Resource Curse, 2006, pp. 12-13). For these reasons, this thesis will accept the previously stated definition of 'resource curse' from the NRGI, which states that can be defined as *"... the paradox of plenty, or the failure of resource-rich countries to benefit fully from their natural resource wealth, and for governments in these countries to respond effectively to public welfare needs"* (Natural Resource Governance Institute, 2015, p. 1). Despite the seemingly intuitive thought that more natural resources automatically generate a better economic situation, the contrary is quite well documented (Natural Resource Governance Institute, 2015; Rosser, The PE of Resource Curse, 2006, p. 10; Brueckner, Durey, Mayes, & Pforr, 2014, p. 5). The mineral wealth associated with mining or extraction processes may seem inherently good at a glance, but paradoxically the newly added resource-based income can impede economic performance (Brueckner, Durey, Mayes, & Pforr, 2014, p. 5).

Rosser (2006) recognizes that most literature on resource curses can be broadly grouped into seven categories[1]: i) *economistic* perspectives, ii) *behaviouralist* perspectives, iii) *rational actor* perspectives, iv) *state-centered* perspectives, v) *social capital* perspectives, vi) *structuralist* perspectives, and vii) *radical* perspectives (Rosser, The PE of Resource Curse, 2006, p. 13). In the case of a resource in Indonesia, three perspectives emerge as particularly interesting: the economistic, the state-centered and the radical.

The economistic perspectives have an emphasis on economic mechanisms. These include, but are not limited to, mechanisms such as taxes, import and export balances, tariffs and investments. Although it can be argued that most perspectives in one form or another have an economic perspective, the econometric perspective has an exclusive focus on the economic mechanisms of a resource curse. An example of a manifestation of economic mechanisms under a resource curse could be a case of the Dutch disease. Dutch disease is a term coined after the Dutch economic issues that occurred after natural resources created a sudden economic boost, which subsequently caused massive inflation. Currently the term refers to situations where *"A large increase in natural resource revenues can hurt other sectors of the economy, particularly export-based manufacturing, by causing inflation or exchange rate appreciation and shifting labor and capital from the non-resource sector to the resource sector"* (Natural Resource Governance Institute, 2015, p. 3). Dutch disease is, as part of a resource curse, not inevitable and some nations have faced serious issues where Dutch disease seemed unavoidable. During the 1970s oil boom the Indonesian government overcame a situation where Dutch disease symptoms were impending by adjusting budget accumulation and currency devaluation (Usui, Policy Adjustments to the Oil Boom and their Evaluation, 1996, p. 888).

The state-centered perspectives suggests that an abundance of natural resources will lead to poor economic performance because it will affect the state's capacity to promote economic development (Rosser, The PE of Resource Curse, 2006, p. 15). Here, the issue of 'rentier' states emerges. Rentier states can be defined as states, which receive "regular and substantial amounts of 'unearned' income in the form of, for instance, taxes on natural resource exports or royalties on natural resource production" (Rosser, The PE of Resource Curse, 2006, p. 15). In general, it is commonly recognized by scholars that the problem with

[1] For the purpose of this paper, only the perspectives relevant to the forthcoming analysis will be described in detail.

an abundance of natural resources is not that it brings economic dependence on natural resources or that it skews export structures, but that it creates rent (Rosser, The PE of Resource Curse, 2006, p. 10). Rent seeking has historically been an issue in the Indonesian political sphere. During the oil boom of the 1970s, increased interest in collecting rent caused the political and bureaucratic elite to seek control over allocation of rents, rather than investing them in a productive manner (Rosser, Escaping the Resource Curse: The Case of Indonesia, 2007, p. 40). Furthermore, it is worth noticing that state-owned enterprises (SOEs) associate with, among other things, production tend to be quite large in rentier states compared to non-rentier-states (Rosser, The PE of Resource Curse, 2006, p. 16). The monopolized state owned electricity utility Perusahaan Listrik Negara (PLN) has had control over electricity production in Indonesia until a recent legislation change opened the market slightly.

The radical perspectives focus on foreign actors and structure of power at a global level (Rosser, The PE of Resource Curse, 2006, p. 13). This branch of perspectives is in contrast to the two previously described, because they both deal with internal factors, whereas radical perspectives emphasize the role of outside variables. These could be positive influences, such as include foreign aid, bilateral support or technical knowledge sharing. However, trade and external factors also increase volatility, which can potentially be bad for development and growth (Hausmann & Rigobon, 2002, p. 9). As Hausmann and Rigobon point out, volatility is especially problematic when it comes to natural resources because there is a low price-elasticity of supply (Hausmann & Rigobon, 2002, p. 9). As a nation extremely reliant on fossil fuel prices, the Indonesian budget finances can be susceptible to minor deviations in prices and volatility, essentially minimizing energy and budgetary security.

The three perspectives described above are derived from the conventional way of applying the curse thesis to fossil fuels. For the purpose of this thesis there must be a clear parallel to the theoretical framework that will support the analysis of the resource curse for renewables. The perspectives described will correlate directly to the perspectives that will be used for the analysis of renewables. Firstly, as both fossil fuels and renewable energy can be characterized as natural resources, the set definition of a resource curse is still valid. Secondly, the economistic perspective illustrated the importance of economic mechanism, such as taxes, tariffs, investment and exchange rates. As an example, Dutch disease can be

categorized as an econometric mechanism. Thirdly, the state-centered perspectives emphasize how the state's capacity to promote economic development is affected by the abundance of natural resources. A part of this branch of perspectives describes rentier states, which is another condition that will be part of the theoretical framework that will support the analysis of the renewables sector. Lastly, the radical perspectives point out how external variables, including trade volatility potentially can constitute a large part of a resource curse.

In sum, the theoretical evidence on resource curse as a theoretical framework suggests that there is strong evidence to support the theory. Albeit acknowledged that a resource curse is not unavoidable and some states, Indonesia included, have previously avoided serious repercussions from an impending curse. Furthermore, the three selected perspectives illustrate the three main symptoms of a resource curse: Dutch disease, meaning rapid exchange rate appreciation; the formation or exploitation of a rent seeking state, where a number of individuals hoard public funds for private gains; and lastly, trade volatility affecting price elasticity. None of the three groups of perspectives are finite or limited to merely their immediate description, so overlapping is inevitable and natural.

4.2 Fragmented Bureaucracy

Fragmentation in bureaucratic procedures and in government is paradoxical, because there is no model for understanding the phenomena, whilst it still poses as an enormous hurdle for development of any kind, often by delaying decision-making processes. Thun (2006) differs between fragmented and unified bureaucracies in key aspects. Whereas a unified bureaucracy manages to allocate capital in a coordinated fashion to advance processes, fragmented bureaucracies fail to do so. Furthermore, a fragmented bureaucracy is characterized by having individual ministries pursuing its own objects (Thun, 2006, p. 27). Individualization of government ministries is problematic, because it hinders collective effort towards a unified goal (e.g. the ratification of a new policy that includes efforts from multiple ministries).

Fragmentation may occur in a single sector, across sectors, or in the overall administration. In any case, the result is non-coordinated or unfocused efforts to commit and prioritize effectively to the resources available (Thun, 2006, p. 27). As the central government determines the framework of rules with local governments (including environmental policy

and corporate law), it also determines the form of interaction with the global economy (e.g. tariff policy) (Thun, 2006, p. 10). The relationship between local governments and the central government is, in other words, important for the further political and economic work the central government will do with any external partners. One reason for the importance of the internal co-operation is that policies, which affect internal affairs, are often closely intertwined with policies, which mainly shape external factors. A key component in the relationship between central and local government is the institutions responsible for creating and overseeing policies.

Albeit the Indonesian state is by no means a failed one, there are a surprising number of government bodies and institutions involved in effectively all decision processes. This does not entail fragmentation in itself, but it can be a symptom of such. The archipelago layout of the nation does not only impair energy development due to an extremely large number of off-grid residents, it also makes unity with local governments challenging. In addition to widely spread local governments with vastly different electrification levels, an unprecedented number of institutions involved in fairly simple processes.

In sum, two main features can characterize a fragmented bureaucracy. Firstly, there is an overwhelming amount of uncoordinated efforts when it comes to investing, which impairs internal development processes. Secondly, there is a tendency for government ministries to have an increased focus on their own objectives, whilst disregarding common goals. These characteristics will construct the basic framework, in which the further analysis of the Indonesian government's efforts in the renewables sector will be analyzed.

4.3 The Nature of Institutions

The institutions of society are the rules that govern incentives in politics (Acemoglu & Robinson, 2013, p. 79; North, Wallis, & Weingast, 2008, p. 4). An analysis of the institutions of a state can provide useful insight into the qualities of the state. Robinson and Acemoglu destinguishes between two overall types of institutions: inclusive and extractive.

In general, inclusive institutions are those who allow inclusion in the political process, enables the individual to make the choices they wish and support economic activity (Acemoglu & Robinson, 2013, p. 74). There is an undeniable synergy between the political and economic institutions of a society (Acemoglu & Robinson, 2013, p. 79). As Acemoglu and

Robinson point out, political institutions construct and support their economic counterparts, whether they be inclusive or extractive.

Inclusive political institutions are somewhat centralized and pluralistic in nature, supporting a wide variety of stakeholders from the surrounding community. An inclusive political institutions will attempt to uproot any economic institution that undermines the transparancy and inclusiveness of the political institutions, in order to ensure progress (Acemoglu & Robinson, 2013, p. 81). Economic instituions are inclusive if they "foster economic activity, productivity growth, and economic prosperity" (Acemoglu & Robinson, 2013, p. 75). The ensuring of property rights is crucial, because only individuals with such rights are willing to invest and foster productivity (Acemoglu & Robinson, 2013, p. 75). Furthermore, inclusive economic institutions create inclusive markets. Inclusive markets entail freedom to choose and sets a leveled playingfield for all those in the same markets (Acemoglu & Robinson, 2013, pp. 76-77). Lastly, inclusive economic institutions are linked to the progress of techology and education (Acemoglu & Robinson, 2013, p. 77). The progression of technology supports innovation and the formation of new businesses is intimately connected to education, because the technological improvements require further developments within the education sphere.

Extractive institutions are those with the opposite properties of the inclusive. These institutions are designed to "extract incomes and wealth from one subset of society to benefit a different subset" (Acemoglu & Robinson, 2013, p. 76). Extractive political institutions have a narrow distribution of power and tend to be more absolutist. They are extremely reliant on the continous extractive nature of those in power, in order for the elite to maintain power. Furthermore, it places few restraints on those in power, essentially allowing them to seek rents or threaten with personal violence (Acemoglu & Robinson, 2013, p. 81). As with inclusive institutions, extractive political institutions foster extractive economic institutions. Extractive economic institutions do not support the safety of property rights, thereby not ensuring private enthusiam about investments. The extractive economic institutions also tend to withdraw resources from society and channel them into a minority sphere of elites, effectively draining common goods for private prosperity.

Creating, managing and maintaining institutions can be complicated for any government. However, it becomes even more challenging if the institutions excessively overlap, meaning that the function of each institution can partially or fully be filled by another

institution, or too many institutions must be involved in a certain process. This is of course beneficial if the processes are well coordinated and structured. If this is not the case it will cause unnecessary delays. Small government, or an extremely limited number of institutions is not an automatic solution, however. Sometimes it is necessary to develop new institutions in order to care for new tasks, since an "institutional patter that is conducive to the development of a sector in one stage of growth might not be appropriate in the next stage…" (Thun, 2006, p. 10).

When political and economic institutions are closely intertwined the process become particularly difficult, because both respond to different incentives (Thun, 2006, p. 10). This is very much the case in Indonesia, where SOEs make up a large part of the energy sector. Conflicting policies concerning the motivation for the SOEs, particularly electricity utility PLN, has created fraction between the central administration and the board of PLN. This poses a vital problem, because foreign investments may depend heavily on a number of factors influenced by the relationship between political and economic institutions (e.g. the regulatory framework, predictability of economic policy and corruption) (Daude & Stein, 2004, p. 2; Islam & Montenegro, 2002, pp. 14-15).

In sum, institutions can be roughly categorized in two ways; inclusive or extractive. Inclusive institutions support free-market trade and property rights, whereas extractive institutions tend to do the opposite and extract resources from society. Close connection between political and economic institutions can be beneficial if there is a synergetic relationship between them. In turn, it can be extremely harmful if the two are not in sync and extract from both each other and society. SOEs play an important role for institutions, because they often connect the two spheres and therefore are important to manage properly.

5.0 Analysis

This section will contain the analytical work, which will be based on the theoretical choices described in previous chapters. The analysis will consist of chapters concerned with each of the three phenomena – Dutch disease, rent seeking, and volatility – which were derived from the perspectives described in the "Resource Curse" chapter in "Theoretical Perspectives". The

individual phenomenon represents a key condition for a resource curse and will serve as a base for analysis of the renewables sector, more specifically solar PV sector, in Indonesia. Each phenomenon will then be investigated with respect to fragmented bureaucracy in the Indonesian state and the institutions involved. This structure allows for an analysis of a wide range of facets all tied to the notion of a resource curse, allowing a more complete analysis than an analysis of a single perspective or phenomena would. Furthermore, it should once again be underlined that due to the domestic nature of the research question, the thesis will not be put in context of a major international relations theory in the analytical chapter.

The reason for this structure is the underlying complexity of the problem formulation. In order to successfully shed light on whether or not the Indonesian solar sector suffering from a resource curse, I must firstly define and determine suitable variables. Since the theoretical ideas on fossil resource curses constitutes an enormous and diverse amount of literature, three significant variables were isolated and chosen for markers in the analysis. Previous academic work on Indonesia has strongly indicated that fragmentation has been an issue, which is why fragmented bureaucracy was included as a theoretical framework. Lastly, the intricate and complex interplay between Indonesian institutions was reason for including theory concerning the nature of institutions. Had this theoretical perspective been neglected, it could have portrayed the Indonesian state and its institutions as failing, which would be inaccurate. With the inclusion of both fragmented bureaucracy and nature of institutions, it is possible to show how inclusive institutions can have fragmentation, but overall still function as inclusive.

5.1 Institutions and Regulatory Conditions of Indonesia's Renewable Energy Sector

The Indonesian energy sector is complex and contains a vast amount of ministries, councils and industry giants. Overall, the primary body responsible for legislation related to energy of any kind is the Ministry of Energy and Mineral Resources (MEMR), which is comprised of four directorates - Coal, Oil & Gas, Electricity, and New and Renewable Energy. MEMR has the legal responsibilities of the project developments, in addition to their overseeing role of the state-owned utilities and energy service companies (Tharakan, 2015, p. 10).

The number of actors involved in each sector is substantial and with some projects covering more than a single sector, the number of stakeholders continues to increase. In Figure 2 the overview of actors involved in different stages of the policy and operations process within the New & Renewables Energy sector are described. As evident, the organization is less than optimal. The structure suffers from a large number of different actors involved in the same process and none in other vital stages of operations. In addition it should be noticed that the organizational structure for other directorates are all different and equally complex to the one found in New & Renewable Energy. Despite the wide variety of actors, some can be considered more vital than others. In the policy making stage, the Ministry of Finance (MoF) oversees matters on tariffs, budget allocation, and public service obligations and subsidies (Tharakan, 2015, p. 12), which gives them a central placement in the planning stage of any energy project. The State Ministry of Natural Development Planning (BAPPENAS) works closely with the MoF, however, whereas the MoF oversees finances BAPPENAS oversees the central planning of natural development projects (Tharakan, 2015, p. 12). In the regulation stage Directorate General for New and Renewable Energy and Energy Conservation (DG EBTKE) and Directorate General for Electricity (DG Electricity) are the main stakeholders responsible for regulating the implemented policy across the many local governments. In addition to the administrative bodies, the state-owned electricity utility Perusahaan Listrik Negara (PLN) is an important stakeholder in any energy development. As PLN holds a de facto monopoly on distribution (Tharakan, 2015, p. 15) and there is intricate legislation in place as to who can

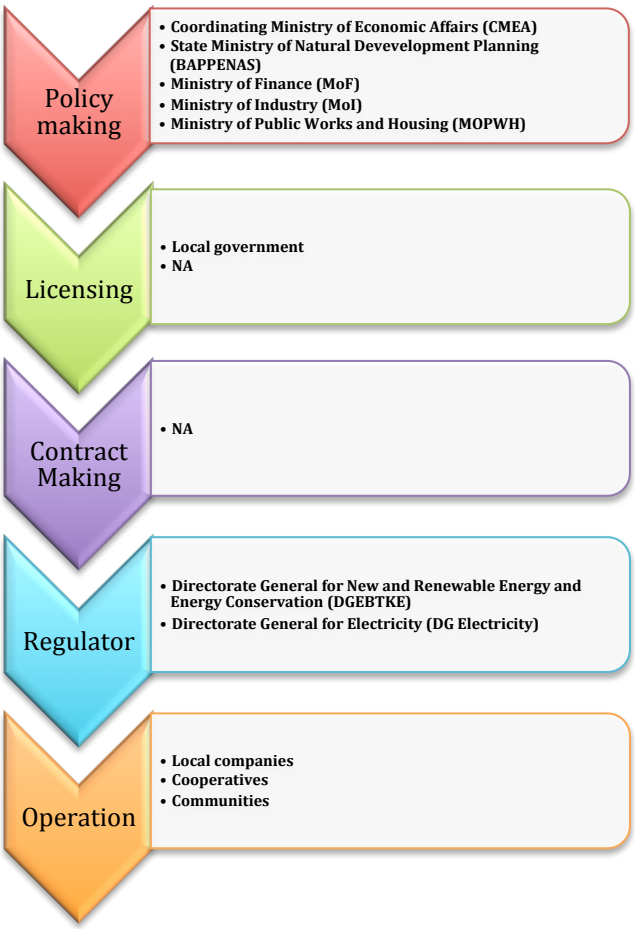

Figure 2. Overview of political bodies involved in policymaking, regulation and operation in the MEMR directorate New & Renewable Energy. Adapted from Tharakan, 2015, pp. 10-11

develop and produce energy for electricity, PLN has a key interest in overseeing most development processes, including the renewable projects.

The central stakeholders in the solar energy sector vary slightly from those described in further detail above. In addition, the Ministry of Industry (MoI) has now been given the task of overseeing and approving components for development projects that are erected under the new legislation on solar energy investment and production (UNEP DTU Partnership, 2016, p. 10). Lastly, Agency for Assessment and Application of Technology (BPPT) will be responsible for assessing the application of new technology, in particular PV cells (UNEP DTU Partnership, 2016). MEMR presented the new regulation No. 19/2016 on power purchase from solar photovoltaic power generator by SOE PLN (Yosiyana, 2016). The new regulation rewards a feed-in tariff (FiT) for producers ranging between 14.5 and 25.0 US cent/kWh and is guaranteed for at least twenty years (Yosiyana, 2016). Furthermore, another Ministerial Decree of the Minister of Energy and Mineral Resources (No. 12/2017) regulates the purchase of electricity produced from prevalent renewable technologies (Susanto, 2017). The consequences of the new regulations will be discussed further in the "Fragmented Bureaucracy and Institutional Behavior" section of the Dutch disease analysis.

5.2 Analysis of Perspectives

This chapter contains the analysis of each perspective described in the chapter "Theoretical Perspectives". Figure 3 shows a visual representation of the structure of the chapter. The case conditions are applied to each key condition – Dutch disease, rent seeking and volatility – and analyzed in light of the other theoretical perspectives, fragmented bureaucracy in the Indonesian state and the behavior of

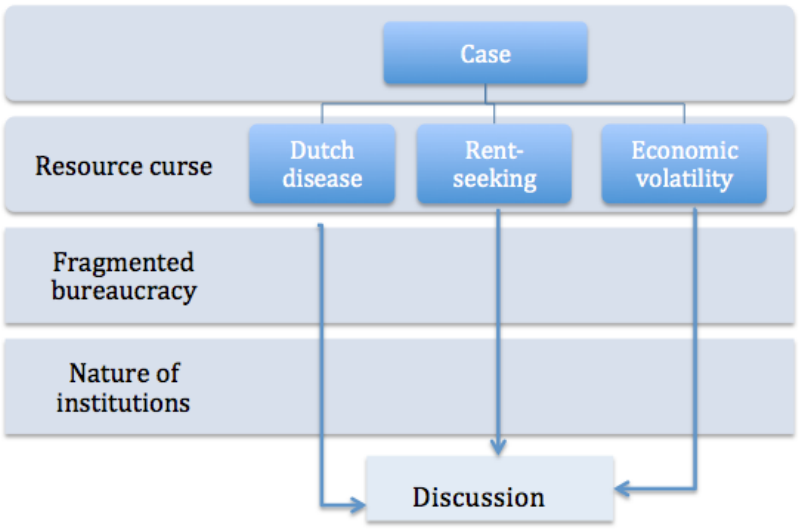

Figure 3. Visual representation of analysis structure. Created by author.

involved institutions. Due to the synergy between the two theoretical frameworks "fragmented bureaucracy" and "nature of institutions", the two will be addressed in a unified section called "Fragmented Bureaucracy and Institutional Behavior", which will be applied to each perspective. Lastly, the analysis will end in a discussion, which will draw on evidence from all three conditions and their current situation.

5.21 Dutch Disease

As described previously, the Indonesian state has in the past been dangerously close to a full-blown Dutch disease, but early policy changes prevented a crisis. The primary mechanisms activated were adjusting the exchange rate and accumulating a budget surplus (Usui, Policy Adjustments to the Oil Boom and their Evaluation, 1996, p. 897). However, previous success does not entail current success. This part of the analysis will focus on any evidence that indicates if there is either currently or potentially a Dutch disease in the Indonesian solar energy sector.

According to Usui (1996) there are two main symptomatic signs of Dutch disease. He phrases them as the "resource movement effect" and the "spending effect" (Usui, Policy Adjustments to the Oil Boom and their Evaluation, 1996, p. 887). The movement effect is characterized by an increase of prices and fall in production in a booming production sector. The higher prices drives resources to other tradable sectors, effectively moving resources between sectors. In contrast, the spending effect refers to how governments must manage boom revenues so that they are consistent with long-term objectives. Due to the changes in equilibrium across different tradable sectors, this may prove a struggle, since the government must also drive further development in the expanding and contracting sectors (Usui, Policy Adjustments to the Oil Boom and their Evaluation, 1996, pp. 887-888).

Due to the infantile nature of the solar energy sector in Indonesia there is little evidence that supports a resource movement effect. This is primarily due to the fact that the low amount of investment does not compose a large enough amount to seriously effect any movement. Albeit there will be some movement between power production sector (e.g. from coal to solar) there is still an urgent need for much more investment for the solar sector to make a serious impact on any other sector. Furthermore, since PV systems are often applied in rural rooftop projects, the households receiving electricity from the systems are primarily

off-grid and thereby not part of the coal-generated customer group. In short, the potential risk for a "resource movement effect" is highly unlikely, due to the currently infantile nature of the solar energy sector. The spending effect may, in contrast, constitute a serious challenge for the government.

The projected potential for solar energy generation is 4.80 kWh/m^2/day and government plans dictate installed PV capacity to be 2,200 MWp by 2025 (UNEP DTU Partnership, 2016, p. 7), up from reported 27 MWp in 2013 (UNEP DTU Partnership, 2016, p. 9). Obviously, this entails enormous amounts of investment and potentially proves a valuable source of revenue when subsidies are fully phased out. If this happens, the GoI must be extremely cautious about spending the newly found revenue in order to avoid a potential Dutch disease. According to the World Bank (2017) there must be a clear priority when reallocating funds (World Bank, 2017). If the increased revenue is not managed properly, there is a potential threat of what Usui defines as the "spending effect", which could have severe consequences for both budget balances, but also the ability to attract investors.

Although it may seem tempting and even somewhat logical to continue investing in well-developed sectors, major international economic institutions, such as the World Bank, suggests that the revenue be allocated in sectors that currently hold low-priority for public spending. These include infrastructure, health, and social assistance (World Bank, 2017). Notably, these are all largely non-tradable sectors. However, despite these all being sectors worth more investment, allocating all of the investment funds in non-tradable sectors can be extremely dangerous because it will cause an appreciation of the real exchange rate, i.e. the rate at which foreign currency buys services in the domestic economy (The Economist, 2014). Despite an appreciation may seem desirable, the appreciation may effectively leave a nation with high domestic prices, which in a developing nation, such as Indonesia, can prove disastrous.

In short, there is a clear dilemma for the GoI tied to the expansion of the solar energy sector. In order to improve investment conditions and thereby attract more foreign investors to the solar energy sector the government would benefit from reinvesting some of the incoming revenue back into the energy sector. This is, however, in contradiction to the clear recommendations from the World Bank that suggests investing in low-priority sectors, such as health and social services, in order to raise the standard of living across the population. Essentially, the pitfall lies in the reallocation of any sizeable revenue from new investors. If

the GoI receives large amounts of FDI and does not have a clear plan for reallocation of the funds, the country could be headed towards a new case of Dutch disease.

The GoI has a fairly complex approach to exchange rate policies. After the financial crisis of 1997-1998 the GoI responded to inflation by instating a floating exchange rate in order to absorb external shocks in the domestic economy (Warjiyo, 2013, p. 178). This is, however, merely part of the overall financial philosophy. In addition, interest rate policy, management of capital flow, and monetary policy communication is a crucial part of financial response tactics (Warjiyo, 2013, p. 179), which entails intensive coordination between institutional bodies involved.

5.22 Dutch Disease: Fragmented Bureaucracy and Institutional Behavior

The prevalent idea that sound economic policies encompass several components across monetary and financial policies, and communication constitutes a seemingly holistic way of approaching financial regulation. If this is to be a successful approach, it requires effective and open channels of communication, in addition to continuous adjustments of priorities.

In the newly introduced legislation on power purchases from PLN, regulation No. 19/2016, the GoI attempts to institute responsibility and transparency for the renewables sector. The regulation constitutes the first regulation specifically directed at renewables-based electricity production since the Supreme Court retracted regulation 17/2013 in 2014. An example of delegation of responsibility is the newly specified regulation and monitoring role of the MoI in relation to local contents in new development projects (Yosiyana, 2016). It also provides a framework for the location and size of projects, and the expected size of the awarded FiTs (Yosiyana, 2016; Susanto, 2017). The legislation prioritizes smaller projects spread out across the many inhabited islands and provides favorable quotas for at least 20 years, the size of which is based on the size and location of the project (Yosiyana, 2016). These conditions provide a much easier political and legislative landscape to navigate, and only a few moths later MEMR issued a ministerial decree, No. 12/2017, with the intent to regulate the “framework of how PLN can procure electricity from renewable energy-based power plants, as well as the maximum prize it is allowed to pay” (Susanto, 2017). In other words, Decree 12/2017 is primarily directed at managing the relationship between the GoI, PLN and producers, whereas regulation 19/2016 has more focus on terms for prospective

investors and the overall conditions for the sector. However, despite much clearer descriptions of the terms and conditions for entering the Indonesian solar PV market, there are still some inconsistencies in the two separate legislative documents. In the new regulation, PLN is put under extreme financial pressure from the GoI. Although this may not necessarily be detrimental for the national economy, it gives PLN very little freedom to transition into a utility, which is ready to be merged with the renewables sector. In addition, the timespan of the quotas are inconsistent with the advised time they should span across (UNEP DTU Partnership, 2016, p. 18).

A main challenge with regards to government control of Dutch disease is coordination of spending and keeping focus on long-term objectives (Usui, Policy Adjustments to the Oil Boom and their Evaluation, 1996, p. 897). When Indonesia in the 1970s experienced a sudden increase in revenue due to oil-extraction, the government responded to the impending threat of Dutch disease by accumulating budget surplus and adjusting the exchange rate (Usui, Policy Adjustments to the Oil Boom and their Evaluation, 1996, p. 887). Both regulatory techniques require unity and common priorities of all involved institutions. Since the oil boom, there have been many political and demographic changes in Indonesia, resulting in a less unified set of regulating institutions today. Although the Indonesian state is in no way failed and the institutions are generally stable (International Business Publications, 2015, p. 170) and inclusive both politically and economically, there are some institutional issues, which must be resolved if the GoI wants to ensure safe economic progress of the solar energy sector. Extractive behavior, such as rent seeking or hoarding of economic funds, is not unheard of and constitutes a significant hurdle to the further development of not only the solar energy sector, but unutilized renewables in general. In addition, graft and nepotism continues to seep through the legislative system, rendering some local business owners helpless to the extortion and essentially becoming BAU.

Albeit the strengthening of accountability and more clear divisions of responsibility required by new legislation is appealing to investors, it remains crucial that the spending of sudden revenue must be consistently revised in order to keep up with long-term objectives of "promoting economic development through the expansion of non-oil tradable sectors" (Usui, Policy Adjustments to the Oil Boom and their Evaluation, 1996, p. 897). If this is not the case, the GoI could face a severe issue with the allocation of funds and thereby also the risk of the onset of Dutch disease. Although there is some way from facing issues with reallocation of

investment capital to full-blown Dutch disease, the foundation for a potentially equally inefficient system as the one currently present in the sector will be laid.

The government must be proactive in the way they approach building legislation, regulation and communication for the solar PV sector. Regulation 19/2016 and decree 12/2017 are the first steps to creating a comprehensive set of regulative guidelines to help control the expected stream of investments, whilst serving as the foundation for the continuous build-up for the sector. It is impossible at this point in time, nor the task of this thesis, to determine the success or failure of the legislation. It can, however, be said that any legislation that somewhat provides a framework for investors is highly needed and has been welcomed. Now the challenge lies in cooperating with other sectors, such as domestic industry, local government rules on conducting business, and obtaining licenses.

5.23 Rent seeking

As described in previous chapters, rent seeking is the act where an individual uses public goods for personal wealth. It is furthermore an action that does not create any value added, thereby being detrimental to society.

Rent seeking is a prevalent issue throughout the Indonesian public sphere, not excluding the energy sector. The most prevalent form of rent seeking continues to be corruption, which is defined as "an agent trespasses the rules set up by the principal by colluding with third parties and promoting his own benefit" (Lambsdorff, 2002, p. 97). However, it is difficult to distinguish between gift giving and bribery, due to the subjective nature of the act. Mehmet's study of Indonesian culture and economy has identified gift giving as a central part of Indonesian business nature, where the general belief that wealth should follow the holder of power (Mehmet, 1994, p. 67). The same study determined a connection between the presence of FDI and the amount of rent seeking happening in the same sector. When separated into private and public investment, the energy sector when from being one of the least corrupt sectors to the second most corrupt sector of all the public sectors (Mehmet, 1994, p. 84). An explanation for this trend could be that the more FDI present in the energy sector, the more regulation and supervision will be required for foreign investors to commit to that specific

sector. The primary reason for the increase of regulation is likely the high investment costs generally tied to large start-up projects in the energy sector.

These two conditions leaves the Indonesian solar energy sector somewhat exposed to rent seeking. Albeit regulation No. 19/2016 on power purchases from solar energy plants creates the first real regulation on the area and the up-front costs of a PV system are much less those of a coal fired power plant, early investors should remain cautious in the newly regulated sector. The amount of foreign investments made in the Indonesian domestic solar industry is still limited, which may be manifested in the way licenses, operation and funds are being handled. For projects with a maximum capacity of 10MW or less, the limit on foreign ownership is 49%, whereas project over 10MW has a limit of 95% (Miechel & Lee, 2016). This means that foreign entities can only control the majority of the ownership if the commit to a system with a capacity of more than 10MW, ergo a larger investment. In addition, there is a requirement of commercial operation within 12 months for 10MW plants and 24 months for plants generating more than 10MW (Miechel & Lee, 2016). Another risk factor in terms of rent seeking is the relatively high profitability of PV systems compared to other power generating systems (Mehmet, 1994, p. 84). Despite some mandatory capital requirements for all PV projects, PV cells have fallen dramatically in costs, thereby minimizing the overall upfront costs of the project. However, as costs are lower it can incentivize the responsible gate-keepers in the administration to maximize transaction costs by seeking higher rents.

Besides intergovernmental rent seeking and corruption, the social contract and context in which these activities happen is a key factor. In 2011 91% of civil Indonesians believed that corruption was widespread in government and business (ASEAN Affairs, 2011). This is problematic because such a common perception of corruption can lead to a general accept of any form of rent seeking as BAU. The election of president Joko Widodo in 2014 is generally believed to be due to his strong anti-corruption platform, from which he actively sought to stress the importance of eliminating rent seeking and corruption of any sort (Oxford Business Group, 2015, p. 151). Previous to Widodo's election, there were a number of public arrests and corruption trials of officials, many of which were high-level management in the energy sector, which severely damaged the public view on government officials. In 2013 the head of SKK Migas, a national up-stream oil- and gas management institution, Rudi Rubiandini came under investigation by the KPK due to allegations of bribery and received a seven-year prison sentence in late 2014 (Oxford Business Group, 2015, p. 151). Shortly after Rubiandini's

conviction the minister of energy and mineral resource stepped down after also being the subject of corruption allegations (Oxford Business Group, 2015, p. 152). In addition to these two high-profile cases, the SOE PT Pertamina was subject to a complete removal of all directors (Oxford Business Group, 2015, pp. 152-153) due to suspicions of continuous operation under the corrupt deals made in the past. Albeit the rent seeking is not limited to the energy sector, the linkage and cooperation between the rent-seeking individuals created massive transaction costs and effectively formed what became known as the "energy mafia" (Oxford Business Group, 2015, p. 152)

As a response to the number of corruption charges of both SOE leaders and other government officials under the previous administration, Widodo replace many of the charged individuals with competent KPK staff. An injection of KPK officers directly into corruption ridden sectors seems the most effective and immediate way of attempting top-down eradication of rent seeking and corruption. In line with this logic, Widodo appointed new leaders for both PT Pertamina and SKK Migas. The continuous effort to strengthen KPK's work and ensure transparency has since 2014 had substantial meaning for the Indonesian business sector. From 2016 to 2017, there were measurable differences in the ease of doing business for foreign investors in Indonesia. The improvements have been enough to move Indonesia from no. 106 to no. 91 on the *Ease of Doing Business* ranking, making them a top 10 improver globally (World Bank, 2017). However, a key issue in the process of creating more transparency is the number of subdivisions in the large SOEs and disturbances to the supply chain. Old contracts and offshore registrations limit KPK's insight into some subdivisions, creating ideal conditions for further rent seeking.

There was found no evidence for any current rent seeking behavior from officials in the solar energy industry, although it cannot be excluded that this is likely primarily due to the lack of high-profile individuals in the sector. There is, however, a potential risk of rent seeking in the form of corruption or gate keeping if the development of the new sector is not managed properly. A major concern can be the involvement of PLN in the early development of PV projects and the financing of such projects. PLN, which has a history of graft and other rent seeking behavior, is the primary buyer and responsible body for issuing tenders available to investors. Although there are numerous initiatives currently attempting to reform PLN, there is still a substantial risk of corruption (Asian Development Bank, 2015, p. 24) within the SOE. As late as in 2015, the French power company Alstom was sentenced to

pay more than $770 million in fines for bribery to other power companies, including PLN, for securing development projects. If isolated only to PLN corruption, the charges state more than $75 million in bribes (United States Department of Justice, 2015).

The ADB assessed in 2015 that large investments into the electricity sector will "stretch the institutional capacity" beyond reasonable (Asian Development Bank, 2015, pp. 24-25). As the GoI seeks to attract $56 billion to green investments from foreign investors and $37 billion from local investors (Oxford Business Group, 2015, p. 161), the collective sum of desired investment capital reaches almost $95 billion. The juxtaposition between government intentions and recorded behavior in the institutional bodies responsible for carrying out any planned reform of the system is strikingly ironical.

Albeit an ambitious to attempt a move from a consumption based to an investment based economy in the energy industry, it is much needed. However, despite many efforts, the achievement of solar PV utilization is still poor (UNEP DTU Partnership, 2016, p. 16).

5.24 Rent Seeking: Fragmented Bureaucracy and Institutional Behavior

The issue of rent seeking occurring fossil fuel sector is relevant for the solar energy sector for several reasons.

Firstly, the overall legislative bodies regulating the fossil fuel industry are to a large extent the same tasked with regulating the renewables sector. Although there are an additional number of directorates and committees charged with monitoring and local regulation, MEMR remains responsible for the overall initiatives and regulations. As shown in Figure 2 the total of involved administrative bodies amounts to five different ministries on the policy level and a number of local governments and random actors in the regulatory and monitoring levels. If the rent seeking present in the policy making units penetrates the sector undetected, there is a significant danger that rent seeking and the elevated transaction costs that often follows will shape business in the solar energy sector similarly to the fossil fuel sector. This is not merely a theoretical concern; investors have expressed concern about corruption and regulatory uncertainty (International Business Publications, 2015, p. 170; Oxford Business Group, 2015, p. 152). Not only is rent seeking patterns in administrative bodies important to detect and remove; the GoI must also ensure to its fullest capacity that the local community that becomes a part of the new solar energy industry. As mentioned in the literature review,

social hierarchy and social contracts from everyday life penetrates to business life. Special consideration to this condition is crucial if developers and the government wish to realize the vision of local projects in a unified effort to support the growing need for electricity and increase electrification rates.

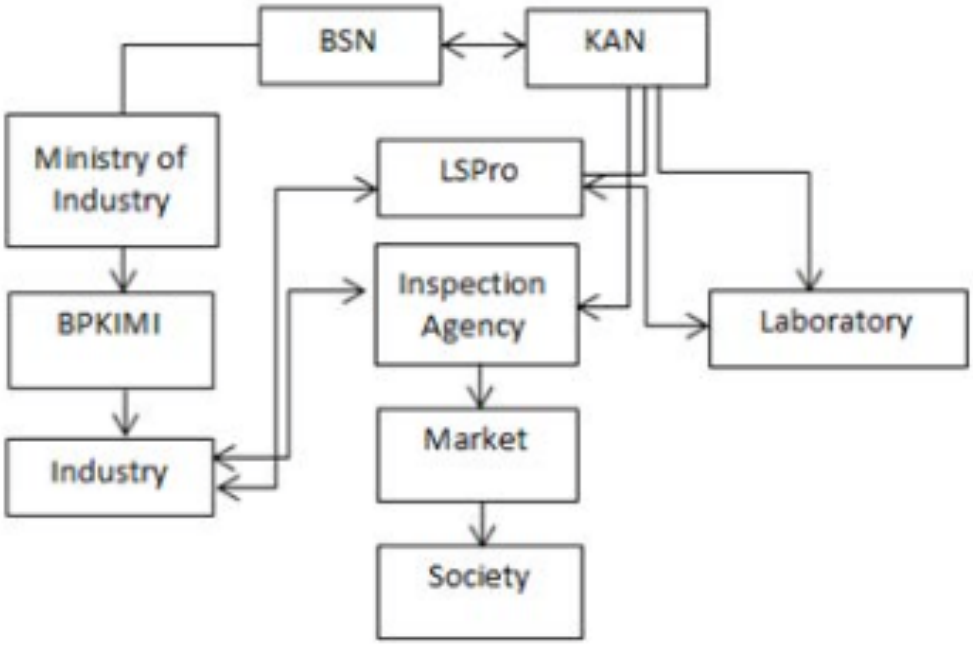

Figure 4. Institutional arrangement for product certification (UNEP DTU Partnership, 2016, p. 10)

Secondly, the direct connection between policy creating ministries and the national electricity unit PLN constitutes a link between a sector severely influenced by rent seeking and the development of a new sector of electricity generation. PLN has previously been at the center of corruption cases involving ministers, media moguls, and latest French power company Alstrom (United States Department of Justice, 2015). Regulators and investors must careful in securing that this unfortunate behavioral pattern is not introduced in the early stages of the development of the solar energy sector. A better established sector will have the chance of resisting any wrongdoings if the foundation is good corporate governance.

Lastly, there is a continuous need for standardization and organization within the regulatory framework surrounding solar energy technology and utilization. Whereas the coal and oil sectors remains some of the most regulated in the Indonesian domestic industry, development of renewables have only recently been addressed in Indonesian legislation. As developers begin to enter the market looking for an early advantage the standardization becomes increasingly urgent (UNEP DTU Partnership, 2016, p. 10). Figure 4 shows the intricacy of current product certification for PV cell technology. Processes like this decreases institutional efficiency and causes economic losses, because the high number of stakeholders

each constitute additional time spent processing the application. In addition to time, each step in the licensing process is also a risk for increased transaction costs if there is prevalent rent seeking in the system.

It must be stressed that the Indonesian state is neither failed nor failing. It is facing a challenge with many stakeholders, a large amount existing legislation on electricity, and, at times, a contradictory institutional setup. The ambitions plans for the solar energy sector are huge, and so is the expected amount of foreign financing. However, if the goals are to be realized, the GoI must continue to pursue maximization of inclusive behavior from all institutional bodies. This entails agreement on priorities for actors involved, crossing both political and economic institutions. Albeit Indonesia is not an extractive state, there is strong evidence that suggests that it is fragmented in its inclusiveness, which will continue into newly developed sectors if not addressed.

5.25 Economic Volatility

For the purpose of this analysis the main interest will be the connection between price volatility, for both oil and solar energy systems, and the consequences for solar development. In addition, there will be some focus on the impact on new investments.

Volatility plays a vital role in management of the Indonesian economy. The Suharto government ran a mainly fuel-based economy, which cause volatility to affect national income highly due to fluctuations in oil prices. As the GoI now seeks to move away from purely resource-based economy to an investment dependent economy, volatility continues to impact conditions on the Indonesian market for consumers, investors and involved government bodies, i.e. ministries and SOEs. Although price volatility will have a decreasing role for the overall still fuel-based income, due to the partial move away from oil and coal, the still relatively extensive subsidy program continues to be extremely affected by the price volatility on fossil fuels.

For consumers, volatility has an impact on prices for fuels used in everyday households. As the Widodo lead government decided to out-phase the subsidy program, which by 2013 reached a yearly expense of a staggering Rp 101.2 trillion, the goal was to only support to absolute poorest families through cash subsidies (Tharakan, 2015, p. 16). The phase-out process of fuel subsidies is, however, an extremely delicate situation in which an

overwhelming number of citizens face a severe price increase for everyday essentials. The key subsidy for most rural households is the kerosene subsidy, which supports purchases of liquid petroleum (LP) gas for food preparation. If a substitute for the subsidy is neglected, consumers will be exposed directly to the true kerosene price, which can affect quality of life severely.

Since most households benefitted from heavily subsidized electricity previous to the phase-out, there is little willingness or ambition amongst end-use consumers to invest in private rooftop cells. This is primarily due to the up-front costs, which cannot be recovered by the electricity savings (UNEP DTU Partnership, 2016, p. 14). The lack of financial support mechanism for consumer investments in rooftop PV cells limits the expansion of solar PV to a top-down approach. The choice to focus on top-down approaches to development of the sector effectively limits the government to larger investment projects or to foreign investors. As a result, poor experience with utilizing solar PV power systems has caused the government to initiate programs that effectively made any proactive initiatives by consumers obsolete, whilst leaving those who venture into acquiring their own rooftop system exposed to low-quality products and lack of qualified human resources to support them in the process (UNEP DTU Partnership, 2016, p. 15).

The issue of isolating development to government bodies or extremely well funded investors continues to manifest itself outside of consumer behavior. The national electricity entity PLN is at the center of the PV development, tasked with the responsibility of issuing tenders for PV generated electricity and working alongside new developers. With

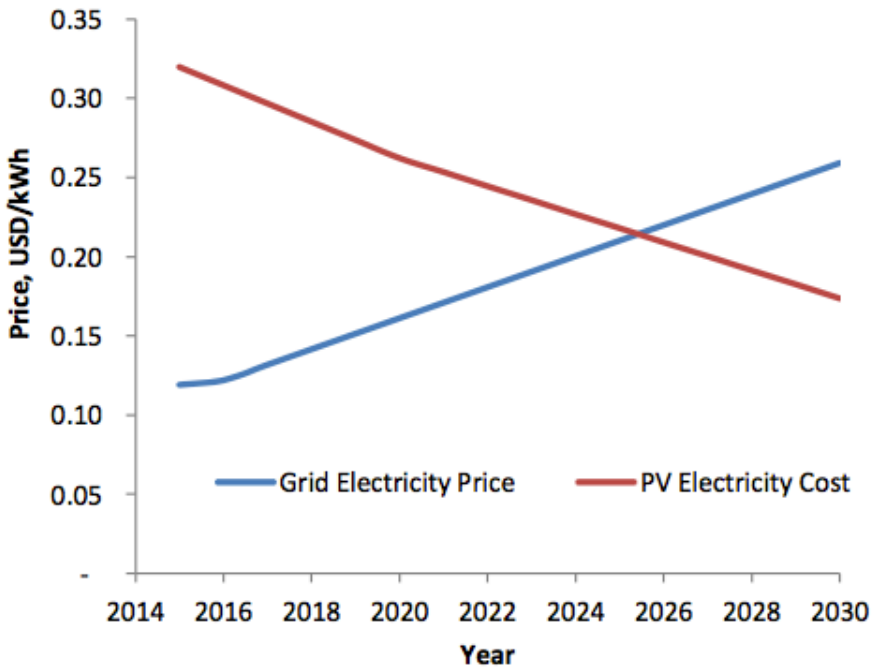

Figure 5. Calculated time of socket parity of solar PV generated electricity. (UNEP DTU Partnership, 2016, p. 17)

an expected equilibrium price between solar PV electricity and that provided by PLN currently being reached by 2025, it is crucial that the solar PV market has the capacity it needs. Figure 5 shows the calculated time of socket parity between the existing grid electricity price and the electricity cost powered by solar PV, i.e. time where the levelized cost of electricity (LCOE) generated by solar PV is equal to the LCOE of other generating sources.

The tenders are based on a 'first come, first serve' basis, meaning that PLN cannot themselves conclusively decide who they wish to award access to the grid. However, financing, limits on foreign ownership of projects, and other regulation make the selection process less transparent than desired. In addition to the lack of transparency, an issue with local financing of projects smaller than 10MW slows the development process down significantly (NetralNews, 2017). The main complaint is that with interest rates as high as 11%, project financing cannot be made favorable enough through local financial institutions (NetralNews, 2017). Two issues related emerge from this complex situation. Firstly, the exchange rate volatility, which is the cause behind the high interest rates on loans for foreign developers, shows how vital volatility remains for the Indonesian economy as it moves towards a more investment-based. Secondly, the government regulations asserting that foreign ownership in projects smaller than 10MW is capped at 49% is not assisted by a financing scheme able to help local developers obtain finances for the last 51% of the project. Despite the setup of the Solar PV Rooftop Support Fund (PVSF), a fund meant to support the development and implementation of rooftop cells, there is still a gap in the financing process. This leaves small development projects with very limited options, which is a problem due to the priority system PLN has been provided with (Yosiyana, 2016).

Extending past the financing issues facing investors, PLN's revenue from consumer tariffs is also endangered. MEMR Decree 12/2017 changed the previous flat FiT for all renewable energy electricity purchases to an adjustable tariff, specific to the generation technology. Since most of PLN revenue comes from consumer tariffs compensating for subsidized prices (Tharakan, 2015, p. 15; Susanto, 2017), the new decree means that as consumer tariffs are adjusted monthly based on exchange rate, inflation and Indonesian Crude Prices (ICP), there is more insecurity around the projected revenue for PLN (Susanto, 2017).

Investors considering entering he Indonesian market rely on stable government policies to control volatility in the most optimum way. Although the price volatility of fossil fuels does not have an immediate effect on price volatility in the solar PV sector the most prominent

connection between the two sectors is due to the political structure. This includes, but is not limited to, the continuous lack of fuel standards, low cost of electricity, and overwhelming power of the de facto PLN monopoly. Legislators passed unbundling legislation in 2009 (Law 30/2009) (Tharakan, 2015, p. 12), but PLN is still the main owner of generation plants, transmission lines, and distribution rights. In addition, the national power entity has the right of first refusal, essentially giving them the right to unanimously determine business relations to private sector participation in distribution (Tharakan, 2015, p. 15). PLNs, and thereby also the GoIs, dominating role in the sales and project acquisition process, but lack of efficient regulation and transparency regarding capital investment leaves investors with a seemingly daunting task when entering the Indonesian electricity market.

Despite effort, there remains a heavy institutional curtain covering the fast-track entrance to the Indonesian solar PV market. As the archipelago nation faces uncertainty in the global economic policy and financial market volatility (World Bank, 2017) it is crucial to establish the solar sector early in the process and bring new actors to the solar PV scene. If this is not achieved within a relatively short period of time, the lack of market capacity and increased supply risk issues may cause price fluctuations (Asian Development Bank, 2015, p. 24) making the market little attractive for investors.

5.26 Economic Volatility: Fragmented Bureaucracy and Institutional Behavior

In general, subsidies are still vitally important for both consumers and SOEs. As Consumer subsidies are being rolled back in an attempt to unlock the large amount of capital required for the sizeable subsidies, the GoI is hoping stabilize the market economy to shocks from price volatility. If the GoI intends to remove fuel subsidies for all families but the poorest, there must be compelling incentives for the consumers to switch to other sources of energy, whilst still accepting the government plans. Parallel to removing subsidies from fuel and introducing subsidies for solar plant developers, the GoI should have a previously agreed rollback plan for the PV subsidies, which does not affect consumers more than necessary. Shielding consumers from the volatility of prices and the effect they have on subsidies seems key for the further positive development of the Indonesian state and its citizens.

The close involvement of the government in PLN business activities is noticeable, due to the significant meaning the connection has on the domestic electricity market. The financial ties the government has to PLN is of crucial nature and although the GoI is currently working on making PLN a more independent entity, most of the financial activity taking place

Item	2015	2016	2017	2018	2019	Total	Percent
Investment requirements from IPPs							
Generation (IPP)	3.1	7.5	11.5	11.5	9.8	43.4	52%
Investment requirements from PLN							
Generation (PLN)	2.6	3.6	3.9	3.1	2.4	15.6	19%
Transmission/Substations	3.8	4.0	3.6	3.4	2.2	17.1	20%
Distribution	1.5	1.4	1.5	1.5	1.5	7.4	9%
Sub-Total PLN	7.9	9.0	9.0	8.0	6.1	40.1	48%
Total	11.0	16.5	20.5	19.6	15.9	83.5	100%

Table 2. Base Investment Cost Requirements for PLN's Network, 2015-2019 (US$ billion). (Tharakan, 2015, p. 18)

is either funded or backed by the MoF. Bridging the gap between PLNs revenue and expenditure by converting debt to equity and providing subsidies constitutes currently BAU (Tharakan, 2015, p. 18). Needless to say, PLN is now 'too big to fail', meaning that the GoI is so involved and has invested too much into PLN for the electricity utility to go bankrupt or fail in any way. Table 2 shows the base cost investment requirements for PLN's expansion plan of their network for the years 2015-2019. As seen in the table, PLN expects that 52% of the investment comes from independent power producers (IPPs), whilst PLN must cover 48% of the total investment, totaling $83.5 billion (US). Furthermore, the amount of IPP capital increases over time, whereas PLN's own investment decreases from 2016-2019 and presumably must continue to do so after 2019. The clear plan to move PLN funding from government supported to non-utility generated capital is positive news for investors, since this indicates that the government, is willing to part with some future revenue possibilities. The market for solar PV is expected to increase dramatically over the next ten year, especially in the rural areas, and this gives investors the possibility to gain significant rates of return, whilst still being protected from volatility due the government guarantee of subsidies for the next 20 years. However, the governments willingness to part with generation responsibilities

is not necessarily equal to that found in the PLN boardroom. Nor is it necessarily reflected by the policies determining government financing of PLN or its subsidies.

The institutional bodies primarily responsible for working together on PLN financing are MEMR, MoF and PLN. By Indonesian standards three institutions involved in the same process if fairly little, so one would expect cohesive regulation could be produced with relative ease. However, as the development of the solar sector needed new regulation for both development and subsidies, cohesion is lacking. The revoke of the consumer program is a good example. PLN provides consumers with electricity tariffs and MEMR provides PLN with electricity tariffs to match the difference between the generation cost and the subsidized consumer price. However, under the new legislation PLN is unable to raise consumer tariffs, whilst MEMR is unwilling to increase electricity tariffs for PLN. Tariffs are adjusted according to exchange rate, inflation and Indonesian crude prices (ICP), making them extremely volatile (Susanto, 2017). This leaves PLN with increasing expenditure, due to the drop in revenue and increase in costs.

The lack of cohesion and unity in regulation reflects the fragmentation of the administration. Independent reports point to international support for the Indonesian solar sector as necessary if it is to be successful (UNEP DTU Partnership, 2016, p. 28). Some international organizations, such as EIA and IEA, have provided full reports on how to manage the new solar sector and the ADB has accepted fiduciary responsibility to ensure that international loans and other financing is used only for the purpose for which they were approved (Asian Development Bank, 2015, p. 26). However, the solution to domestic issues, such as bureaucratic fragmentation, may not be internationally driven. Solid financial and environmental gains for consumers, severe decrease in rent seeking, and a structured political framework must be in place before external support can be of significant help with political unity.

There are, however, other aspects where international assistance may prove beneficial for the GoI and the further development of the solar sector. As previously shown, the licensing process for products related to solar panels is extremely intricate. Technical support from related international institutions can help build capacity and serve as technical assistance for the most efficient development (UNEP DTU Partnership, 2016, p. 28). The advanced technical knowledge may also prove helpful in eliminating the current top-down strategy and attracting investors. There is currently very little incentive for consumers to

contribute to the conversion process from fossil fuels to renewables, but education and new consumer advantage programs may help changes this. The lack of incentive could to a high degree stem from a lack of education. This is not just amongst consumers but also results in extremely limited skilled manpower. To investors this can cause concern and act as an additional reason for hesitating entering the solar energy market, despite the GoIs best efforts (Emerhub, 2016).

5.3 Discussion

It is evident from the analysis that there are a number of hurdles for further development of solar PV energy in Indonesia. The legislative transition intended to push Indonesia into fast development of renewables, in particular solar energy, is in several aspects conflicting with preexisting regulations. Whilst the recent decrees and regulation gives somewhat of a clearer image of the political and economic landscape for investors, the contradicting priorities found in ministries and the state-owned entity PLN causes a halt in the development. In short, the institutional fragmentation is counterproductive to the ambitious development goals necessary for moving Indonesian citizens away from fossil fuels and towards renewables.

The consumers may end up paying for the political and economic cluster. Whilst the GoI is rolling back subsidies for fossil fuels, the need for alterative fuel sources is somewhat neglected leaving citizens with little choice other than paying more for electricity. In addition, there is extremely little incentive for private consumers to educate themselves in the use of alternative power sources, due to the lack of support and training programs. Although it is widely agreed that solar energy is one of the most optimal ways of providing electricity to remote off-grid islands, the GoI is doing little to train locals in installing, operating and monitoring the solar cells. Furthermore, banks are having a hard time providing loans options desirable enough for people to take any risks.

The lending issue illustrates the complexity and contradictory nature of the new renewable policies quite well. The Indonesian government has previously, and does still partially, exuded great skill in creating progressive legislation. Creating limits on the amount of FDI in solar PV plants and focusing on developing small-scale plants before plants over 10MW is beneficial for the domestic energy sector, because it gives the Indonesian a

possibility of receiving development aid but still own the majority of their own energy. However, the cap on foreign financing has put so much pressure on local banks that the development has developed much slower than intended. The banks simply cannot provide interest rates beneficial enough for the small-scale projects to be feasible. The issue of feasible lending is unfortunately common, albeit rather simple; there is a legislative setup for extremely positive development, but due to lack of institutional cohesion the required support mechanism are not able to back the desired development speed.

The contradictory situation leaves the GoI and PLN in a situation where government funding is continuously distributed from the MoF, but generates very little development. In addition to the fuel subsidies that still exist, the GoI has mandated PLN to purchase power generated from renewables. However, PLN must also deliver electricity to end-use consumer to a certain price. Until solar energy reaches socket parity, which is expected to happen by 2025, the electricity produced by PV cells will be more expensive than the power generated by conventional power plants. This leaves PLN with a gap of expenses they must cover through government financing. This gap cannot be covered by FDI due to the restrictions on ownership of generation plants and the prioritization of smaller plants over larger plants. Once again, the basic legislation is progressive, but the necessary support mechanisms are not in place.

The contradictory nature of the GoIs policies in the solar energy sector is extremely unfortunate. Not only is funding limited for both foreign and local investors, which puts a damper on development, but the institutional fragmentation is jeopardizing the inclusiveness of the institutions. In addition, the issues with rent seeking, the spending-effect and continuous exposure to economic volatility poses serious threats to the positive development of not only solar energy, but renewables in general. In short, despite development potential the GoI has failed to support a full opening of the solar energy sector for both IPPs and consumers due to institutional fragmentation and early signs of a potential resource curse.

6.0 Conclusions

The Indonesian government is facing a situation where it is forced to roll back the majority of the fossil fuel subsidies, which has upheld the quality of life for millions of Indonesians in rural areas. Fortunately, Indonesia has enormous potential for development of the solar PV energy sector, which could support rural, off-grid households in a sustainable manner. This would primarily be possible due to foreign investments. However, previous experiences with sudden influxes of energy-related income has proven to be difficult to administer and the GoI could therefore potentially be headed towards a resource curse for solar energy if the expended funds are not managed correctly. This puzzled situation lead to the problem formulation: *Is there a resource curse in the renewables sector, specifically the solar energy sector, in Indonesia? What are the factors that shape the institutional framework that surrounds the development of the sector?"*

To investigate this question, a research design consisting of a case study was utilized. Due to lack of previous research on the topic, the research design is the first of its kind in this specific area. The case was identified as being a unique case, which was approached with an interpretivist manner in a hermeneutic pattern of investigation. The original width of the problem formulation and the depth of the existing literature were complimented well by the loose structure of the case study design, allowing the researcher to explore several variables and continuously reassess the results found.

The theoretical framework utilized was rather extensive, but contained specific variables isolated from each theory applied. In total, three theories were utilized for the analysis. Resource curse theory provided three conditions for resource curses – Dutch disease, rent seeking, and economic volatility – which were all tested on the case against the two other theoretical frameworks, fragmented bureaucracy and institutional behavior. The chosen theories provided the necessary scope of academic basis for investigating the complex question of a resource curse for renewables.

The analysis found that there are indicators of a possible resource curse in the GoIs comprehensive plan for development of solar energy. Longstanding issues with rent seeking, primarily in the form of graft, poses a severe problem for developing the transparency needed for economic support from foreign investors. There is also some fragmentation within many of the Indonesian institutions, despite them all are relatively inclusive. This means that

although proposals and legislation is approved there is not enough unification to support the policies to success. Lastly, the Indonesian economy is extremely exposed to volatility, despite moving away from fossil fuels as the main government revenue. Investors are not protected from trade volatility and banks are too exposed to exchange rate volatility to fund local projects. If the volatility is not managed under a comprehensive plan, possibly with international economic institutions providing supervision, the desired amount of financial input will be difficult to reach.

In sum, there was found no evidence to support the claim that the Indonesian solar sector is currently experiencing a resource curse. However, there were found extensive signs of a potential curse. Retrieving the definition of resource curse for this thesis, reminds us that a nation is experiencing a resource curse if a resource rich country fails to benefit fully from their natural resource wealth. In addition, governments in these countries must respond effectively to public welfare needs. Although it is true that the infancy of the solar sector inhibits the GoI from neglecting the full potential of the solar sector, the foundation for a poor development has been laid. The GoI cannot fulfill the first condition of the resource curse, simply because the sector is yet too underdeveloped to neglect in a way that constitutes that necessary of a resource curse.

If the Indonesian government is successful in solving its financing issues with foreign investors, the amount of investment capital flowing into the country could constitute a substantial sum of money. That money must under all circumstances be directed to the appropriate sectors and it must be done so under the right supervision. If not, the second condition of the resource curse will be fulfilled. Fragmentation and rent seeking, which is still present in surrounding sectors, cannot seep into the new sector if it is to be successful. If the government fails to keep it out it may end up suffering from a case of Dutch disease or full-blown resource curse.

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