ESI 2008

Ed 14

Electrical Supply Industries & Utilities of the World

ESI – Ed 14 2008
Electrical Supply Industries & Utilities of the World

Reports for a Changing Industry

Introduction to the ESI series of reports

ESI 2008 is a series of reports surveying the global Electrical Supply Industry (ESI). It provides surveys of the ESI in every country and lists the companies in the industry.

Countries and ESIs surveyed	195
ESI companies listed	9,368
Generating companies	4,232
Transmission companies	1,104
Distribution companies	6,182

In 2008 ABS has expanded the scope of this global report which covers over 190 countries, with the addition of four regional editions with significantly more information for each country.

ESI 2008 Ed 14 continues as a global report, surveying every country in the world, as it has for the last 14 years. It is also accompanied by an Excel database of 4252 generation, 1,104 transmission, 6,182 distribution and 9,368 supply companies.

This year we have added a new series of four regional editions of the ESI series of reports. The regional reports contain considerably more information for each country, with charts of data and maps of the networks. These regional reports also include proprietary data from ABS databases of generating capacity, transmission and distribution.

Regional Editions

ESI 2008 Ed 1 - Europe and the CIS
ESI 2008 Ed 1 - Asia Pacific
ESI 2008 Ed 1 - Middle East and Africa
ESI 2008 Ed 1 - Americas

Scope of the reports

In compiling ESI 2008 Ed 14, ABS has built up a database of information about the electricity supply industry in every country over the last 16 years. In the early years this database reflected a traditionally integrated industry, much of it state-owned. ABS classified the utilities as generators, transmission companies or distributors. In many countries there were vertically integrated utilities performing all three functions, often with only one company serving an entire nation.

In 2008, in most countries the electricity supply industry is now structured as a business rather than a public service supplier, with four separate functions; generation, transmission, distribution and supply, the last consisting of the marketing and sales of energy. In many countries competition has been introduced to generation and supply, while transmission and distribution are natural monopolies, since the electricity has to be delivered physically via the same wires. Privatisation has escalated. The result is a mix of systems throughout the world, ranging from traditional single vertically integrated utilities serving an entire country, to Electricity Supply Industries with all functions operating separately and in competition.

ESI 2008 is a report designed to outline the ESI clearly and concisely in every country. It is a global reference work. One table summarises the characteristics of the industry, as in the example below for Sweden. Similar

information is provided for all major countries and advanced economies and in more abbreviated form for the smaller developing counties.

Contents of the ESI 2008 Ed 14 Global Report

The report contains one section for each country, consisting of tables and text.

- Table- Economic Statistics
- Text outline - Introduction
- Text outline - Structure of the ESI
- Text outline - Generation
- Text outline - Transmission
- Text outline - Distribution
- Text outline - Market Structure
- Table – Installed capacity MW
- Table- ESI Characteristics

Contents of ESI 2008 Ed 1 Regional Reports

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- Introduction
- Table- Economic Statistics
- Text outline - Structure of the ESI
- Text outline – Generation
- Chart - Generating capacity 1950 to 2008, MW
- Chart - Generating capacity by energy source, 1990-2008, MW
- Text outline - Transmission
- Text outline – Distribution
- Chart - Transmission and distribution line lengths, 1970-2010
- Map - Transmission network
- Text outline - Market Structure
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The ESI 2008 Reports are available as a PDF report or in hard copy. The **ESI Companies Database 2005 Ed 2** is an Excel database of the 6,600 ESI companies documented in the report.

Price of Global Report - £1,200
Price of Database - £975
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A typical entry in the Global Report

Sweden

Table: Economic statistics

Population mn mid-2007	9 mn
Labour force mn 2006	4.6 mn
Unemployment % 2006	5.6%
Capital	Stockholm
GDP per capita $ PPP 2006	$32,200
Reserves of foreign exchange and gold $ bn 2006	$28 bn
Inflation % 2006	1.4%
GDP $ bn PPP 2006	$290.1 bn
GDP $ bn official exchange rate 2006	$372.5 bn
GDP real growth % 2006	4.5%
Composition of GDP %	
Agriculture	1%
Industry	29%
Services	70%
Exports $ bn 2006	$153.7 bn
Imports $ bn 2006	$132.8 bn

Aided by peace and neutrality for the whole of the 20th century, Sweden has achieved an enviable standard of living under a mixed system of high-tech capitalism and extensive welfare benefits. It has a modern distribution system, excellent internal and external communications, and a skilled labour force. Timber, hydropower, and iron ore constitute the resource base of an economy heavily oriented toward foreign trade. Privately owned firms account for about 90% of industrial output, of which the engineering sector accounts for 50% of output and exports. Agriculture accounts for only 1% of GDP and 2% of employment. The government's commitment to fiscal discipline resulted in a substantial budgetary surplus in 2001, which was cut by more than half in 2002 due to the global economic slowdown, declining revenue, and increased spending. The Swedish central bank (the Riksbank) focuses on price stability with its inflation target of 2%. Growth remained sluggish in 2003 but picked up during 2004-06. Presumably because of generous sick-leave benefits, Swedish workers report in sick more often than other Europeans. In September 2003, Swedish voters turned down entry into the euro system concerned about the impact on the economy and sovereignty.

Structure of the ESI

There are around 20 major producers and distributors of electricity in Sweden, and the government is actively pursuing a policy of encouraging greater competition but there are three dominant companies. The largest is the state-owned Vattenfall.

Generation

There are more than 100 electricity generating companies in Sweden but production is dominated by a small number of companies. In 2006, three companies (Vattenfall, Fortum and E.ON Sweden) accounted for 87% of generated electricity. The three companies had about 31% of the total Nordic electricity production.

At present, the two largest generating companies control approximately 65% of total installed capacity. The largest of these companies is Vattenfall AB. Previously known as Statens Vattenfallsverk (Swedish State Power Board), Vattenfall AB was established in 1909 to harness Sweden's extensive hydro potential, although the company now also operates nuclear and thermal capacity. It controls around 50% of the country's capacity and has interests in a number of other generating and distributing companies. Vattenfall AB also previously controlled the national transmission system.

In 1992 Vattenfall was changed to a limited liability company. At the same time the responsibility for transmission and links to other countries was transferred to a separate state agency; Svenska Kraftnit (Swedish Power Grid).

The second largest electricity producer in Sweden is Sydkraft AB. Sydkraft controls between 15% and 20% of installed capacity. On 1st January 1993 it acquired a smaller company, Bikab AB, which gave it a majority share of OKG AB, the company which owns and runs the Oskarshamn nuclear plant. The third largest electricity utility is Stockholm Energi AB, an organisation which is wholly owned by the City of Stockholm.

Transmission

There are two transmission networks, national and regional. Svenska Kraftnät is the utility which owns and operates the national electricity grid, comprising the country's 400 and 220 kV power lines, as well as stations, international inter-connectors and IT systems. SK is responsible for the electricity system's being in short-term balance, known as the system responsibility. It also owns Nord Pool (the Nordic power exchange) together with its Norwegian counterpart Statnett.

Vattenfall operates only local grid systems now comprising 16,000 km of regional network and 98,000 km of local network. Due to the restructuring in the country, a bulk of the transmission network has been handed over to Svenska Kraftnät which runs the grid under the auspices of NUTEK the Swedish National Board for Business and Technical Development.

The national transmission network operates at 400 and 220 kV. 400 kV lines carry supplies from the large hydro plants in the North of the country to the urbanised South. The 220 kV network transports supplies to the various regional distribution companies.

Distribution

Distribution is carried out by 180 regional municipal companies at 30, 20, 10, 7.6, 3 and 1.5 kV. The networks vary considerably in size. The smallest company has around 3 km of power lines, while the largest has over 115,000 km.

Market Structure

Liberalisation and deregulation have been achieved ahead of target. By July 2000 all customers with access to the high voltage grid had free choice and the market has now been opened 100%.

The wholesale market is considered competitive, as Swedish power generation is part of the regional Nordic market (which also includes Denmark, Finland and Norway). The retail market exhibits higher than average switching rates.

Sweden is a member of Nordel, the Organisation for Electric Power Co-operation in Nordic Countries, a common electricity market which provides a market place for spot deliveries on a daily basis, as well as a market for financial contracts. As a result, Sweden has 9 interconnections with Norway, 6 with Denmark, 5 with Finland and one newly completed with Germany. The connection with Germany is via the Baltic cable. This enterprise was established to place a 250 km DC cable with a capacity of 600 MW between Sweden and Germany.

Table: Installed capacity MW Sweden

	2004	2005	2006	2007
Coal	700	130	130	130
Oil	4,500	4,690	4,496	4,230
Gas	456	460	500	545
Hydro	16,140	16,137	16,150	16,150
Nuclear	9,441	9,040	9,172	9,306
Wind	452	510	591	674
Biomass	1,200	1,580	1,600	1,700
Waste	720	720	740	740
Geothermal	0	0	0	0
Solar PV	4	5	5	6
Total	33,613	33,272	33,385	33,480

Table: ESI characteristics Sweden

Largest generator by capacity – 15% Top 3 producers by capacity – 88% Vattenfall – 46% Sydkraft Birka Energi
Large companies present Largest – VF Other significant – E.ON, Fortum
TSO – 1 Svenska Kraftnät Ownership
Network access – Regulated third party access
Monitoring of wholesale/balancing market – TSO
Import capacity as % of installed capacity – 29%
DNOs – 180 Legally unbundled
Regulator – STEM, Energimyndigheten/Swedish National Energy Administration - Office of the Electricity and Gas Regulator Ex-post
First market opening – 1996 Market opening 2008 - 100% Full market opening – 2000
How charges are set – Market
Dominant single generator within balancing area - No
Number of active licensed suppliers - 127
Number of suppliers independent of DNO - 127
Number of suppliers with share > 5% - 4
Top 3 suppliers share – 70%
Switching since market opening Large eligible industrial users – <50% Small commercial / domestic – ni
Eligible customers 2007 – 1005
Number of customers 2007 – 5,126,668
Exchange – Nord Pool
Generating capacity 2007 – 33,480MW
Transmission line length (110 kV) – 51,000 km Distribution line length – 536,512 km

2.9 Indonesia

Overview

Indonesia, a vast polyglot nation, has struggled to overcome the Asian financial crisis, and still grapples with persistent poverty and unemployment, inadequate infrastructure, endemic corruption, a fragile banking sector, a poor investment climate, and unequal resource distribution among regions. The country continues the slow work of rebuilding from the devastating December 2004 tsunami and from an earthquake in central Java in May 2006 that caused over $3 billion in damage and losses. Declining oil production and lack of new exploration investment turned Indonesia into a net oil importer in 2004. The cost of subsidising domestic fuel placed increasing strain on the budget in 2005, and combined with indecisive monetary policy, contributed to a run on the currency in August, prompting the government to enact a 126% average fuel price hike in October. The resulting inflation and interest rate hikes dampened growth through mid-2006, while large increases in rice prices pushed millions more people under the national poverty line. Economic reformers introduced three policy packages in 2006 to improve the investment climate, infrastructure, and the financial sector, but translating them into reality has not been easy. Keys to future growth remain internal reform, building up the confidence of international and domestic investors, and strong global economic growth. Significant progress has been made in rebuilding Aceh after the devastating December 2004 tsunami, and the province now shows more economic activity than before the disaster. Unfortunately, Indonesia suffered new disasters in 2006 and early 2007 including: a major earthquake near Yogyakarta, an industrial accident in Sidoarjo, East Java that created a "mud volcano," a tsunami in South Java, and major flooding in Jakarta, all of which caused additional damages in the billions of dollars. Donors are assisting Indonesia with its disaster mitigation and early warning efforts.

With significant natural gas reserves and a position as the world's largest exporter of LNG, Indonesia still relies on oil to supply about half of its energy needs. About 70% of Indonesia's LNG exports go to Japan, 20% to South Korea, and the remainder to Taiwan. As Indonesia's oil production has levelled off in recent years, the country has tried to shift towards using its natural gas resources for power generation. However, the domestic natural gas distribution infrastructure is still not extensive.

Table 10: Economic statistics Indonesia

Population mn mid-2007	235 mn	GDP $ bn official exchange rate 2006	$264.7 bn
Labour force mn 2006	106.4 mn	GDP real growth % 2006	5.5%
Unemployment % 2006	12.5%	Composition of GDP %	
Capital	Jakarta	Agriculture	12.9%
GDP per capita $ PPP 2006	$3,900	Industry	47.0%
Reserves of foreign exchange and gold $ bn 2006	$42.4 bn	Services	40.1%
Inflation % 2006	13.1%	Exports $ bn 2006	$102.7 bn
GDP $ bn PPP 2006	$948.3 bn	Imports $ bn 2006	$73 bn

Structure of the ESI

The main electricity utility is state-owned PLN (Perusahan Umum Listrik Negara), which is responsible for generation, transmission and distribution throughout the country. The crisis led to severe financial strains on PLN, which made it difficult to pay for all of the power for which it had signed contracts with IPPs.

PLN is now in a process of reorganisation and redevelopment, necessitated by the accelerating economic growth of the last decade.

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2.9 Indonesia, Continued

Generation

Indonesia has installed electrical generating capacity estimated at 47 GW, with 87% coming from thermal (oil, gas, and coal) sources, 10.5% from hydropower, and 2.5% from geothermal. Prior to the Asian financial crisis, Indonesia had plans for a rapid expansion of power generation, based mainly on opening up Indonesia's power market to IPPs. Indonesia is facing an electricity supply crisis, and it appeared that the PLN would be unable to take on any new customers in 2005. Intermittent blackouts are already an issue across Java.

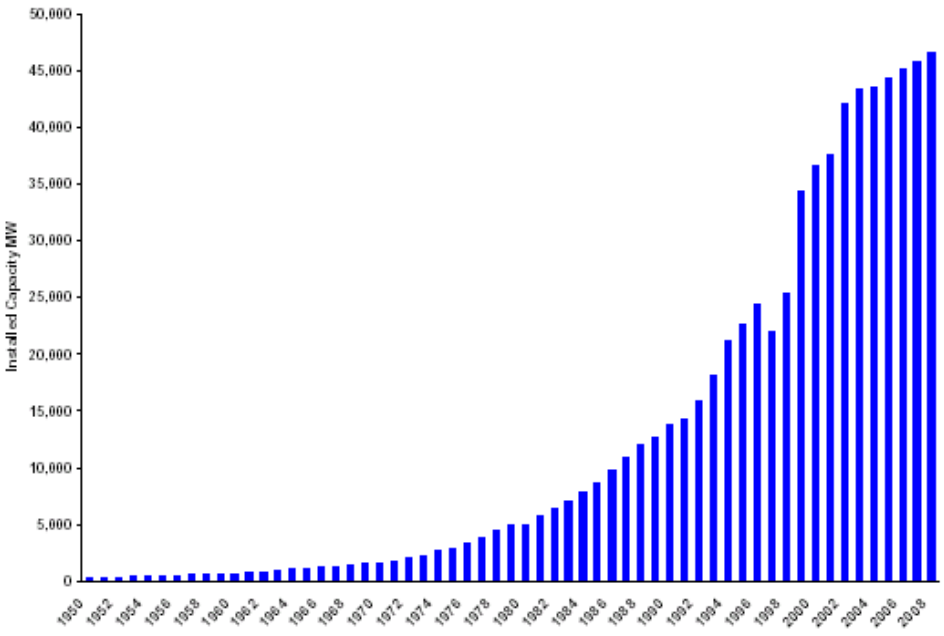
A feature of the Indonesian electricity sector is the high proportion of captive generation, which accounts for about 50% of the total. The very high amount of industrial generation has come about because of the inadequacy of the public supply, both in generation and transmission, and the existence of some huge industries in widely scattered locations in the various islands.

Demand for electrical power is expected to grow by approximately 10% per year for the next ten years.

In 1995, PLN divested its generating assets in Java and Bali to two new commercially operated subsidiary companies: PLN Pembangkitan Java-Bali I (or PJB I, now known as Indonesia Power), operating 8 generators with a total installed capacity of 8,978 MW, and PJB II with 5,738 MW as of 2001. Indonesia Power supplies 46% of power demand in Java and Bali, which account for 75% of the country's consumption.

On 29 March 2006, PLN announced tenders for 6 Independent Power Projects.

Figure 40: Generating capacity in Indonesia for 1950 to 2008, MW



Source: ABS Power Predictor Ed 6 2007

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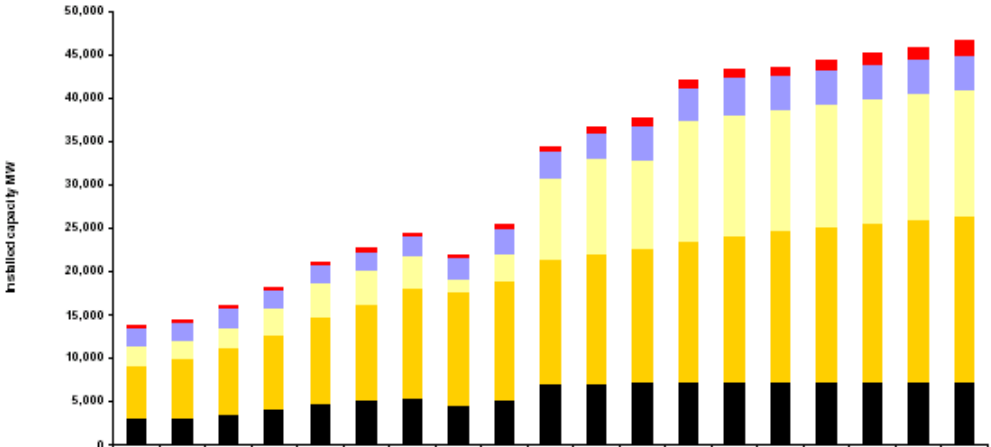
2.9 Indonesia, Continued

Figure 41: Generating capacity by energy source, 1990 - 2008, MW



	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Solar PV	0	0	0.0	0.0	0.0	0.0	1.0	2.0	3.0	3.0	3.0	4.0	4.0	5.5	5.5	6.3	7	8	10
Geothermal	131	145	180	230	270	310	310	310	400	400	589	787	850	900	1,000	1,135	1,200	1,400	1,600
Hydro	2,095	2,116	2,179	2,125	2,178	2,180	2,183	2,436	3,065	3,012	3,015	3,908	3,908	4,393	3,908	3,908	3,908	3,908	4,000
Gas	2,387	2,065	2,354	3,009	3,933	3,819	3,757	1,473	2,985	9,520	11,026	10,129	13,966	13,950	13,836	14,088	14,283	14,482	14,593
Oil	6,008	6,804	7,705	8,726	9,882	11,192	12,677	13,210	13,764	14,343	14,945	15,573	16,227	16,908	17,650	18,003	18,363	18,730	19,105
Coal	3,093	3,105	3,494	4,052	4,837	5,102	5,427	4,499	5,219	7,013	7,071	7,172	7,172	7,172	7,172	7,172	7,305	7,305	7,305

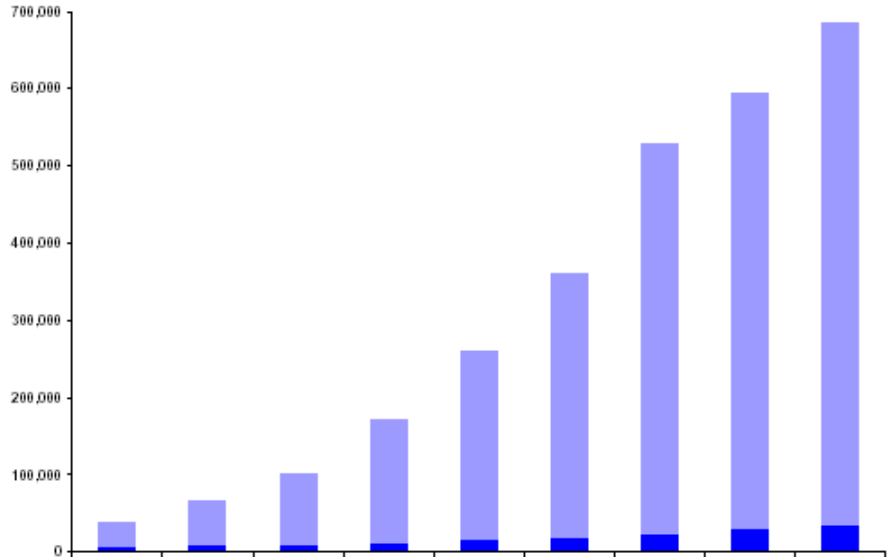
Source: ABS Power Predictor Ed 6 2007

Transmission and Distribution

PLN has an interconnected transmission system in the islands of Java and Bali, consisting of a network of 500, 150, 70, 30 and 25 kV lines.

Sub-transmission is at 20, 15 and 12 kV. Outside this system there are 640 independent networks with mini-grids.

Figure 42: Transmission and distribution line lengths, 1970 - 2010



	1970	1975	1980	1985	1990	1995	2000	2005	2010
Distribution	29,857	56,000	90,855	158,000	242,177	341,070	503,801	563,839	650,000
Transmission	7,633	8,875	10,320	13,400	17,000	19,296	24,822	30,945	35,000

Source: ABS T&D Report Ed 7 2007/08

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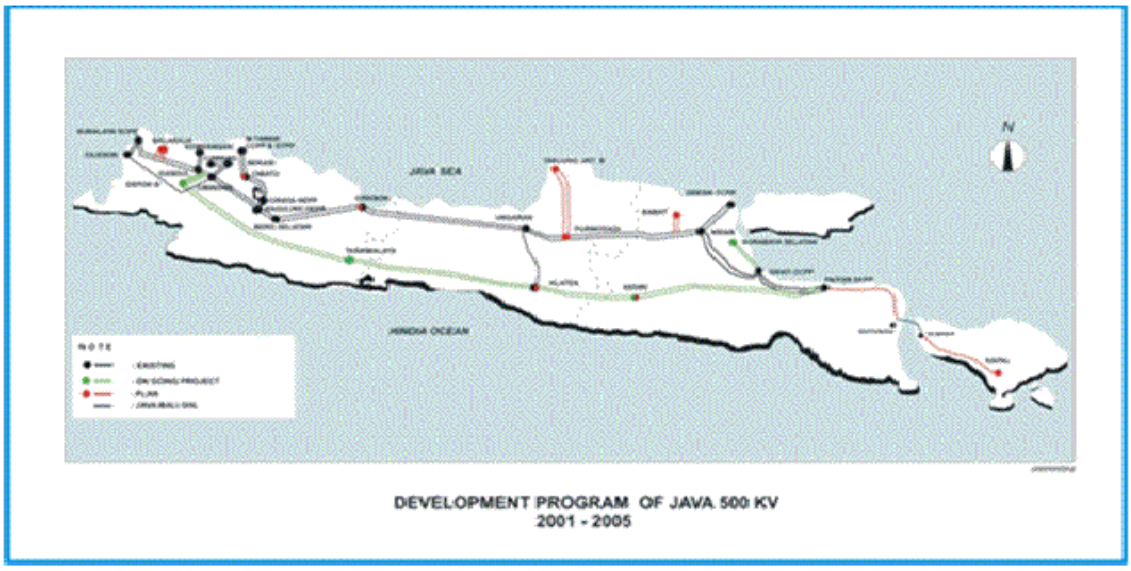
Figure 43: The Javanese transmission network



Source: JBTC

Figure 44: The Sumatran transmission network

Source: APEC

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2.9 Indonesia, Continued

System losses

System losses were 12% in 2005.

Market Structure

In 2002, Indonesia's government undertook measures to liberalise the nation's electricity market in order to make it more attractive to foreign investment.

Competition for power generation will be open on the islands of Batam, Java, and Bali by 2007. In 2008, retail competition in the electricity market will begin under the terms of the nation's new electricity law, approved in September 2002. The law requires an end to PLN's monopoly on electricity distribution within five years, after which time private companies (both foreign and domestic) will be permitted to sell electricity directly to consumers. However, all companies will need to use PLN's existing transmission network.

In 2002, Parliament endorsed Electricity Law No. 20/2002 to liberalise the power sector gradually and to facilitate investment. The salient features of this law are as follows:

- Within one year (of the passage of the bill into law), the government will establish an electricity regulatory commission, which will set fair power prices prior to the introduction of free competition
- Within five years of the implementation of the law, the government will designate at least one area for free competition where licenced private companies are free to develop power plants
- Under free competition, all licenced companies will be free to develop power plants and sell power to the public directly or via agents
- The government, through a state agency, will continue to control the power transmission and distribution network, which power suppliers will be able to use for a fee
- Local governments have the right to issue licences to private companies to set up power plants or sell power to the public in their respective jurisdictions

Table 11: ESI characteristics Indonesia

Generators (State-owned) PT Pembangkitan Tenaga Listrik Java-Bali (PJB) I & II - 52% (to be split into 5 gencos) IPPs - 8% CPPs - 40%	Regulator - Directorate General for Electricity and Energy Development (DGEED)
TSO – 1 Java-Bali Transmission Company (JBTC)	Implementation of market opening - 2003 Market opening 2008 – 0% Full market opening - 2007
Network access – Regulated third party access	Number of customers 2007 – 40,000,000
DNOs – Several regional distribution companies	Exchange – None
Suppliers	Generating capacity 2007 – 48,317 km
Consumption - Industry – 36%, Residential – 27%, Other – 37%	Transmission line length – 30,563 km Distribution line length – 558,262 km Network losses - ni

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