

Associate Paper

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Indonesia's Energy Requirements – Part Two: Future Energy Demands

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Key Points

- It has been estimated that, by 2030, the Indonesian energy market as a whole could be worth up to US\$270 billion.
- Barriers to international investment across the energy sector are significant, but the Indonesian Government has introduced a number of initiatives to support international investment and ensure that demand does not further outstrip supply.
- Particular opportunities exist for international investment in the future:
 - Exploration and the exploitation of new reserves, particularly oil and gas, will be a necessity in meeting energy demand.
 - Expertise and the application of modern technology will be required to increase the efficiency of existing energy production sources and support electrification across the archipelago.
 - Opportunities may also exist for energy sales to Indonesia, particularly in gas, as shortfalls emerge before new production sources come online.
 - The alternative energy market is estimated to grow by more than ten per cent each year to be a US\$60 billion market by 2030.
 - Significant investment opportunities will also emerge, from both financial and technical perspectives, in small- to mid-scale hydropower and geothermal power generation.

Summary

Despite a preponderance of energy reserves, Indonesia is facing a number of challenges in ensuring that it has sufficient energy supplies to support its continued economic growth. Looking ahead, a lack of power generation capacity, limited investment in the energy sector and the relative decline of production capacity against demand all pose significant problems.

The future of the Indonesian energy sector will be a priority for the Widodo Government, as is a recognition that greater investment of both finance and expertise – foreign and domestic – will be needed to transform the energy sector to support the country's continued economic growth.

Opportunities will likely emerge in coming years for greater commercial engagement in Indonesia by foreign businesses with energy sector expertise and knowledge. With a strong energy industry, Australian business may have much to gain from engaging in the Indonesian energy sector out to 2030.

Analysis

Indonesia's energy requirements will continue to grow in the coming years, with demand for energy continuing to be strongly linked to domestic economic growth and consumption. Most economists agree that the economic fundamentals of Indonesia will continue to be sound. McKinsey and Company suggest that, by 2030, Indonesia will 'have added more than 90 million people to its consuming class' (third to only China and India) and will likely be the world's seventh-largest economy, overtaking Germany and the United Kingdom. This consuming class will generate significantly more demand for energy consumption, with estimates suggesting that Indonesia's annual demand for energy could rise to around 17 quadrillion British Thermal Units (BTUs), up from six quadrillion BTUs currently.

The future of Indonesia will also be characterised by the growth of cities. A number of mid-level cities outside the main populated island of Java will have strong demand for energy. The key cities of Batam, Pekanbaru and Makassar are likely to double their populations from one million to two million by 2030. Additionally, McKinsey and Company estimate that 'up to 90 per cent of urban areas whose economies are growing faster than seven per cent (above estimated GDP growth) will be outside of the island of Java.'

Modelling by the *Economist Intelligence Unit* also suggests that consumption will remain strong across all energy types, with notable increases in renewable energy. This will partially be driven by increased production due to government support and additional investment.

With a lack of investment in the oil sector and decreasing production levels, it is likely that Indonesia will continue to import oil to meet domestic demand, particularly for transport fuels, and increasingly use its existing infrastructure for the refining of imported crude. Much will depend, however, on the government's approach to the issue of fuel subsidies, which have artificially inflated demand, and the success of government support to shift to greater gas use over oil, particularly for base load generation. Significant issues exist with

this strategy though, including gas reserves being located a distance from consumer markets, thus increasing costs.

While the industrial sector has been the largest consumer of gas to date, the power sector is likely to be the most important driver of future gas consumption. Gas will also continue to provide significant export revenue for the Indonesian economy but, to meet both domestic and export demand the country will likely become a net importer of gas by 2019. A similar challenge will face the coal industry, as it seeks to continue to supply the power sector while also balancing export commitments.

Consumption and Market Share of Energy in Indonesia (Economist Intelligence Unit, May 2014)						
		2012	2014 (estimate)	2016 (estimate)	2018 (estimate)	2020 (estimate)
Oil	Consumption (ktoe)	72,537	73,373	75,078	78,284	80,888
	Market Share of Energy mix (per cent)	33	31.7	29.7	29.1	28.1
Natural Gas	Consumption (ktoe)	37,004	40,826	45,484	50,347	55,405
	Market Share of Energy mix (per cent)	16.8	17.7	18.0	18.7	19.3
Coal	Consumption (ktoe)	37,921.2	43,025.7	47,307.7	50,131.9	52,217.9
	Market Share of Energy Mix (per cent)	17.3	18.6	18.7	18.6	18.2
Renewables	Consumption (Ktoe)	72,841	74,018	85,065	90,145	98,862
	Market Share of Energy Mix (per cent)	24.7	24.7	23.8	23.6	23.3

The electricity sector will continue to be a core consumer of energy, particularly coal and gas, and electricity demand will continue to be strong. Most demand will continue to come from the residential sector and continue apace at about 4.3% per year on average to 2020. Demand from the industrial sector will expand on average at 2.7% per year over the same period, reflective of supply constraints. From a production perspective, between 2.4 gigawatts and 5.0GW of capacity will need to be added each year to sustain a six per cent annual national GDP growth rate. This will be a challenge, but also an opportunity for business.

Gas distribution and electricity transmission infrastructure are currently inadequate to meet the needs of Java, let alone growing areas across the rest of Indonesia. The country's electricity transmission networks are also inefficient, to the extent that about ten percent of the power generated is lost during transmission and distribution, compared with four per cent in Malaysia and six per cent in Thailand. Additionally, while there are almost 3,600 miles of natural gas transmission distribution pipelines, they are predominantly confined to Java and North Sumatra, and are virtually non-existent elsewhere in the archipelago.

Investment in infrastructure on the whole has been anaemic. After reaching a high of eight per cent of GDP in the mid-1990s, it dropped to three per cent after the 1997 Asian Financial Crisis and has risen to the current level of four per cent. This compares to around seven per cent in China, Vietnam and Thailand. Even with increases in spending, it will be some time

before energy infrastructure projects have a significant impact on the sector, in view of the long lead times and the difficulties in initiating and undertaking infrastructure projects.

As noted, its existing export markets in Asia are also likely to continue to express strong demand for Indonesian energy. Industry aside, the consumption demands that Indonesia has experienced through the urbanisation process and the growth of the middle class are likely to be replicated elsewhere in the Asian market. McKinsey estimates that, of the 1.8 billion people who will join the global consuming class in the next 15 years, more than 75 per cent will be in Asia.

The Policy and Governance Environment

The challenges faced by the Indonesian Government in addressing the country's energy requirements are significant. At a fundamental level, the government's main objective will be ensuring that supply and production are sufficient to meet domestic demand and can support the country's continued growth, while still meeting existing export commitments.

Broadly, the government has introduced efforts in recent years to re-orientate energy supply and production towards domestic markets. A particular feature is the introduction of Domestic Market Obligations, which are designed to ensure that a proportion of the energy produced is reserved for Indonesia. Currently, 25 per cent of oil production and approximately 20 per cent of coal production must be made available for sale to domestic markets, although this varies, often on a negotiated basis. A number of LNG plants have also been designated for purely domestic production.

Electrification will continue to be a priority. To address shortfalls in capacity, a wave of power plant construction is planned, the majority of which will be coal- and gas-fired. An US\$8 billion (\$10.4 billion) programme has been uninitiated to build 10GW of coal-fired capacity, with up to 40 plants spread throughout Indonesia, but with a focus on Java. The switch to coal as a preferred fuel is driven by its abundance within Indonesia and its relative ease of access compared to other energy sources. Additionally, the government is making great efforts to encourage a move away from oil as a fuel for electricity generation and to free up extra capacity for transport fuels.

Spending on fuel subsidies outstrips that in health and education, with the fuel subsidy bill in 2012 estimated to be US\$20 billion (\$26.1 billion). Despite the subsidisation policy being popular among a majority of voters, in 2013 the subsidies were reduced, and gasoline prices rose by 44 per cent. Following the subsidy reduction, inflation also rose significantly, necessitating a government plan to distribute cash handouts to poor households. Subsidies have also artificially inflated demand in the market and have been a key driver for imports.

Environmental issues will also be a policy challenge for the government. Analysis suggests increased coal consumption, along with other fossil fuels, may result in a 160 per cent rise in carbon emissions by 2030. For Indonesia, the effects could be severe, including flooding of coastal areas and reduced crop and fishery yields. Former President Susilo Bambang Yudhoyono implemented a number of measures to address environmental concerns by supporting opportunities for alternative energy sources to provide a greater

percentage of Indonesia's energy mix. A notable policy was the announcement of plans to build sufficient geothermal plants by 2020 to provide ten per cent of the country's electricity (up from 2.3 per cent in 2013). Investment in this type of capacity generation is likely also to be a focus of the Widodo Government.

The government cannot address these challenges on its own, however. The private sector – and particularly international companies – has both the capital and the technical expertise that Indonesia will need to support exploration and the further development of its energy sector.

But key challenges exist in attracting private sector investment. A complex permit and regulatory system for access to land and resources, caps on foreign ownership, the lack of clear and transparent contract and tendering systems, corruption and multiple levels of inefficient administration and bureaucracy all contribute to dissuade private investment. The government has initiated a series of laws and policies, particularly around land ownership and transparency, in an effort to address many of these issues, as well as a commitment to increase the use of public-private partnerships. There is still a long way to go, and recent protectionist measures introduced in the lead-up to the 2014 presidential election have not helped.

More specifically, attracting investment in exploration will also pose a challenge. Most significant reserves are located in remote areas (predominantly in eastern Indonesia), where there is frequently a lack of roads, communications and power, all of which contribute to a higher cost for exploratory activities when compared to other countries in the region. Particularly with regard to oil and gas, most exploration is occurring in deep water, the cost of which is often too great for domestic firms to do alone (estimates run at between US\$200 million to US\$300 million for a single exploratory site). The distance of new reserves from domestic markets, the difficult, and often hazardous, archipelagic geography in between, also makes infrastructure such as pipelines an expensive and high-risk proposition for prospective investors. It makes exports a more attractive option for foreign companies, but this is not necessarily the direction in which policy is moving.

Reserves

The issues facing the Indonesian Government as it formulates its energy decisions do not include a lack of energy reserves. There are substantial proven crude oil reserves of 3.7 billion barrels, the majority of which are located in the main producing fields in the Sumatra Basin (230,000 bbl/d), and the East Java Basin (43,000 bbl/d). The Cepu block in East Java, discovered in 2011, is estimated to contain 600 million barrels of recoverable reserves and a potential estimated peak production of 165,000 bbl/d. Progress has been slow in tapping these reserves, however, with production likely to be realised in late 2015.

Declining production rates have seen the introduction of Enhanced Oil Recovery (EOR) techniques in these areas, stemming declining yields. Chevron has introduced steam injection EOR some of its operations in the Sumatra Basin, making it one of the largest steam-flood projects in the world. National oil company Pertamina is also looking to EOR activities to halt production declines in its fields, but lacks the technological capacity and

expertise. Deepwater exploration and limited production is predominantly occurring in the Kutei Basin in Kalimantan, in Western Papua and in the Bonaparte Basin, with Chevron the main investor. Beyond an existing eight deepwater fields, however, the US Energy Information Administration has noted that ‘technical and commercial success rates have not incentivised further development in these deepwater areas.’

Indonesia is estimated to have the thirteenth-largest reserves of natural gas in the world at 104.4 trillion cubic feet, second to only China in the Asia-Pacific. As of 2012, Indonesia’s annual production of gas was approximately 2.6 trillion ft³. The largest fields are in the Aceh region of Sumatra and East Kalimantan. Chevron is developing a number of deep-water fields in East Kalimantan that are expected to produce 1.1 billion ft³ per day of natural gas. Significant attention has been given to the Natuna Basin, off the north-west coast of Indonesia, in the South China Sea. The Natuna D-Alpha block contains 46 trillion ft³ of reserves alone but, since 2011, producers have only extracted 200 billion ft³. Despite its abundance, the presence of carbon dioxide concentrations make extraction technically challenging and ongoing territorial disputes with China regarding the “nine dash line” demarcation in the South China Sea are likely to slow efforts to tap these reserves. West Papua and Central Sulawesi are also likely to be key areas of future development. In West Papua, there are proven reserves of 14.4 trillion ft³. Additionally, the Arafura Sea is estimated to contain reserves of around 12 trillion ft³.

Indonesia’s reserves of unconventional gas (coal bed methane or coal seam gas) are estimated to be 453 million ft³, with major reserves located in Sumatra, Kalimantan, West Papua and Java. Only one unconventional gas project has commenced to date, however, located in north Sumatra and estimated to hold 18.6 trillion ft³ of shale gas. The government does have high hopes for coal seam gas output to reach 183 million ft³ per year by 2020, a target that will require increased exploration and development.

Oil and gas aside, coal is also abundant, with the country estimated to have 6.1 billion tons of recoverable coal, located primarily in Sumatra, and East and South Kalimantan, although it is possible that the figure may be much higher. Around 70 per cent of the coal reserves to be found in Indonesia are sub-bituminous or lignite, a type of coal preferred for steam-powered electricity generation. Approximately two-thirds of Indonesian coal production comes from East Kalimantan, and the region is home to some of the world’s largest coal mines.

From an alternative fuels perspective, Indonesia has significant untapped potential. This is particularly true for geothermal, solar, hydropower and biomass. From a geothermal perspective, Indonesia is home to more than 40 per cent of the estimated global reserves of geothermal energy sources, spread throughout the archipelago. Estimates suggest that geothermal may have the potential to provide up to 27,510 MW of power. Hydropower sources, also spread throughout the archipelago, are estimated to have a generation capacity of 75,760 MW. Only fractions of both have been utilised at this stage.

Favourable agricultural conditions for the production of crops such as jatropha, cassava and sorghum also suggest that there may be significant potential for biomass production. Solar power, too, is relatively undeveloped, but favourable environmental conditions exist for its potential use, particularly outside urban areas. From a regulatory perspective, however,

there are few incentives and little support for widespread mass installation, especially an ability to sell back to the grid.

Opportunities

Development and investment in the energy sector will be a priority for the Indonesian Government. It may also be a sizeable market for investors: the McKinsey Global Institute has estimated that, by 2030, the Indonesian energy market as a whole could be worth up to US\$270 billion. Significant opportunities will exist for business, particularly Australian companies that have the expertise, experience and capital to invest in the energy sector.

Foreign investment and expertise will continue to be needed in the traditional areas of oil, gas and coal exploration, a market estimated to be worth up to US\$150 billion out to 2030. Additional production will need to come online to address increased demand, and new technologies will need to be applied to existing fields to produce higher yields. This is a cheaper alternative to investing in new infrastructure and is an approach that Jakarta has expressed interest in pursuing. Companies that can apply these technologies will be in high demand, but investment in new production and infrastructure will also be required. The Indonesian Government has recently shown signs that it is supportive of greater public-private partnerships in these areas.

Rapid growth in cities across the archipelago will require the building not only of additional power capacity for electrification, but also efficient distribution and transmission networks. Significant demand will exist for the construction of remote area networks. Expertise and experience in remote area engineering and construction, and energy efficient transmission technologies, will be core needs.

This will only be a part of the picture, though, in addressing energy needs in remote or isolated areas without access to grid networks. Innovative solutions involving geothermal, hydropower, biofuels, biomass and solar power all have the potential to fill this need, and the Indonesian Government has set lofty goals for the achievement of renewable energy targets. Notably, it is estimated that the alternative energy market will grow by more than ten per cent per year to be a US\$60 billion market by 2030.

Opportunities will exist in the construction of small- and medium-scale hydropower and geothermal plants throughout the archipelago to service the electricity needs of remote populations. There will be strong demand for international investment in these areas, due to the technically complex and capital intensive nature of these endeavours. While a significant barrier will be ownership and leasing rules around land (60 per cent of geothermal sources are found in conservation areas), companies that are able to deftly manage public-private partnerships, or partnerships with domestic companies, may have much to gain, particularly as Jakarta moves towards providing greater regulatory and financial incentives for international investment in these areas.

Investment in the Indonesian domestic market aside, there are also likely to be ongoing opportunities for export sales to Indonesia, particularly of gas. The slow timeframes for initiating new production projects mean that there is likely to be a shortfall in supply in

coming years, and Indonesia may need to increase its gas imports to meet both its export commitments and domestic needs. The gas import deal with Texan firm Cheniere Energy, signed in 2013, has the potential to be the first of many. Depending on the future of oil subsidies and the pace at which new initiatives come online, similar dynamics may also emerge with oil.

Conclusion

Assuming that Indonesia's economic fundamentals remain stable, there are likely to be significant opportunities for investment in the energy sector in the years ahead. Australia, with its strong history in developing an energy sector, may find significant opportunities in the archipelago as international energy demands evolve and the strength of Australia's own mining boom diminishes.

About the Author: Mr Patterson has written extensively on the Asia-Pacific region for a number of publications. Mr Patterson has taught Political Science and Security Studies at a number of universities and is currently completing a PhD in International Relations.

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