

## The Swelling Demand for Electricity: Commercial Opportunities in Indonesia's Power Sector

### Indonesia's Electricity Picture

The rapid expansion of Indonesia's consumer class has driven domestic demand for products and services, and in turn has helped propel economic growth. With this growth have come increasing household, business, and government demands for electricity, putting a strain on existing supply and the production capacity of the sector. Deputy Energy and Mineral Resources Minister Rudi Rubiandini and PT Perusahaan Listrik Negara's (PLN) Director of Planning and Risk Management Murtaqi Syamsuddin have stated that Indonesia's annual electricity consumption is expected to rise by 9% in 2013. The National Energy Council (DEN) expects a broader threefold increase in energy demand by 2030.

Electricity prices are subsidized in Indonesia, which keeps rates artificially low, though demand is putting additional pressure on existing prices and in turn the sustainability of the subsidy system. Prices are scheduled to rise 15 percent this year, starting with a 4.3 percent increase at the start of the year and further rise every three months. The growing demand for power and the strain on the cost structure system compound with a broad underutilization of existing energy resources.

Untapped energy potential and inefficient use of existing energy resources will make it difficult for Indonesia to reach its goal of 90% electrification by 2020. Only 65% of the population is currently estimated to have access to electricity or modern forms of energy and the electrification rate is considerably less in rural areas. Per capita MW is among the lowest in the region.

This electrification picture reflects the low levels of growth in electricity generation. Unfortunately this trend correlates with the

broader deficit of infrastructure development in the country. Since the Asian financial crises of 1997-1998, Indonesia's spending on infrastructure has dropped from 9% of GDP to just 4% of GDP in 2011. Indonesia ranks 78 out of 144 countries in the quality of its infrastructure in the World Economic Forum Global Competitiveness Report. The quality of the electrical supply puts Indonesia at country 93 out of 144 total countries in the World Economic Forum's Global Competitiveness Report.

World Economic Forum Global Competitiveness Report 2012-2013 Infrastructure: Rank-78 (of 144) Score-3.75 (of 7)	
2.01 Quality of overall infrastructure	.....3.7 .....92
2.07 Quality of electricity supply	.....3.9 .....93

Existing power production and distribution systems are inefficient and call for the development of more modern technologies and energy savings structures. Diversification of energy and power generation is also a necessary step to meet rising demands and costs.

### The Energy Mix for Electricity Production

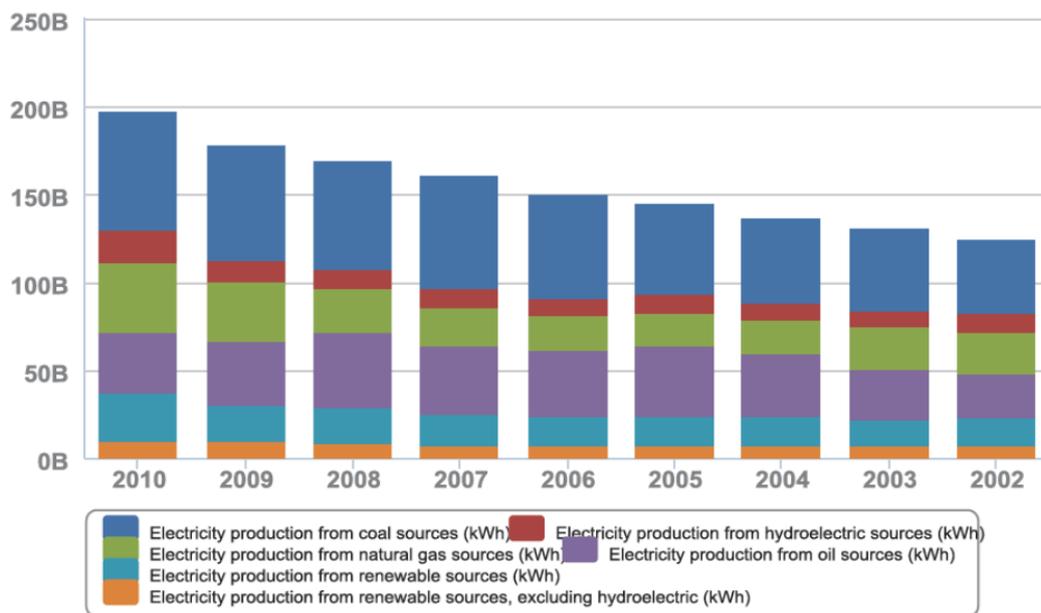
Indonesia is endowed with substantial energy resources that include both fossil fuels and renewable energy resources, including the largest geothermal reserves in the world (approximately 40% of the total reserves). Despite the abundance of resources suitable for electricity generation feedstock, Indonesia's generating capacity comes mainly from coal and oil. Domestic consumption of petroleum products has been heavily subsidized, promoting the development of power generation based on diesel and other

petroleum-based fuels. Natural gas production has increased by over a third since 2005, with Indonesia ranking the eighth largest net exporter of natural gas in 2011. Gas supplies remain under-developed for domestic use and power generation and most gas is exported to regional consumers. Renewable energy makes up the smallest percentage of Indonesia's energy picture and coal, oil, and gas continue to lead the charge in sources of power generation for electricity. Subsidies for oil products and the absence of revenue sharing arrangements for

exploration and expansion of other sectors is part of the problem.

Creating and maintaining an attractive investment climate for investment in energy infrastructure is another key challenge facing the Government as is mitigating local and global impacts of emissions from burning fossil fuels. Scaling-up renewable energy production and applying advanced low-carbon technologies can improve energy security and shift the economy to a more productive and sustainable path.

**2002-2010 Diversification of Electricity Production (World Bank Indicators):**



**Setting a Course for Power Sector Development**

The development of renewable energy is regulated by Presidential Decree No.5 / 2006 which mandates the increase of renewable energy production to 15% by 2025. Geothermal and biomass are slated to see the most growth. The government also has a 90% electrification target by 2020. The formulation of power sector development policies is the responsibility of the Ministry of Energy and Mineral Resources while PT PLN, the state-owned electricity company, is

tasked with energy exploration and generation. In 2008 the government started to offer tax incentives for foreign investment. Geothermal companies currently benefit from the 2003 law which established long-term licenses for land use and a regulated price for geothermal energy, though PLN's position as the main energy supplier complicates receiving this incentive. Currently the government is composing a law on new and renewable energy which includes the supply

and usage of new and renewable energy along with its incentives.<sup>1</sup>

In 2011, the Indonesian government published a “Master Plan” for infrastructure development and President Yudhoyono has made achieving this plan a key goal of his administration. The “Master Plan” includes more than 500 projects throughout the country as well as six development corridors aimed at creating economic clusters in various industrial sectors. Power sector projects are a major component of the plan and the government has stated its intent to increase the capacity of Micro Hydro power plants to 2,846 MW by 2025, of Biomass 180 MW by 2020, wind power (Bayu power plant) 0,97 GW by 2025, solar 0,87 GW by 2024, and nuclear power 4,2 GW by 2024. The total investment needed for this development of new and renewable energy sources up to the year 2025 is projected to be approximately \$13 billion.

### **Opportunities in Renewable Energy**

The markets with the most opportunity for development in Indonesia are geothermal, biomass, hydropower, and solar power. All markets are currently underdeveloped, despite the high levels of naturally-occurring resources suitable for power generation. Geothermal sources have the potential to provide 27,510 MW of power, the highest in the world, though not much more than 1,000 MW have been developed to date. Biomass

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<sup>1</sup> Energy is covered under several policies and provisions: Law 30/2009 makes access to energy a right; Law 30/2007 obligates the government to provide energy access in remote areas and in post disaster contexts; Energy, Law No. 15/1985 on electricity, Government Regulation No. 10 / 1989 which is renewed by Government Regulation No. 03 / 2005 and No.26 / 2006 regarding the supply and usage of electricity, Ministerial Regulation No. 002 / 2006 on the commercialization of middle scale renewable energy power plants, and Minister of Energy and Mineral Resources Decree No.1122k/30/MEM/2002 on the spread of small scale power plants.

resources have a production potential of 49,810 MW, again with fewer than 1,000 MW utilized to date. Several companies have tapped into fast-growing crops such as cassava, jatropha, and sweet sorghum for biofuel development and PLN in partnership with GE will launch the first biomass gasification project in the country, which could produce at least 750 kilowatt of electricity. The pilot project with PLN will be located on Sumba Island, East Nusa Tenggara. The equipment utilized in the electricity generation process is far more compact than that used in traditional power plants and allows for easy deployment into rural areas.

Hydro-power, particularly mini-hydropower also has great potential, given Indonesia’s island topography. Large hydropower facilities are virtually non-existent however and current production hovers around only 5,000 MW, despite PLN estimates of 75,670 MW of power potential in the sector. Solar power is another virtually untapped market, with most installations to date on roof-mounted solar photovoltaic cells in urban areas. However, there is no market on which to sell excesses of energy collected (given PLN de facto monopoly) and little internal capacity to install, maintain, or update systems.

### **Commercial Opportunities by Region**

In 2004 the Indonesian government announced a “crash program” to produce 20,000 MW. Phase I is primary coal-fired electricity generation while Phase II, originally projected to take place in the 2013-2014 range, is focused on renewables. In practice, Phase I is still taking place and coal fired power development will continue to dominate the market and remain a major focus of the Ministry of Energy and energy related state owned enterprises. The government is projecting a massive increase in power supply this year due to the development of 19 coal-fired power plants, with a combined operational capacity of 3,620 megawatts (MW). The funds required

for the completion of this development is Rp 80 trillion (US\$8.3 billion) with expected PLN financial coverage of around Rp 40 to 45 trillion. Financing has been secured for some of the projects but other sources will be necessary to bring all anticipated projects online.

In addition to the 3,620 MW projects initiated by PLN this year, the government also expects another 1,000 MW of additional supply from private companies under the independent power producer (IPP) scheme, such as the Poso plant in Central Sulawesi. According to PLN, the peak production in Java-Bali alone has added to another 20,500 MW, while Sumatra comes in second with 5,000 MW. The eastern part of Indonesia including Kalimantan has a peak production of around 3,000 MW.

### **South Sumatra**

#### **Energy and Utilities**

#### **Coal including Coal Bed Methane (CBM)**

South Sumatra has the largest coal resources and reserves in Indonesia, accounting for 40% of Indonesia's coal resources and reserves, primarily in the form of lignite. According to the Mining and Energy Service Office of South Sumatra, the province holds 22.24 billion tons of coal resources, compared to 19.56 billion tons in East Kalimantan, and 8.67 billion tons of resources in Central Kalimantan. In addition, South Sumatra has the largest CBM reserves in the country with a potential 183 trillion cubic feet (Tcf) compared to 105 Tcf of resources in South Kalimantan and 106.4 Tcf of resources in East Kalimantan. Although lignite is not yet suitable for conventional power generation and is not traded in the energy market due to its high total moisture and low calorific value, opportunities exist for the utilization of lignite for mine mouth coal-fired power generation, coal upgrading, coal gasification and liquefaction.

Since 2008, the South Sumatra government has encouraged participation of international coal companies in the country's coal sector. International companies have a significant presence in the upstream and coal distribution sectors and plenty of opportunities exist for additional investment.

To attract CBM investment, the South Sumatran government is committed to improve the investment climate. It has worked closely with the tax authorities, the Ministry of Energy and Natural Resources, and formerly BPMigas, now SKKMigas, the oil and gas regulatory agency, to improve the commercial viability of CBM projects and address operational issues of land access, permits, approvals, and water disposal.

Recent coal mining investments include:

- Reliance Power, an Indian firm, will invest as much as \$5 billion to develop three coal mines and a railway in South Sumatra. The government has offered fiscal concessions, including land to Reliance Power to make it attractive for them to invest in Indonesia. The company plans to build a 230-km long railway that will link its coal production base in Batang Hari to Tanjung Api-Api port.
- NuEnergy, an Australian mining company, started coal production in 2011. The location comprises a combined area of 1,861 km<sup>2</sup> containing between 10 m and 40 m thick, low rank coal seams ranging in depth from 350m to 1,300m. They have a joint operating agreement with PT Pertamina. The concession also appears robust for CBM development containing thick sections of coal at optimal depths and located close to existing oil and gas infrastructure.

## Power Generation, Transmission, and Distribution

South Sumatra has existing energy infrastructure such as power grids to North Sumatra and Greater Jakarta as well as gas pipelines to West Java. This available infrastructure provides South Sumatra access to the rest of Sumatra, Java, and Asia-Pacific nations. Gas pipelines owned and operated by state-owned gas company Perusahaan Gas Negara (PGN) span Sumatra to western Java.

Electrical systems in South Sumatra are well interconnected with neighboring Bengkulu and Jambi provinces through 150 kV transmission networks in the so-called South Sumatra, Jambi and Bengkulu Region System (S2JB). However, the ratio of the electrification in South Sumatra is only 56.39% in 2011. The PLN waiting list has reached 54,845 customers requests for 62.3 MVA (million volt-amperes).

South Sumatra's total geothermal energy potential is equivalent to 1,911 MW or 6.8% of national capacity.

In an effort to meet the electricity needs of the S2JB region, Java and Bali, state-owned utility company PLN has plans to build 713km of power transmission lines and a 2,100 MVA Substation. PLN has also awarded contracts to three joint-venture companies for the construction of three coal-fired power plants with a combined capacity of 2,140 megawatts (MW). PT DSSP Power South Sumatra will produce 300 MW of electricity; a joint-venture between a Korean company and DH Energy of Indonesia will generate 600 MW; and the consortium between state-owned coal company PT Bukit Asam and China Huadian will build a 1,240 MW power plant. With the difficulty of finding suitable locations for power plants in Java and Bali, PLN hopes that these plants will help meet the expected 9% growth in Java and Bali and PLN's expected additional capacity needs of 3,500 MW per year.

Indonesia plans to launch the construction of the Java-Sumatra Interconnection Transmission Line for low carbon power supply development. It will connect the Bangko Tengah substation in South Sumatra and X-Bogor substation near Jakarta, crossing the Sunda Straits. The undersea cable will be able to transmit power with a total capacity of up to 3,000 MW from Sumatra to Java.

## Natural Gas

South Sumatra has large potential reserves of natural gas resources. The South Sumatra - West Java gas pipeline can be used for distribution of natural gas produced in the province to Indonesia's industrial and population centers in the Jakarta area.

According to the Mining and Energy Service Office of South Sumatra, South Sumatra has 24 trillion cubic feet (Tcf) of potential natural gas reserves. South Sumatra has an existing 300-km gas pipeline to supply the domestic market including to Java and an additional 177-km natural gas pipeline to Singapore.

Conoco Phillips is one of the major gas producers in South Sumatra, with gas production from its Suban Field. Discovered in 1998, Suban Field has gas-in-place estimates in excess of 7 trillion cubic feet.

Indonesia, the world's third-largest exporter of liquefied natural gas (LNG), after Qatar and Malaysia, sells more than 60% of its output to countries such as Japan and South Korea. Opportunities exist for U.S. businesses for LNG development in South Sumatra.

### Proposed Master Plan Power Projects for South Sumatra

- Mine Mouth Coal Fired Steam Power plant (2X600 MW)-Sumsel 9 and 10
- Mine Mouth Coal Fired Steam Power Plant (1X600 MW)
- Power plant Mulut Tambang 4X150 MW
- Power Plant Mulut Tamban 2X300 MW
- Power Plant Banjansari 2X100 MW

- Power Plant PLTU Tanjung Enim 3X10 MW
- Power/Energy PLTP Lumut Balai Unit 1 and 2 (2X55 MW)
- Power/Energy PLTP Lumut Balai Unit 3 and 4 (2X55 MW)
- Power/Energy PLTU at Muara Enim Industrial Area (2X10 MW)
- Electricity development in South Sumatra province (21 spots)

Additional Master Plan Power Projects in Sumatra:

- 600 MW Peninsula Malaysia power development

## East Java

Energy and utilities

Oil and Natural Gas

A number of international oil and gas companies have presences in East Java. Gas supply, however, is still lacking and current gas supply (130 mmscfd) has not met demand (400 mmscfd) even though untapped oil and gas resources remain in East Java. According to the Indonesian Government, East Java has 6.4 trillion cubic feet of gas reserves and over 1000 mmstb of oil reserves.

Recent oil and natural gas investments include:

- Hess Indonesia Pangkah is developing 17 new gas wells in Gresik with a production capacity of 8 mmscfd. Exxon Mobil also has a large gas project in Cepu (Central Java), but is building a pipeline through East Java to Tuban.
- Australian Energy World Corporation plans to build an LNG Receiver Terminal capable of handling up to 420 mmscfd.

Power Generation, Transmission, and Distribution

In anticipation of growing electricity demand, the Government of East Java has invited foreign investors to build an additional 5971 MW in power plants by 2020; discussions are still ongoing. Though electricity supply is readily available, electricity connections are still lacking in some areas of East Java as electricity has reached 7,264,607 out of 9,862,111 households, or about 73.66%.

The following is a listing of the Masterplan power projects identified for East Java:

- Steam Power Plant (PLTU) Tj. Awar-awar 700 MW
- Steam Power Plant (PLTU) Paiton 660 MW
- Steam Power Plant (PLTU) Pacitan 630 MW
- Gas/Steam Power Plant (PLTGU) Tuban/Cepu 1,500 MW
- Gas Power Plant (PLTG) Grati 800 MW
- Hydro Power Plant (PLTA) Kalikonto 62 MW
- Hydro Power Plant (PLTA) Kesamben 37 MW
- Power PS Grindulu 500 MW
- Power PS Grindulu 500 MW
- Power and Energy transmission development in East Java until 2015 (1,147 kms)

In Central Java:

- Central Java Coal Plant 2,000 MW
- Additional Central Java Power Plants 5,000 MW

## East Kalimantan

East Kalimantan produces 37% of Indonesia's natural gas and (at 120 million tons per year) nearly 70% of its coal; collectively, oil, gas,

and mining contribute half of the province's GDP. Coal reserves represent more than a third of national stock, but as LNG production declines and coal mining is forced to move inland, the overall value of these industries will decline. The East Kalimantan Bappeda (regional planning agency) recognizes that the province's major GDP drivers – oil, coal, and gas – will run out in the next 15-20 years, and is working to develop a new economy based on renewable resources, secondary processing, and technology.

Power generation has inhibited further development in East Kalimantan. Blackouts are a regular occurrence, and all major companies have generator facilities onsite. Power capacity is currently supplied primarily by coal-fired power plants, but the highest-quality locally-produced coal is shipped to export markets.

The following is a listing of the Master Plan power projects identified for East Kalimantan:

- Power Plant East Kalimantan-PLN
- Balikpapan Airport Power Station
- Development for Electricity Transmission Facility East Kalimantan-PLN
- Development for High Voltage Transmission Network 150 KV Muara Teweh

Additional Power Projects in the Kalimantan corridor:

- Construction of High Voltage Electricity Grid Serawak-Kalbar-Bengkayang

#### **Other Projects:**

PLN ECA Projects – PLN has four power plant projects that it is looking for ECA financing. The four projects are: Jati Gede (W. Java) 2X55 MW hydropower plant; 2X100 MW Sumbagut (N. Sumatra) I and II gas-fired

power plants; and 2X55 MW Tanung Kasam (Batam) power plant.

In the Sulawesi-North Maluku corridor, there is a need for at 450 MW power plant. In the Bali-Tenggara corridor there is a need for 457 MW EJBNT power generation facilities and in the Papua-Maluku corridor there is a need for a 350 MW Urumka Hydropower project.

Pertamina and PLN are also working on a new initiative to create a mini Liquid Natural Gas network in eastern Indonesia. Though the initiative is brand new, it may offer opportunities for the private sector as the planning goes through development.

While most of the power sector projects listed in the Master Plan are larger power plant projects, smaller distributed generation may be a more effective way of electrifying the country and can be implemented without tapping into the nation's inefficient electricity grid.

#### **U.S. Government Support**

Financing for power sector projects can come from a number of sources, including the U.S. government, multi-lateral institutions, the Indonesia government, and other donor funds. At the last East Asia Summit, President Obama, in partnership with President Yudhoyono, announced the formation of the U.S.-Asia-Pacific Comprehensive Partnership for a Sustainable Energy Future which will make available a package of U.S. support for the region from EXIM, OPIC, USTDA, the Department of State and the Department of Energy.

The U.S. Export-Import Bank can provide funding to businesses engaged in projects that generate U.S. exports and purchase of U.S. technology. The Overseas Private Investment Corporation can provide project finance, equity investments, and political risk insurance. There are a number of opportunities to work with the U.S. Agency for International Development and U.S. Trade

and Development Agency in support of economic development, capacity building, and work on project or sector assessments. Finally, the Millennium Challenge Corporation will be releasing a call for proposals from the business community for use of funds from the MCC's Green Prosperity initiative of 332 million in Jambi and West Sulawesi.

Restrictions on foreign investment in Indonesia still exist in some infrastructure sectors, though there are no major regulatory or legal impediments at this time for foreign

sector involvement in the power sector. However, access to financing, protracted land acquisition processes, and legal uncertainties can still cause bottlenecks in infrastructure projects in the sector and serve as a deterrent to doing business in Indonesia. The agencies of the American Embassy in Jakarta can provide U.S. companies with up-to-date market information, sector specific resources, and options for the various bottlenecks. We encourage you to get in touch with our team and to explore options for U.S. government assistance.