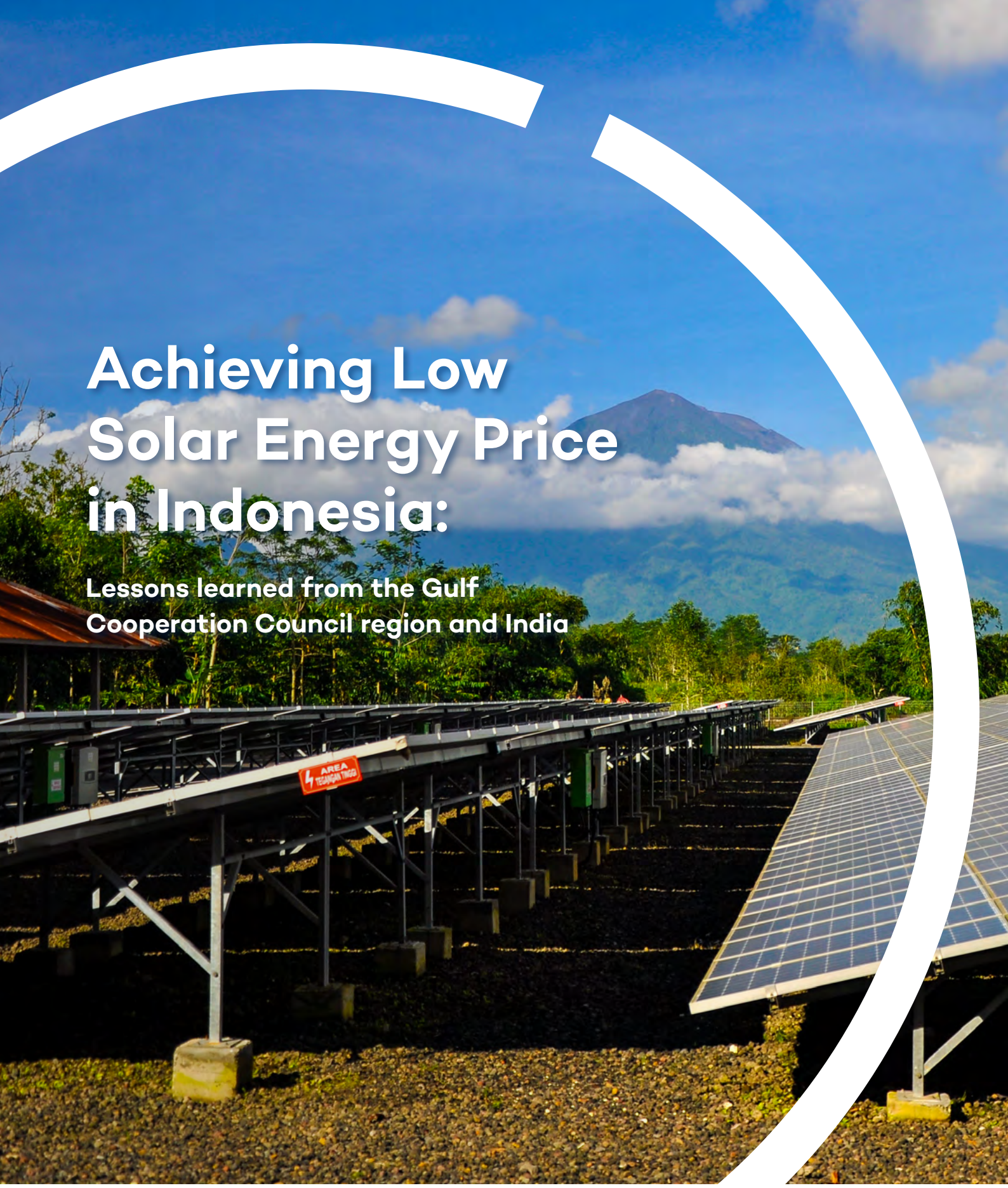

Achieving Low Solar Energy Price in Indonesia:

Lessons learned from the Gulf Cooperation Council region and India

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Global Subsidies Initiative

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Table of Contents

Acronyms and Abbreviations

CFSPP	coal-fired steam power plant
CPI	Climate Policy Initiative
DPT	selected vendor list
FS	Frankfurt School
GCC	Gulf Cooperation Council
GW	gigawatts
IISD	International Institute for Sustainable Development
IPP	Independent Power Producer
IRENA	International Renewable Energy Agency
kWh	kilowatt-hour
LCOE	levelized cost of energy
MBR	Mohammed bin Rashid Al Maktoum (solar park)
MEMR	Ministry of Energy and Mineral Resources
MNRE	Ministry of New and Renewable Energy
MW	megawatt
NRE	new and renewable energy
O&M	operations and maintenance
PPA	power purchase agreement
PT PLN	PT Perusahaan Listrik Negara
PV	photovoltaic
SECI	Solar Energy Corporation of India
TERI	The Energy and Resources Institute
UAE	United Arab Emirates
UNEP	UN Environment

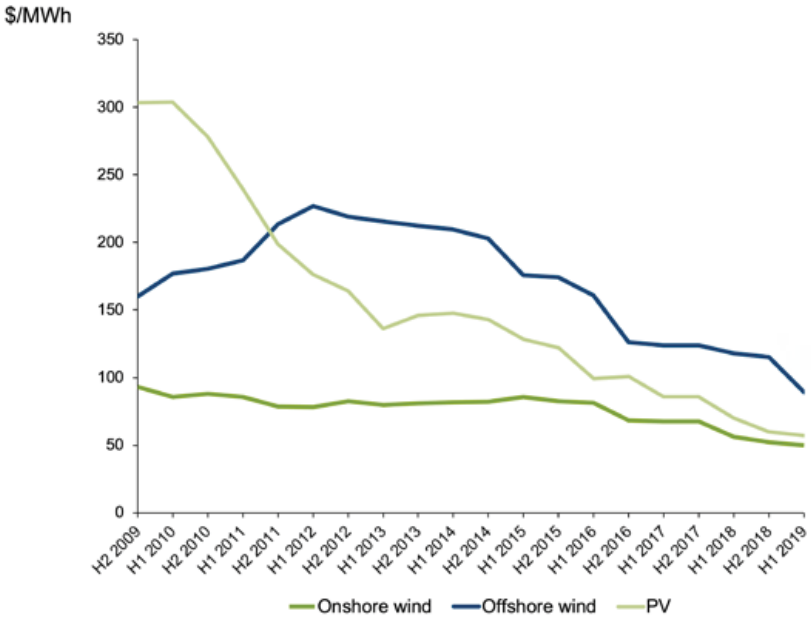
1.0 Introduction

Renewable energy pricing in Indonesia has been identified as one of the main roadblocks for renewable energy development. The price paid to renewable energy generators is the single most significant factor that influences the financial viability of projects. A previous report by the International Institute for Sustainable Development (IISD), *Missing the 23% Target: Roadblocks to Renewable Energy Development in Indonesia,* identified that, based on the current regulations, power purchase prices are simply too low to allow developers to recover their investments and make reasonable profits (Bridle et al., 2018). Meanwhile, as the sole offtaker, Indonesia' state-owned electricity company, PT Perusahaan Listrik Negara (PLN), has repeatedly stated that power purchase agreement (PPA) prices are actually still too high for its appetite, often leading to lengthy PPA negotiations. As a result, up until now, setting tariffs at a rate that satisfies both renewable energy developers and PT PLN still remains a challenge.

Renewable energy developers have also voiced their concern that the current system of pricing does not provide any recognition of the environmental benefits of renewable energy, and, in fact, favours fossil fuel sources. By subsidizing and financially supporting the coal industry, the Government of Indonesia is indirectly and artificially decreasing the average generation cost of electricity. Since renewable energy prices are now linked to these prices through Biaya Pokok Pembangkitan (basic cost of generation), unsubsidized renewables are competing against subsidized coal generation (Bridle et al., 2018).

A recent report from Frankfurt School and UN Environment (FS and UNEP) Collaborating Centre (2019) shows that the levelized cost of energy (LCOE) for solar and wind power continues to decline, even reaching grid parity in some of the world's biggest markets, such as California, China and parts of Europe. BNEF analysts estimate that some of the cheapest solar projects financed recently will be able to achieve an LCOE of USD 27–36/MWh, assuming that competitive returns for equity investors are factored in. Cheaper equipment costs are the main driver behind the latest price drops (Maisch, 2019).

Figure 1. Decline in LCOE globally over the years



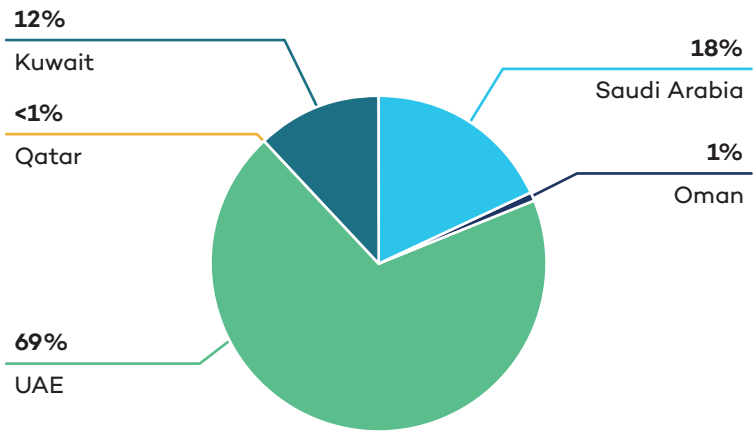
Source: FS and UNEP Collaborating Centre for Climate & Sustainable Energy Finance, 2019.

The FS and UNEP Collaborating Centre (2019) also indicates that the decline of LCOE is the result of several factors: fierce competition among manufacturers and developers to cut overheads, the influence of renewable energy auctions in driving that competition, improving technology that has added incrementally to efficiency (the number of megawatt-hours of energy coming from the same number of megawatts of capacity) and a strong downward trend in finance costs.

The trend of cheap renewable energy projects also extends to the Gulf Cooperation Council (GCC) countries and India. Similar to Indonesia, these regions also have extensive fossil fuel reserves, but in contrast to Indonesia, both have managed to kickstart the shift to renewables. The falling cost of renewables, reinforced by private sector involvement and political will for carbon-free energy, is setting up the GCC countries to be a global power in renewable energy development. For example, early in January 2019, Saudi Arabia set a record low for onshore wind price of USD 2.13 cents/kWh (MEED, 2019).

Though renewable energy accounted for less than 1% (867 MW) of total installed power capacity (146 GW) in the Gulf region at the end of 2018, in which the United Arab Emirates (UAE) accounted for 68% and Saudi Arabia 16%, it does show a four-fold increase compared to the level in 2014 (210 MW) (Apostoleris et al., 2019).

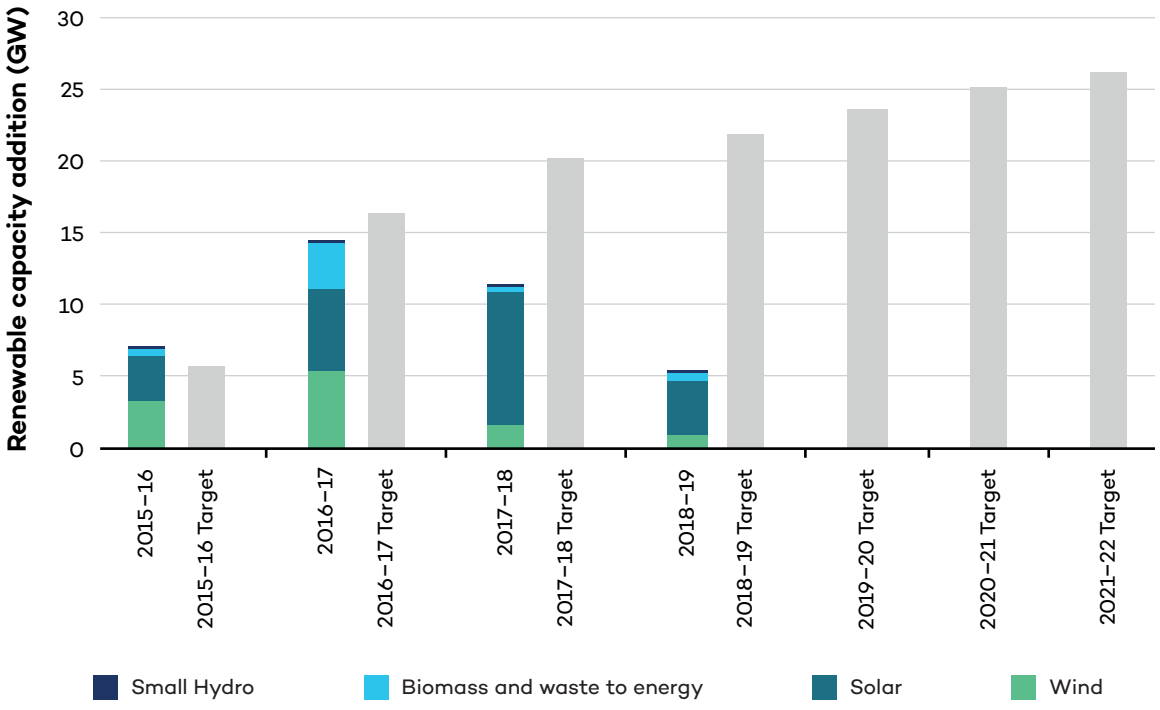
Figure 2. Growth in renewable energy capacity in the GCC by country, 2014–2018



Source: International Renewable Energy Agency (IRENA), 2019.

A recent analysis by IRENA also found that the costs of setting up solar photovoltaic (PV) projects in India have dropped by about 80% between 2010 and 2018 (Economic Times, 2019a). Figure 3 shows the growth of renewable energy capacity in India. While the additions have been impressive, especially between 2015 and 2017, the shortfall also increased between 2017 and 2018 due to the increase in annual targets (Bhati et al., 2019).

Figure 3. Indian renewable energy sector growth trends



Source: Bhati et al., 2019.

This paper will look at five factors that drive renewable energy prices and review examples from the GCC countries and India to explore what Indonesia could learn from these experiences. These factors are:

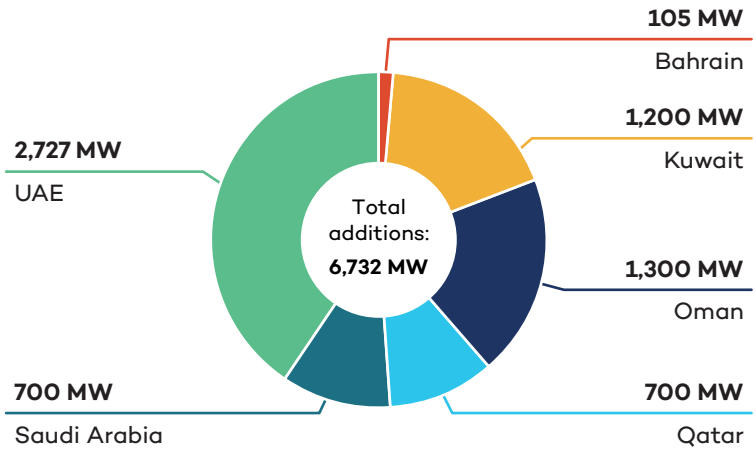
- Government targets and policy
- Government procurement (auction design)
- Land and grid access
- Investor confidence and finance
- Local content and import duty

2.0 Government Targets and Policies

2.1 GCC Countries' Renewable Energy Targets

Recent developments in renewable energy plans and targets in the GCC differ across the countries, but the overall trend is showing that the region is shaping up to be one of the most dynamic markets in the world. Although the region is still quite a new market for renewable energy, the UAE and Saudi Arabia's markets in particular are quickly becoming the region's biggest (IRENA, 2019). GCC countries have also become world leaders in developing low-priced PV power plants, without any official solar incentive programs. The UAE was the first country to realize unsubsidized solar electricity for less than USD 3 cents/kWh (Apostoleris et al., 2019).

Figure 4. Renewable power planned additions by country



Source: IRENA, 2019.

2.1.1 UAE's Renewable Energy Targets and Policies

Although UAE is the second-largest market in the region, right behind Saudi Arabia, it has the largest and fastest-growing solar market, with solar PV accounting for 83% of the 589 MW of installed renewable energy capacity.

In 2017, the UAE launched Energy Strategy 2050 (also known as UAE Energy Plan 2050), the first unified energy strategy in the country to become a law. The strategy aims to increase the share of clean energy in the country's electricity generation capacity to 50% by 2050 (44% renewable and 6% nuclear) and to expand renewable energy capacity to reach 44 GW. The country also has short- to medium-term targets. In line with Vision 2021, the UAE plans to generate 27% of its energy requirements from non-fossil fuel sources, including nuclear power (IRENA, 2019).

However, the UAE Minister of Energy and Industry said in February 2019 that UAE would miss this target, due to the delay of the Barakah nuclear power plant. Out of the 27% target, 25% of the share was projected to come from the Barakah power plant, which was due to open

in 2017. However, the possible operation date has now been pushed back to 2021. Critics have commented on why the UAE government relied on a single source of energy in order to achieve its ambitious renewable energy target (Dajani, 2019).

2.1.2 Saudi Arabia's Targets and Policies

Saudi Arabia accounts for half of GCC's total final energy consumption, making them the largest energy market in the region. As of 2017, the country's renewable energy capacity stood at about 92 MW, mostly from small-scale solar PV pilot projects. The kingdom's new National Renewable Energy Program, launched in 2016 as part of Saudi Arabia's broader economic development plan, Vision 2030, aims to diversify the economy by making it less dependent on oil (IRENA, 2019). Although rich in oil, Saudi Arabia sees the value of renewables to supplement the huge volumes of oil and gas used for domestic consumption. Less consumption at home will mean more oil and gas to be exported abroad, as well as the creation of new jobs. Casting green energy as in the national interest, in addition to record-breaking low prices for solar and wind power, means the push toward renewable energy has a bigger chance for success (Safi, 2019).

The National Renewable Energy Program aims for 3.45 GW of installed renewable energy capacity by 2020 and 9.5 GW by 2023 (10% of power generation capacity), with the longer-term target of 30% renewable energy (including nuclear power) in power generation by 2030 (Ministry of Energy, 2019).

The launch of Vision 2030 in 2016 also led to intra-governmental restructuring aimed to create more streamlined decision-making. One of the most important changes was the combining of the previously separate ministries of oil and electricity under one Ministry of Energy, Industry and Mineral Resources, created to oversee the National Renewable Energy Program. At the same time, the government also pushed ahead several rounds of auctions, focusing mostly on solar power (IRENA, 2019).

2.2 India Renewable Energy Target and Policies

In 2015, the Government of India set a target to install 175 GW in renewable energy capacity by 2022. The target includes 100 GW of solar energy, 60 GW of wind power, 10 GW of biomass energy and 5 GW of small hydropower. Moreover, in June 2018, the New and Renewable Energy Minister announced the additional target of 52 GW (up to 227 GW in total by 2022) from new schemes like offshore wind and solar (Institute for Essential Services Reform, 2018).

India has recognized the importance of transitioning to renewable energy sources since the early 1970s. The central government's Ministry of New and Renewable Energy (MNRE) has the specific task of facilitating the development and deployment of new and renewable energy to supplement India's energy requirement. It supports the research and development of new and renewable energy technologies, products and services.

The Government of India also formed multiple agencies that are specifically devoted to dealing with the development of renewable energy in India. The MNRE overlooks various technical and financial institutions, as well as other companies, that focus on facilitating

growth in all renewable energy sources. MRNE's financial arm, the Indian Renewable Energy Development Agency, provides loans, channels funds and oversees other initiatives to promote renewable energy. India also provides various fiscal and financial incentives, preferential tariffs, renewable energy purchase obligations, generation-based incentives and renewable energy certificates. Other support programs, such as research and development and promotions, are also covered under the financial support schemes provided by the government (The Energy and Resources Institute [TERI], 2015). Most of the regulatory basis for these incentives are covered in The Electricity Act 2003, the National Electricity Policy 2005 and the National Tariff Policy 2006 (Institute for Essential Services Reform, 2018). The latest revision of the National Tariff Policy in 2011 notified uniform renewable energy purchase obligation levels across the country, as well as exempting wind and solar energy projects from payment of inter-state transmission charges and losses (Kumar & Thapar, 2017).

2.3 Indonesia's Renewable Energy Target

As part of the Paris Climate Agreement, Indonesia has committed to reducing greenhouse gas emissions by 29% below its baseline emissions by 2030 (and by 41% conditional on international support) (Republic of Indonesia, 2016). Since more than a third of Indonesia's greenhouse gas emissions come from the energy sector, one of the key efforts toward this goal was setting a national target of achieving 23% new and renewable energy in the energy mix by 2025 (see Box 1).

Box 1: Indonesia's climate, renewable energy and renewable power generation targets

Climate change

- 29% reduction below its baseline emissions by 2030 (and 41% conditional on international support) (Republic of Indonesia, 2014).

Renewable energy in the primary energy mix

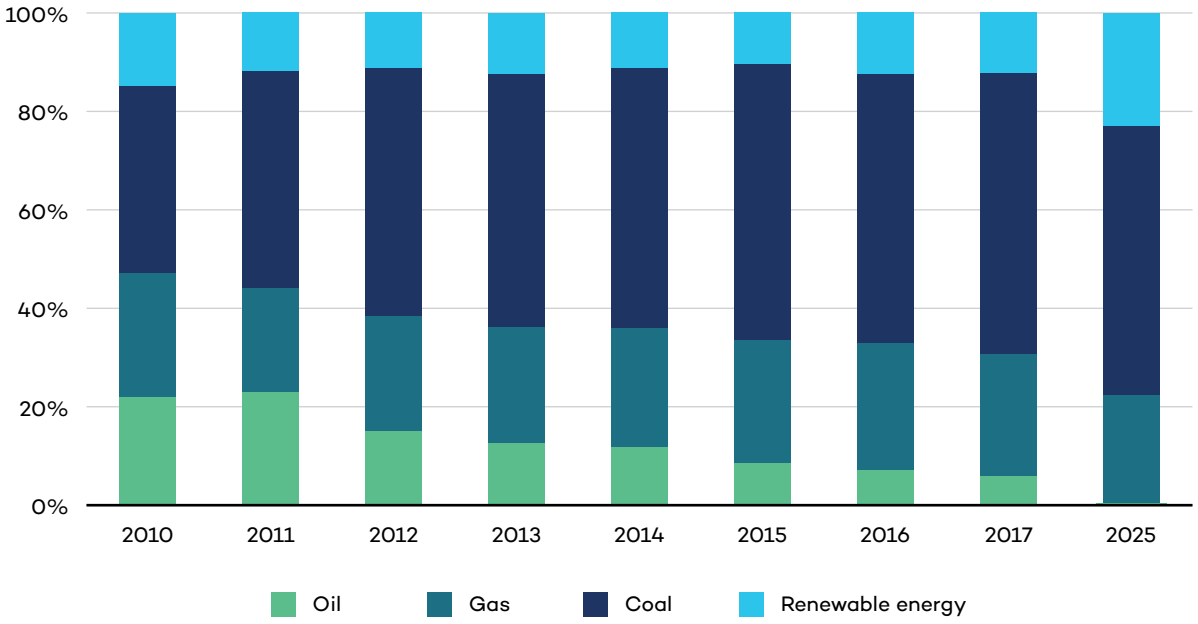
- New and renewable energy (NRE) of at least 23% of primary energy demand by 2025 as well as oil of less than 25%; coal of at least 30% and natural gas of at least 22% (Republic of Indonesia, 2014).
- 23% NRE is composed of: 10% bioenergy, 7% geothermal, 3% hydropower and 3% other NRE.
- NRE of at least 31% of primary energy demand by 2050 as well as oil of less than 20%; coal of at least 25%; and natural gas of at least 24% (Republic of Indonesia, 2014).

Renewable power generation

- The power generation energy mix should comprise approximately 23% of NRE, 54.6% coal, 22% gas and 0.4% diesel fuel by 2025 (PLN, 2019b).

However, Indonesia is currently off target. In the electricity sector, the share of renewable energy to date is around 13%.

Figure 5. Development of fuel mix for installed power generation



Source: PricewaterhouseCoopers, 2018; PLN, 2019b, p. 1071.

Figure 5 shows the development of the fuel mix for installed power generation from 2010 to 2017, as well as the projected fuel mix in 2025. It shows that the share of coal has been growing significantly in the past few years, while the growth of renewable energy seems to be stagnant. Energy is still dominated by coal. Contrary to the government's predictions, installed capacity additions of renewable energy power plants have been slow over the past three years, with only 320 MW of additional capacity being installed. The total renewable installed capacity stood at 9.4 GW at the end of 2018, well under Ministry of Energy and Mineral Resources (MEMR) target of 15.5 GW by the second quarter of 2018 (Institute for Essential Services Reform, 2019).

In 2018, IISD published a report identifying a series of "roadblocks" for renewable energy development in Indonesia. As mentioned in the earlier section, issues surrounding power purchase price are one of the main roadblocks identified in the report. Issues concerning frequent changes to policy, regulatory delays and patchy implementation of government policy by PLN further undermine investor confidence and increase project development risk (Bridle et al., 2018).

3.0 Government Procurement

3.1 Notable Projects in the GCC Region

Saudi Arabia's ACWA Power submitted a tariff of just USD 1.6953 cents/kWh for the 900-MW fifth phase of Dubai's Mohammed bin Rashid Al Maktoum (MBR) Solar Park, which sets a new record for unsubsidized solar PV production in the region. The bid was submitted in order to compete for the fifth phase of the 5-GW MBR solar park in Dubai. The fourth phase of the solar park, also by ACWA, also broke a record low of USD 24/MWh using a combination of solar PV and solar thermal technology (Institute for Energy Economics and Financial Analysis, 2019). Excellent lending conditions and the 25-year contract obtained by ACWA Power play a large part in achieving the low rate (Parnell, 2018).

In addition, the Noor Abu Dhabi solar power plant went online in June 2019 and became the cheapest solar plant operation in the world at USD 2.94 cents/kWh. The plant demonstrates that large-scale renewable energy can compete with fossil fuels, which typically cost USD 4–6 cents/kWh.

A study by Khalifa University reveals how large solar plants in the UAE can sell unsubsidized electricity for under USD 3 cents/kWh while still making a profit. The two main factors that contributed to the low price are the plummeting cost of solar panels and the reduced cost of financing. The cost of solar panels represents one third of the total construction costs, and the projects receive large loans covering 70–80% of the project costs with very low interest rates. The fact that the project developers are large state-connected companies might contribute to investor confidence, as well as the company's own willingness to accept a somewhat lower return on their investment compared to purely private developers (Apostoleris et al., 2019).

3.2 Notable Projects in India

At an auction for 500 megawatts (MW) of capacity at the Rajashtan Bhadla Solar Park on May 12, 2017, the state-run Solar Energy Corporation of India (SECI) set a record-low tariff of USD 3.4 cents/kWh. The previous low was two days before that when tariffs hit USD 3.7 cents/kWh during auctions for another phase of Bhadla solar park. At this price, solar power in India is even cheaper than coal-based thermal power plants that are priced at USD 4.5 cents/kWh (Ghoshal, 2017).

The same tariff of INR 2.44 per kWh was again achieved in 2018 by Giriraj Renewables for a 300-MW auction held by Gujarat Uria Vikas Nigam Ltd. However, this tariff indicates that the recently imposed safeguard duty has not been taken into account. The tariff was also lower than another solar auction held by the National Thermal Power Corporation one month prior in the same year for 2,000 MW of projects, where the winning tariffs were in the range of INR 2.59–2.690 per kWh (Chandrasekaran, 2018).

A study by TERI and Climate Policy Initiative (CPI) projected that the cost of solar power generation in India is set to fall to as low as USD 2.7 cents/unit over the next decade through 2030, if the widespread deployment of tracking technology raises the capacity utilization factor of new plants above current levels (ETEnergyWorld, 2019).

India's success in setting up ambitious goals and exceeding them while also dropping the costs of setting up solar PV by about 80% in eight years is the story of an effective public–private partnership model. An article by *The Economic Times* (2019a) attributed success to the following:

1. **Role of the government:** The MNRE and the SECI, specialized bodies formed by the Government of India, played a pivotal role in implementing the policies through streamlined efforts.
2. **Incentives and policies:** Subsidies and incentives provided by the government and the Jawaharlal Nehru National Solar Mission since 2010 have been instrumental, especially the accelerated depreciation benefit and tax holiday, which provided major relief to solar developers.
3. **Land certainty:** Historically, land acquisition has always been a problem in India and is a major reason for cost escalation in infrastructure projects, since the cost of land constitutes about 7% of a large-scale solar project. The MNRE then introduced the Solar Park Policy guidelines, which require lead state governments to identify suitable large tracts of land with appropriate insolation levels to speed up the acquisition process for setting up solar parks. This completely erased all the project costs related to risk and uncertainty for land acquisition.
4. **Low cost of labour:** India has the lowest cost of labour in the world, allowing the solar industry to employ a large number of people and resulting in speedy project completion at the lowest cost.
5. **Price sensitivity:** Key components, such as solar panels, inverters, junction boxes, etc., are available at more competitive prices than other countries, sometimes even from the same international vendors.

Strong competition among solar developers is also cited as a main driver for low tariffs. At an auction for 750 MW of capacity at Bhadla solar park in 2017, there were 33 developers lining up in an overtly aggressive bidding war. Moreover, the reverse auction process adopted by India has also helped push tariffs even lower, with developers typically underbidding each other to win the auction (Ghoshal, 2017).

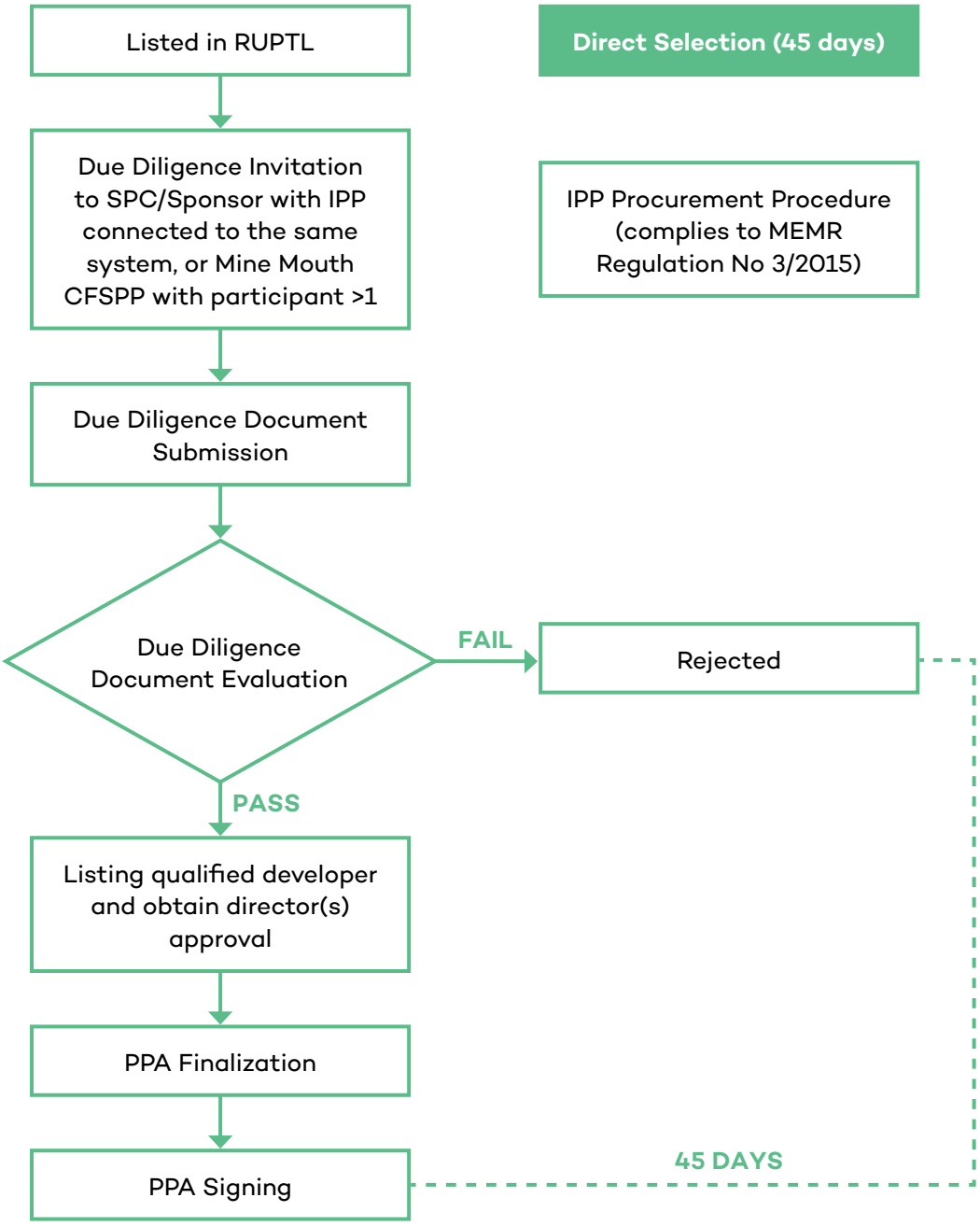
3.3 Current Issues with Renewable Energy Prices in Indonesia

Pricing for renewable energy tariffs has always been the subject of debate between PLN and developers, often resulting in lengthy PPA negotiations. It is one of the bottlenecks leading to why renewable energy development in Indonesia is not progressing as fast as it should. Investors in general found that the current pricing scheme is too low to attract interest. Coming up with the correct pricing scheme has been hailed as one of the keys to encouraging more renewable energy in Indonesia. However, it might be more effective to look at the bigger picture and analyze which factors have the biggest impact on pricing.

Power generation projects in Indonesia are mostly done through PLN auctions. There are three types of independent power producer (IPP) procurement processes in Indonesia:

1. **Direct appointment:** This process is done for mine mouth coal-fired steam power plants (CFSPPs), marginal gas-fired power plants, hydroelectric power plants, an emergency or crisis of electricity power supply or project expansion in the same location using the same system. The process usually takes 30 days, complying with MEMR Regulation No 3/2015. The tariff for projects under this category is decided based on MEMR Regulation No 3/2015 and/or negotiation and/or other applicable regulations issued by MEMR.
2. **Direct selection:** This process is done for tenders related to energy diversification to non-fuel oil (mine mouth CFSPPs, non-mine mouth CFSPPs, gas-fired power plants, hydroelectric power plants), expansion projects for power plants in a different location of the same system or if there is more than one direct appointment proposal. The process usually takes 45 days, complying with MEMR Regulation No 3/2015. The tariff for projects under this category is decided based on MEMR Regulation No 3/2015 and/or the lowest price proposal submitted by a bidder. Based on MEMR Regulation No 50/2017, this is the scheme that is now adopted for renewable energy projects, as shown in Figure 6. In order for developers to be able to qualify for the tender, they need to be already included in PLN's selected vendor list (DPT), which also serves as a pre-qualification. All vendors that are included in PLN's DPT are considered to have appropriate technical and financial competence to conduct the project. The DPT is evaluated every three years.

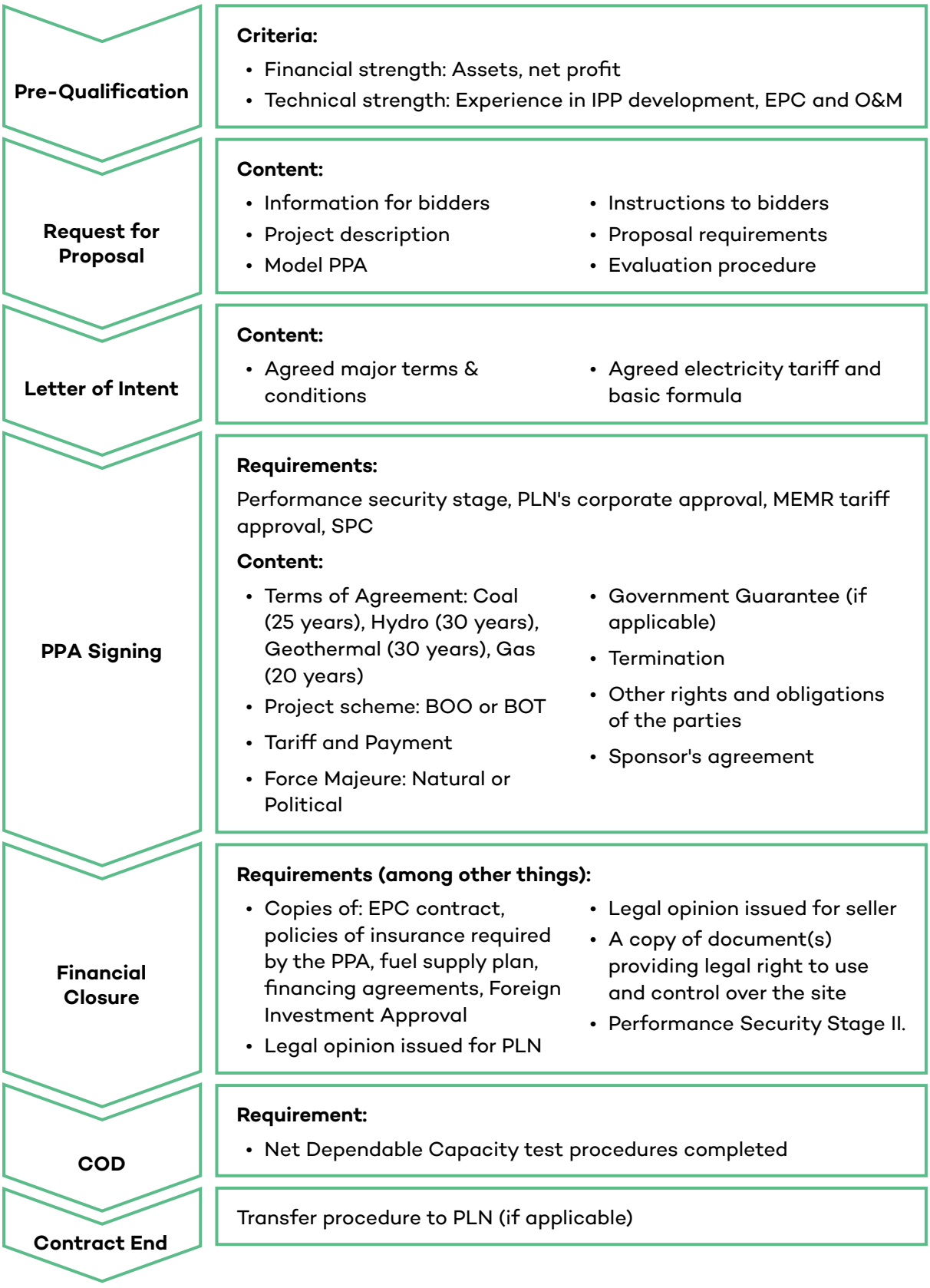
Figure 6. PLN direct selection flowchart



Source: PLN, 2019a.

3. **Open tender:** This process covers all other IPP projects that are not eligible for direct appointment or direct selection. Complying to MEMR Regulation 1/2006 and MEMR Regulation No 4/2007, the IPP procurement process through open tender for projects with a capacity of ≥ 15 MW requires 321 days (from tender announcement up to PPA signing) under the condition that there is no repetition in the pre-qualification and bidding process. The tariff for projects under this category is decided based on the lowest price proposal submitted by a bidder.

Figure 7. IPP business process flowchart



Source: PLN, 2019a.

Figure 7 shows the typical business process for IPPs. As described in Figures 5 and 6 regarding the process of direct selection, developers are required to submit a detailed due diligence study as well as various other documents during the bidding process. Included in these are the interconnection study required to build the transmission lines. In order to do a proper due diligence and interconnection study that would be considered bankable by financial institutions later on, most developers would hire a reputable third party, which usually incurs high cost. They would also need to start securing all the land plots and permits required for the project sites as well as the transmission lines. All of these burdens are borne by the developers, before even securing a PPA from PLN. This high level of risk is what stops a lot of investors from entering the game in the first place and later translates into additional costs for the project.

IPP payments usually have five tariff components:

1. The fixed cost or capacity charge is to be borne by the IPP whether or not the power plant is in operation, the form of:
    a) A Component (capital cost recovery): cost of capital recovery (capital and debt) and investor's profit calculated based on power capacity with specific Availability Factor agreed by the IPP and PLN.
    b) B Component: cost of fixed operations and maintenance (O&M), although the power plant is not operating.
    c) E Component: cost of capital recovery from building transmission lines, if the IPP is obligated to build one.
2. Variable cost is cost not to be borne by the IPP when the power plant is not operated.
    a) C Component: fuel cost to be issued to produce electric power.
    b) D Component: O&M cost issued only if the power plant is operating.

It is important to note that, in most renewable IPP projects (geothermal, hydro, etc.), the tariff is a single-tariff scheme (no components A, B, C or D as mentioned above). This is often problematic since PLN generally expects a similar price for similar projects, which should be subject to reconsideration since land acquisition prices and processes highly vary across locations, resulting in lengthy and difficult PPA negotiation processes and difficulty in obtaining financial closure later on.

4.0 Land and Grid Access

4.1 Land Access in Saudi Arabia

Similar to Indonesia, the responsibility of securing land to develop renewable energy projects in Saudi Arabia lies with the developers. In order to secure land (whether through purchase or lease), foreign developers must first establish a legal business presence in Saudi Arabia. Saudi land is zoned according to permissible uses. One key challenge is the fact that it is very difficult to obtain approval to change the permitted use of zoned land that has been allocated for a different use. Once an appropriate portion of land has been identified, the developer must ascertain who the owner of the land is, obtain the approval of the landowner and, where land belongs to the government, obtain prior consents from the relevant authorities. This must be undertaken for all access rights necessary to develop, construct and operate the project. However, unlike in Indonesia where developers must purchase the land plots, in Saudi Arabia, there are several scenarios through which the developers may try to secure land, including through conditional purchase, conditional lease, outright purchase or lease with the right to purchase. The kingdom is also still in the process of establishing a regulatory framework to support power supply from renewable sources and grid connections (Davies et al., 2016).

4.2 Land Access in UAE

While foreign developers are allowed to purchase or lease land in Saudi Arabia once they have a legal business presence, that is not the case for the UAE. In several countries, such as Abu Dhabi, only UAE nationals and companies wholly owned by UAE nationals may freely buy and sell residential, commercial, investment, and agricultural land and buildings. Foreigners (non-UAE nationals and non-GCC nationals) are given the right to own buildings in investment zones, but non-GCC nationals may not own the underlying plots of land. Non-GCC nationals are allowed to enjoy usufruct rights over the underlying land pursuant to agreements of up to 99 years and lease rights pursuant to agreements of up to 50 years. However, in practice, for example, in the case in Abu Dhabi, foreigners rarely apply to purchase, either inside or outside the investment zones.

4.3 Land Access in India

As mentioned in the previous chapter, India also identified land acquisition and permitting as one of the issues in renewable energy development. They identified the need to streamline permits and land acquisition, particularly in relation to land acquisition and environmental permitting. Lack of coordination among key organizations has led to time and cost overruns resulting in high transaction costs. A robust system setting a time-bound target for getting all approvals, without having to follow up with different state government departments, needs to be put in place for renewable energy developers (TERI, 2015a).

The new Solar Parks Scheme requires the host state government to identify a large chunk of land for the purpose of setting up a large number of solar park projects, complete with providing all the necessary statutory clearances and common infrastructure facilities to set up

a project. Also included in this scheme as part of the state government's responsibility is to set up road infrastructure and the transmission systems (Kumar & Thapar, 2017).

The Indian Electricity Grid Code is the decisive policy framework to ensure the absorption of electricity from renewable sources into the grid. Established in 2010, the code provides a methodology for renewable energy scheduling as well as incentive mechanisms for states that absorb a significant degree of renewable generation. This gives the motivation for power system operators to utilize as much power as possible from renewable sources (Institute for Essential Services Reform, 2018)

Therefore, Indian developers do not need to worry about land requirements and grid connections, as these all fall within the government's responsibility. These are all in contrast with the system in Indonesia, where road infrastructure and transmission systems both fall under the project developer's responsibility, which understandably would add significant cost to the overall project cost, as reflected in the pricing formula discussed in earlier sections.

5.0 Investment Climate and Financing

5.1 Investment Climate in the GCC region

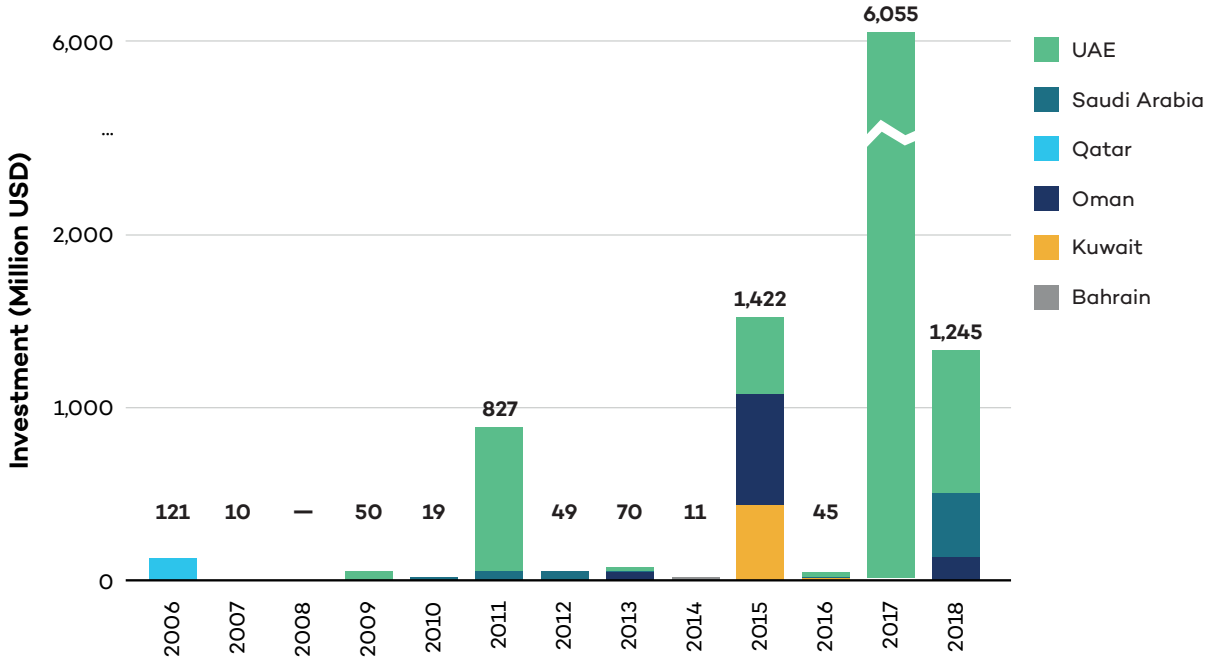
There is an observable trend of Build–Own–Operate and IPP large-scale projects when it comes to renewable energy projects in the UAE. Most of the efforts have been concentrated in Dubai and Abu Dhabi, where they purchase electricity from the Dubai Electricity and Water Authority and Abu Dhabi Water and Electricity Authority. The UAE has also been focusing on net metering initiatives to raise awareness about clean energy and encourage households and private sector involvement (Abdelrahim, 2019).

Saudi Arabia, as a country, hosts several major IPPs and Independent Water and Power Producers delivered under long-term PPAs that are proven to be bankable and have already attracted billions of dollars in domestic and international investment. As the private sector gets more involved in power generation, a process of introducing market-based tariffs is encouraged by the government to lower the subsidies that were worth USD 40 billion in 2013 (Davies et al., 2016).

Federal Law No. 19 of 2018 on Foreign Direct Investment allows 100% foreign ownership of companies in certain sectors (electricity services included) in the UAE, up from the previous 49% maximum under Federal Law No 2 of 2015 on Commercial Companies. However, this 100% foreign ownership is still subjected to approval from the UAE Cabinet (Afridi & Aloke, 2019).

The investment pattern observed in the GCC countries reflects their status as relatively new markets for renewable energy. A considerable share of investment is driven by large, individual projects, implying considerable year-on-year fluctuations in investment volumes. So far, investments are concentrated in the UAE. As deployment picks up, annual investment flows will likely become more consistent and increase across all countries. Investment trends in renewable energy projects in the GCC between 2006 and 2018 are shown in Figure 8.

Figure 8. Investment in renewable energy projects in the GCC, 2006–2018



Source: IRENA, 2019.

Most of the investors based in the GCC region are keen to invest in industries with prospects for long-term development. Masdar, a UAE-based developer that holds stakes in many renewable energy projects around the world, is wholly owned by UAE's Mubadala Investment Company, a sovereign wealth fund. ACWA Power, a Saudi developer of power and desalination plants, is partially owned by the Saudi Public Investment Fund, the sovereign wealth fund of Saudi Arabia. Nebras Power, a Qatar power company, is a joint venture between the Qatar Electricity and Water Company and Qatar Holding, the latter being founded by the Qatar Investment Authority, a sovereign wealth fund of Qatar.

UAE also has a special fund in the form of the Abu Dhabi Fund For Development, which has committed USD 350 million in concessionary loans over seven funding cycles to renewable energy projects recommended by IRENA. The first five funding cycles has allocated USD 214 million to co-finance 21 renewable energy projects, which in turn helps leverage an additional USD 420 million from other funding sources. There is also the Sovereign Wealth Funds Initiative of the One Plane Summit, which includes investment funds from several GCC countries, including Abu Dhabi, Kuwait, Qatar and Saudi Arabia. This fund is committed to investing in companies that factor climate risks into their strategies (IRENA, 2019).

To fulfill the target of 7% renewable energy by 2020 and 25% by 2030 in Dubai, the emirates created the Dubai Green Fund, a USD 27.2 billion clean energy fund used to create and install several renewable energy projects. The MBR solar park is the one project that stands out prominently. This solar park is forecasted to grow to a capacity of 1,000 MW by 2020 and to 5,000 MW by 2030. It was built under an IPP model, with Dubai Electricity and Water Authority as the buyer in the PPA (Abdelrahim, 2019).

5.2 Investment Climate in India

India is among the top 10 countries in terms of new renewable energy investments. The government has identified the need for an additional USD 450 billion of capital by 2040 to reach 480 GW of renewable energy capacity. The strong policy commitment and large market size certainly benefit India in developing their position as an economically attractive market. A report by CPI shows that Indian renewable energy is now classified as low-medium risk with medium-high growth. This matches the appetite of domestic institutional investors that are mostly seeking low-risk investments and long duration assets. The investment landscape of large renewable energy projects that is now medium risk–moderate return (15% expected return) also suits the appetite of foreign institutional investors (Prakash, Meattle and Shrimali, 2018).

India also allows foreign investors to set up renewable energy-based power generation projects with up to 100% foreign direct investment under the automatic route (Kumar & Thapar, 2017). The renewable energy and transmission sectors in India are even classified as having the lowest overall risk when it comes to cash flows. This is because renewable energy projects have high predictability in terms of volume of sales and pricing because of long-term PPAs, low O&M expenses, no fuel expenses and no recurring capital expenditure (Prakash et al., 2018).

In 2018 India committed USD 11 billion in renewable energy investments, down 15% from 2017 but slightly above its five-year average of USD 10.3 billion. Solar investment was USD 6.9 billion, some 19% lower, mainly due to falling capital costs, while wind investment was USD 4.1 billion, down 8%.

5.3 Investment Climate in Indonesia

In the case of Indonesia, there is actually a significant and increasing amount of funds available to support renewable energy investments coming from both national and international funds, but they have remained mostly untapped. Most of these funds are focused on public investment, but some public funds can be accessed directly by private firms—in some instances, through specific facilities.

However, the Build–Own–Operate–Transfer scheme adopted in all renewable energy PPAs with PLN—which means that, after a certain period, the asset is to be handed over to PLN—changes the incentives for investors. This means that investors need to recoup their initial costs and make their return in a limited period, thereby increasing the project cost to obtain a price that is acceptable for investors. There are even some circumstances where this requirement stops investment entirely. PLN's requirement that some generation projects must be developed as jointly owned projects also dampens a lot of interest by investors due to the minority shareholding requirement for PLN.

Banking institutions with green lending or green investment programs are key actors in moving financing. However, the difficulty lies in securing the loans. Local banks tend to offer much higher interest rates (10–11%) and shorter tenor (maximum five years) and are only willing to finance up to 50–60% of total project costs. To further complicate the

matter, MEMR Rule No 50/2017 caps the renewable energy electricity tariff at lower than its production cost, which makes it very difficult for developers to simply return their capital, let alone with a high interest rate and short tenors. The lack of knowledge and experience in conducting renewable energy projects on the part of government policy-makers, as well as local financial institutions, plays a major role in discouraging the appropriate coordination necessary to create a stable investment climate. In contrast to the situation in India, renewable energy projects in Indonesia are still considered high in capital costs, high risk and low return. All these factors contribute to the local banks' decision to charge higher interest rates to account for the high-risk level.

The cost of finance is often overlooked. Since renewable energy projects commonly involve high capital expenditure and low ongoing running costs, the cost of the equity and debt used to finance new capacity plays a large role in the calculation of the total LCOE of new green power projects. A study done by the Council on Economic Policies shows the impact of interest rates on LCOE.

Table 1. Estimated LCOE for different levels of interest rates (in USD/kWh)

Interest Rate	1%	2%	3%	4%	5%	6%	7%	8%
Coal	0.04	0.04	0.05	0.05	0.05	0.06	0.06	0.07
Combined cycle gas turbine	0.04	0.04	0.05	0.05	0.05	0.05	0.05	0.05
Combustion turbine	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.07
Gas-based fuel cell	010	0.11	0.11	0.12	0.12	0.13	0.13	0.14
Nuclear	0.03	0.04	0.04	0.05	0.05	0.06	0.06	0.06
Biomass	0.05	0.05	0.06	0.06	0.06	0.07	0.07	0.07
Geothermal	0.06	0.06	0.06	0.07	0.07	0.07	0.08	0.08
Hydroelectric	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02
Photovoltaic	0.08	0.09	0.10	0.11	0.12	0.14	0.15	0.16
Solar concentrator	0.08	0.09	0.10	0.11	0.12	0.14	0.15	0.16
Wind, offshore	0.07	0.08	0.08	0.09	0.09	0.10	0.11	0.11
Wind onshore	0.03	0.03	0.04	0.04	0.04	0.05	0.05	0.05

Interest Rate	9%	10%	11%	12%	13%	14%	15%
Coal	0.07	0.07	0.08	0.08	0.09	0.09	0.10
Combined cycle gas turbine	0.05	0.05	0.06	0.06	0.06	0.06	0.06
Combustion turbine	0.07	0.07	0.07	0.07	0.07	0.07	0.08
Gas-based fuel cell	0.14	0.15	0.15	0.16	0.16	0.17	0.18
Nuclear	0.07	0.07	0.08	0.09	0.09	0.10	0.10
Biomass	0.08	0.08	0.08	0.09	0.09	0.09	0.10
Geothermal	0.09	0.09	0.10	0.10	0.10	0.11	0.11
Hydroelectric	0.02	0.02	0.03	0.03	0.03	0.03	0.04
Photovoltaic	0.18	0.20	0.21	0.23	0.24	0.26	0.28
Solar concentrator	0.18	0.19	0.20	0.22	0.23	0.25	0.26
Wind, offshore	0.12	0.12	0.13	0.14	0.14	0.15	0.16
Wind onshore	0.06	0.06	0.06	0.07	0.07	0.07	0.08

Source: Monnin, 2015.

Based on the table above, it can be observed that the impact of different interest rates affects renewable energy much more compared to fossil fuel-based energy. Renewable energy tariffs become significantly lower with lower interest rates (Monnin, 2015).

Many countries now enjoy record-low official interest rates. Combined with increasing competition among investors and banks to fund new renewable energy deals, the cost of both equity and debt has been driven down. Taking the example of German onshore wind farms, the all-in cost of debt dropped from 6% at the end of 2009 to 2.2% in the first half of 2018 (FS and UNEP Collaborating Centre, 2019). This shows that the current high interest rates given by the local banks in Indonesia could be one of the factors that drive up renewable energy prices.

Although foreign banks offer much lower interest rates (usually below 5%) and longer tenors, they tend to have much stricter requirements that are quite difficult for local developers to meet, such as longer portfolio lists, more years in operation and more available equity. They also tend to impose additional requirements such as export credits or the need to adopt the technology from the lender's country.

6.0 Import Duty and Local Content

6.1 Import Duty and Local Content in the UAE

There is not much information to be found regarding import duty and local content regulation when it comes to renewable energy projects in the UAE. On April 30, 2019, the UAE Cabinet issued the Cabinet of Ministers Resolution No.31 of 2019 concerning economic substance regulations in the UAE. The resolution required all in-scope UAE entities that carry on certain activities to have demonstrable economic substance in the UAE from April 20, 2019. Entities that are directly or indirectly owned by the UAE government (both federal and local) are specifically excluded from the regulations. On this basis, UAE sovereign investment funds and other UAE government-related entities would not need to meet the UAE economic substance requirements (PricewaterhouseCooper, 2019). Since the generation, transmission and distribution of electricity in the UAE is dominated by four water and power authorities, three of which are owned by the governments of the emirates of Dubai, Abu Dhabi and Sharjah, it is unlikely that electricity-related business would be much affected by this regulation. These state-owned authorities serve as the exclusive purchasers and distributors of electricity in the respective emirates. While the private sector has been allowed to participate in the generation of electricity, transmission and distribution are performed exclusively by state-owned authorities. Abu Dhabi and Dubai currently have the most active private sector participation in the energy sector (Afridi & Aloke, 2019).

6.2 Import Duty and Local Content in Saudi Arabia

Saudi Arabia exempts manufacturers with an industrial licence from the duty on raw material and finished products not produced domestically (Renewable Energy Project Development Office, 2019). They also have a local content roadmap for renewable energy projects, as described in Table 2.

Table 2. Saudi Arabian local content roadmap

Short Term (2017)	Medium Term (2018–2019)	Long Term (2020 onwards)
LCOE Baseline	Local Content Buildup	Global Competitiveness
Tendering guidelines and processes established	Tenders designed to drive up local content	Tenders support the setup of export capabilities
Introductory capacity of 700 MW	Aggressive capacity scale-up	Stable development to install 2030 targets
Established LCOE price baseline	Balanced LCOE and local content	Balanced LCOE and Local Content
Kick-start renewable energy supply chain development	Set up of solar and wind industry clusters	Sustainable and export-oriented renewable energy supply chain
Localization 30%	**Localization 40%-60%**	**Localization 60%+**

Source: Renewable Energy Project Development Office, 2019.

In January 2020, the King Abdullah City for Atomic and Renewable Energy revealed a plan to increase local content in the renewable energy industry chains in Saudi Arabia. In accordance with its Vision 2030 and National Transformation Program 2020, the plan will ensure that the ongoing work includes developing specifications that are compatible with the country's climate features (Asharq Al-Awsat, 2020).

Back in December 2019, ACWA Power, who is one of the largest renewable energy developers in the region, signed a Memorandum of Understanding with Saudi Basic Industries Corporation to pursue opportunities in enhancing local content in the economy of the Kingdom of Saudi Arabia. Under the agreement, Saudi Basic Industries Corporation and ACWA Power would assess the potential opportunities of facilitating collaboration between local and international partners with expertise in the field and explore the localization potential of relevant international players (ACWA Power, 2019).

6.3 Import Duty and Local Content in India

The boom of cheap solar power in India was powered mostly by imports of cheap solar cells and panels. Up to 85% of the solar panels used in the projects are made in its neighbouring country, with rapidly falling prices as China has invested and taken the lead in mastering the technology (Singh, 2019b). Domestic manufacturers in India had long sought government intervention, and authorities imposed a 25% safeguard duty on solar cells and panels starting July 30, 2018. It will be gradually decreased to 15% from January 30, 2020, to July 29, 2020. India has had a significant increase in imports of solar cells, jumping from 1,275 MW in 2014/15 to 9,790 MW in 2017/18, accounting for more than 90% of the total inbound shipments in the country, imported primarily from China, Malaysia, Singapore and Taiwan. The domestic manufacturers produced 842 MW in 2017/18. The Power Minister also announced a power storage policy that would provide tax incentives for solar equipment manufacturing in India (Economic Times, 2019b).

Apart from imposing safeguard duties, the MNRE also created the Kisan Urja Suraksha Evanm Utthan Mahaabhiya benefit program for domestically manufactured solar cells and panels. In order to qualify for this benefit, manufacturers must demonstrate that solar cells used in the panels are made in India with undiffused silicon wafers or black wafers. Semi-processed solar PV cells (blue wafers) will not qualify for the scheme. Earlier in 2019, the country imposed an anti-dumping duty on imports of ethylene vinyl acetate sheets used in solar cells from China, Malaysia, Saudi Arabia and Thailand. The duty will be in effect for five years (GlobalData Energy, 2019).

The Directorate General of Trade Remedies note that anti-dumping duties in the United States and the European Union have prompted Chinese companies to sell more aggressively in the Indian market, putting pressure on Indian manufacturers like Vikram Solar and Adani Solar, based in Kolkata and Ahmedabad, respectively. Solar power developers, however, deny this justification for the import duties. They cite that an increase in imports is expected after India raised its solar energy goals. The imports of components used in the solar industry have increased substantially since the launch of the government's ambitious Jawaharlal Nehru National Solar Mission to have 20 GW of grid-connected solar power by 2022. In response to the import duty, Indian developers stepped up their cell and panel imports prior to July

30, 2018, and demand dipped right after the duty came into effect. It has even caused some cancellation of solar development projects due to developers quoting higher costs compared to 2017. Very few believe that a safeguard duty is going to help the domestic manufacturers (Mehrotra, 2019).

While it does add to the price tag of Chinese imports, it is still cheaper compared to domestic panels and cells. The MNRE's scheme of incentivizing developers to set up manufacturing units is also struggling to take off (Singh, 2019b). The domestic manufacturer's failure to compete with China can be attributed to three factors: China's core competence in semiconductors; China's government policy of subsidizing land acquisition, raw material labour and exports; and the cost of capital in China is much lower compared to India (India's cost of debt is 11% compared to China's 5%) (Mehrotra, 2019).

One year after the imposition of the safeguard duty, solar developers in India still prefer Chinese modules, citing low prices and better quality. They also cited that this policy might even jeopardize India's target of solar generation capacity (Singh, 2019a)

6.4 Import Duty and Local Content in Indonesia

Back in 2017, IISD conducted a study in identifying subsidies given to renewable energy. The inventory reveals several subsidies to renewable energy. In addition to previous regulations promoting renewable energy, there are several recent policies that may confer a subsidy to the industry. These come in the form of electricity purchase prices above generation cost, tax reductions, import duty exemptions and soft loans for renewable energy projects, especially geothermal (Attwood et al., 2017).

The local content requirement for energy projects in Indonesia was also reported to be one of the factors that increase project costs. According to MEMR Decree No 5/2017, the local content for energy projects in Indonesia was a minimum of 40% in 2017 and will be gradually increased up to 60% in 2019. Due to the relatively small scale of solar manufacturing in Indonesia, it is unlikely that local production can be competitive against international prices. Mandating local production of solar panels raises prices for developers, reducing the number of viable projects. Although the regulation was originally developed to encourage local industries, policy-makers should carefully consider whether the benefit of it outweighs the costs to the energy sector (Bridle et al., 2018).

7.0 Key Messages and Conclusions

There are several things Indonesia could learn from the GCC countries and India in terms of the development of renewable energy and how it manages to achieve low electricity prices. There is a common theme between GCC countries and India when it comes to creating a supportive atmosphere for developing renewable energy projects in the country: clear and supportive policies. The UAE, Saudi Arabia and India all have specific national programs for renewable energy, which serves as the main roadmap, such as Energy Strategy 2050 (UAE) and the National Renewable Energy Program (part of Saudi Arabia's Vision 2030). These countries also did some intra-government restructuring aimed to create more streamlined decision-making. India's MNRE overlooks multiple agencies, technical institutions, financial companies, etc., that focus on facilitating growth in all renewable energy sources. The MNRE and the SECI, which are specialized bodies formed by the Government of India, have played pivotal roles in implementing the policies through streamlined efforts.

A study identified that the two most stand-out factors that contributed to the low price of renewable energy in the GCC countries are the plummeting costs of solar panels and reduced costs of financing. Projects there receive large long-term loans with very low interest rates. This is also applicable in the case of India. Key components, such as solar panels, inverters, etc., are available in India at much more competitive prices compared to other countries.

Historically, land acquisition and permitting issues have always been a problem in India and play a significant role in cost escalation. The MNRE addressed this by introducing the Solar Park Scheme, which requires host state governments to identify the chunk of land needed for the project, along with all the necessary statutory clearance and common infrastructure facilities. This completely erased all project costs related to risk and uncertainty related to land acquisition. This is probably the biggest contrast with the system in Indonesia, where the road infrastructure and transmission system fall under the project developer's responsibility, which understandably would add significant cost to the overall project cost.

There is an observable trend of large-scale projects being delivered under long-term PPAs when it comes to renewable energy projects in the GCC region. The projects are proven to be bankable and have no problem attracting billions of dollars of domestic and international investment. Most of the investors for these projects are based in the region themselves, such as Masdar (UAE-based), ACWA Power (Saudi-based) and Nebras Power (Qatar-based). Most of these companies are backed by sovereign wealth funds that are keen to invest in industries with prospects for long-term development.

CPI has rated that India's renewable energy projects are now classified as low-medium risk with medium-high growth, marking their position as an economically attractive market, which suits the appetite of both domestic institutional investors and foreign institutional investors. In a very stark contrast compared to Indonesia, the renewable energy and transmission sectors in India are even classified as having the lowest overall risk when it comes to cash flows. This is because renewable energy projects have high predictability in terms of volume of sales and pricing through long-term PPAs, low O&M expenses, no fuel expenses and no recurring capital expenditure (Prakash et al., 2018). One reason the low risk level is associated with renewable energy projects in India is there are already many large-scale projects being carried

out successfully. Investors and other stakeholders now have a better understanding of how a project works. The first gigawatt would be relatively expensive, but the 10th gigawatt would be a lot cheaper.

However, challenges remain. India introduced a 25% safeguard duty and various benefit schemes for locally manufactured solar cells and panels in order to protect its local solar manufacturers against cheap imported panels. This resulted in solar project developers showing lower interest; some even responded by quoting higher tariffs for projects auctioned in 2018. Local industries also show no sign of picking up. If you consider that India has a far more developed renewable energy industry compared to Indonesia, has been relying on imported panels to meet its ambitious goal and is not seeing promising results from imposing local content requirement and safeguard duty, the Government of Indonesia should take the time to carefully consider its local content policy.

Overall, there are various factors that drive low renewable energy prices, apart from the costs of the technology itself. Creating a stable investment climate to attract both domestic and foreign institutional investors by having supportive policies can reduce the cost of financing, which will eventually translate into lower project costs. Coming up with other de-risking policies, such as India's Solar Park policy, can also take away the costs and risks associated with land acquisition, which in Indonesia's case plays quite a large role in driving up project costs.

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