IFC International Finance Corporation
World Bank Group

GSMA Green Power for Mobile

In partnership with the Netherlands

Greening the Network: Indonesia Market Analysis

(Sizing Potential for Green Power in Indonesia)

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Objective

This Indonesia specific market analysis report aims at identifying and examining green power deployment possibilities and their potential for the Telecom industry in the country.

The report analyses the current state of energy and infrastructure regulations in Indonesia and looks into current deployment methods in telecommunications and infrastructure management. The report walks the reader through the number of towers installed and their power connection status. It also evaluates market sizing and future trends in greening Telecom networks and will showcase the potential opportunities for ESCO providers with regards to energy outsourcing model.

Approach

The approach for this report was to gather first hand data through stakeholder interactions and questionnaires. At the same time, the report utilises some generic data from the market through various secondary resources.

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Definition

GSMA	GSM Association
GPM	Green Power for Mobile
MNO	Mobile Network Operator
DG	Diesel Generator
GDP	Gross Domestic Bruto
PLN	Perusahaan Listrik Negara/State Electricity Company
MEMR	Ministry of Energy and Mineral Resources
GHG	Green House Gas
TOE	Ton of Oil Equivalent
RE	Renewable Energy
kWh	kilo Watt hour
MWh	Mega Watt Hour
GB	Giga Byte
SLA	Service Level Agreement
KPI	Key Performance Indicator
OPEX	Operating Expenditure
CAPEX	Capital Expenditure
SPMS	Spare Part Management System
MCIT	Ministry of Communication and Information Technology
FCU	Fan Cooling Unit
BTS	Base Transmitter Station
ESCO	Energy Service Company
PPA	Power Purchase Agreement
ESA	Energy Saving Agreement

Off-grid site:	Telecom Base Station Site which is NOT connected to the commercial Grid power supply
On-grid site:	Telecom Base Station Site which is connected to the commercial Grid power supply
Tower Company:	A company that manages a part or the entire assets of a telecom tower

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Executive Summary

Indonesia, the country of thousand islands, was recognized as the biggest archipelago country in the world, with 17,508 islands. The 5 biggest islands, lying from west to the east, concentrate more than 242 million people. The whole country has more than 60 million people with limited access to electricity.

The Telecom industry is one of the key driving forces for social-economic development in Indonesia. Approximately 90,699 towers serve more than 90.29 million unique subscribers with coverage of about 87% of the population. Market penetration in Indonesia is about 44% and expected to grow in the coming year[1].

Out of the total 90,699 deployed sites, GSMA identified 874 sites that rely completely on 24x7 Diesel based energy resource and 3,300 sites are configured with optimized DG battery hybrid solutions. **By 2015, GSMA estimates the number of telecom towers will reach 134,426.**

Green power deployments have led to the establishment of 4,590 green sites in the network, of which 87% are solar based power solutions. The GSMA estimates that the total energy consumption for powering 90,699 sites is around 1.58 billion kWh and it would reach up to 2.35 billion kWh by 2015. The number of off-grid and unreliable grid sites will increase from 4,174 to 14,854 sites.

In the short term, MNOs can make immediate savings of about US$5.8 million by implementing DG battery hybrid solutions for 874 off-grid sites. **GSMA also estimates a potential saving of around US$56.4 million by converting 4,174 potential sites to renewable energy, which would reach US$151.5 million by 2015.** This will require an investment of about US$526.6 million for 14,854 sites by 2015.

The ESCO business model presents another opportunity for realizing OPEX savings for MNOs. Adopting the ESCO model based on a power purchase agreement (PPA), MNOs realized an OPEX savings of around US$11.1 million for 4,174 potential sites in 2012 and it those could rise up to US$82.6 million by 2015. GSMA estimates that the market potential for the ESCO reached an estimate US$6.4 million in 2012 and it could reach US$22.7 million by 2015 for 14,854 sites.

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1. Indonesia

Indonesia is a country consisting of 17,508 islands from the East to the West and lies between Asia and Australia. It shares borders with Malaysia on Borneo Island, East Timor on Timor Island and Papua New Guinea on Papua Island. Other neighbouring countries include Singapore, Philippines, Australia, Palau and India.

1.1 Geographical

Stretching from Sabang to Merauke, Indonesia consists of various ethnic, linguistic and religious diversities. The Javanese are the largest ethnic group and, politically, the most dominant. Besides having a large population and densely-populated regions, Indonesia possesses a rich nature that supports the second highest level of biodiversity in the world.

Figure 1. Map of Indonesia

Indonesia has a population of about 242.32 million people and a territory of 1,904,569 sq. km, with a density of 134 per sq. km[2]. The territory of Indonesia stretches from 6o 08′ N to 11o 15′ S latitude and from 94o 45′ E to 141o 05′ E longitude.

Weather and climate in Indonesia are linked to the country's proximity to the Equator, making Indonesia a tropical climate country where, in general, the weather is hot and humid. Indonesia's climate is divided into two distinct seasons: dry and rainy seasons. The rainy season goes from October to April and the dry season starts in March and ends in September.

1.2 Economic

Indonesia's economy has experienced a stable growth for the past four years with an average increase in GDP per capita of around 5%. Similarly, the population growth is stable with 1% annual growth. In 2011, GDP per capita has reached US$3,495, relative to 2003, where GDP per capita was around US$ 1,058. It showed significant increase within one decade[3].

Table 1. GDP at the current price

	2008	2009	2010	2011
GDP per capita (current US$)	2,172	2,273	2,952	3,495
GDP per capita growth (annual %)	4.89%	3.54%	5.11%	5.38%
Population growth (annual %)	1.07%	1.04%	1.03%	1.02%

1.3 Power and Energy

Indonesia, as an emergent country, still has a problem with energy. Around 25% of the population does not have access to electricity[4]. The challenge in Indonesia is unique as it is an archipelago. The power generation and distribution are the main challenges to providing energy access to community.

Power and energy are managed by the State Electricity Company (PLN) under the Ministry of Energy and Mineral Resources (MEMR). PLN is responsible for generation, distribution and maintenance of the electricity infrastructure whereas MEMR formulates policies related to power. The supervision, control and management are managed by State Minister for State Owned Enterprises (BUMN).

2 Statistics Indonesia – www.bps.go.id
3 World Bank – www.worldbank.org
4 Ministry of Energy and Mineral Resources – www.esdm.go.id

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1.3.1 Electricity Infrastructure

To build electricity infrastructure in Indonesia is tricky. The geographical distance that separats one island from the other brings its own challenges. If we have a look at the electrification history since 1980 up until 2012, as shown on Figure 2, the electrification ratio has reached more than 75% in 2012. It does not mean that the access to electricity is identical from one place to the other. In fact, the highest electrification ratio is in the main capital city, Jakarta, and the lowest one is in Papua, with 34.64% of the population having access to electricity[5].

Figure 2. Electrification Ratio

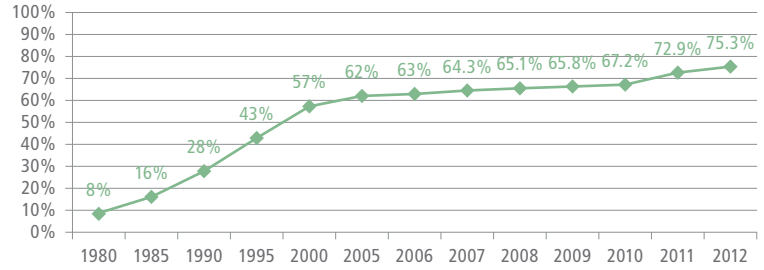


Figure 3. Electrification Ratio by Provinces[6]

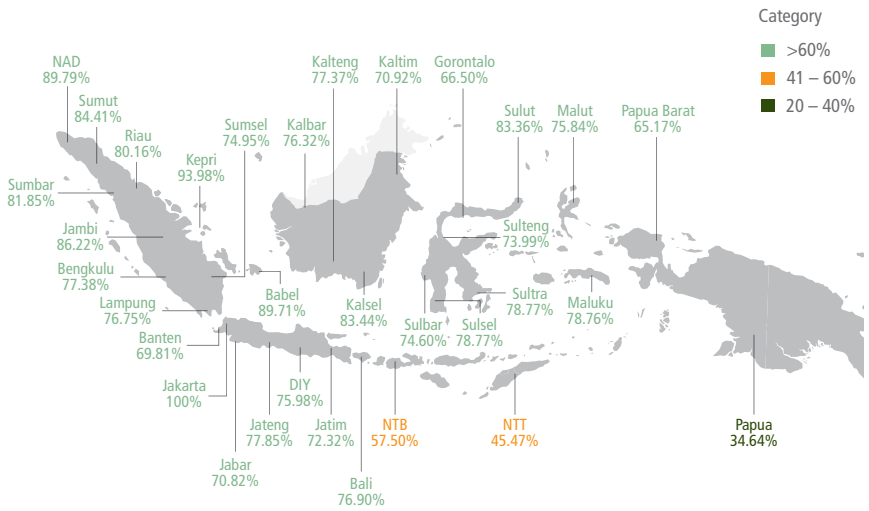


Table 2 below gives us the comparison of power generation versus demand and presents a net positive total generation year by year. At the province level, the electrification ratio is given in Figure 3, and shows that while some provinces are still lacking electricity, most of them are well provided with an electrification ration of more than 60%.

Table 2. Electricity Generation vs Demand[7]

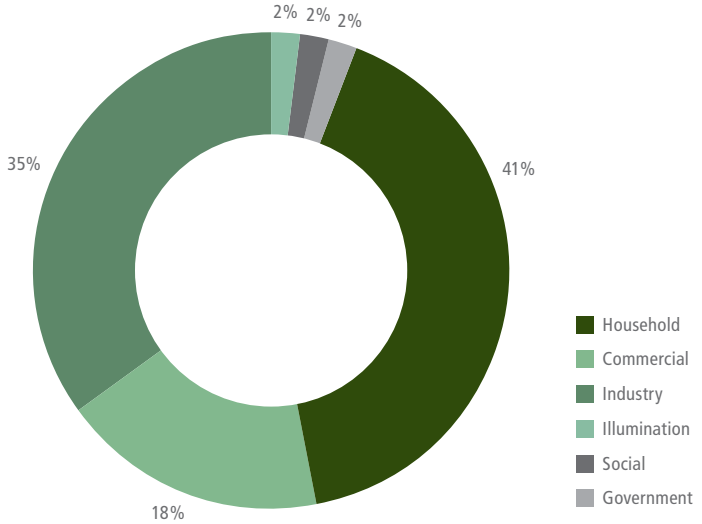
	2008	2009	2010	2011
Electricity Generation (GWh)	134,343	139,354	153,832	166,355
Demand (GWh)	129,019	134,582	147,297	157,993

Note: Total electricity generation after losses calculation

To fulfil the national energy demand, PLN purchases electricity from the private sector at a higher price, pushing PLN to subsidise the cost, since it sells the electricity based on the price fixed by government.

Based on PLN's 2011 power consumption data, the household sector has the highest national energy consumption level (41%) and is followed by the industrial sector (35%).

Figure 4. Power Consumption per Sector Basis, 2011[8]



5 Ministry of Energy and Mineral Resources – www.esdm.go.id
6 State Electricity Company (PLN) – www.pln.co.id
7 Ministry of Energy and Mineral Resources – www.esdm.go.id
8 State Electricity Company (PLN) – www.pln.co.id

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1.3.2 Energy Regulation in Indonesia

The Ministry of Energy and Mineral Resources predicts an average growth of energy consumption of 7% per year and the biggest energy demand is dominated by fossil energy. Indonesia has aimed to reduce Green House Gas emission (GHG) by 26% or 767 million Ton of Oil Equivalent (TOE) by its own effort – and by 41% with international support by 2020, as stated in the President Act No 61/2011[9].

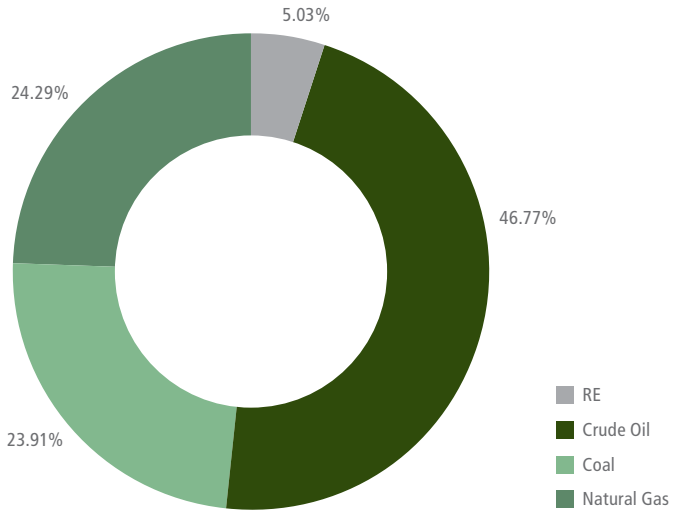
The table 3 below shows the breakdown in targets of GHG emission reduction across segments. The energy sector contribution in the target GHG emission reduction stands at 30 TOE as shown in the table. MEMR expects that, through the development, implementation of renewable energy and clean fossil technology, it will reach the target.

Table 3. Own Effort Commitment[10]

Sector	Target (million TOE)	Percentage
Forest, Peat Land, Agriculture	680	88.66%
Energy Sector	30	3.91%
Waste	48	6.26%
Industry	9	1.17%

Based on 2011 data, the total energy usage mix in the country is as seen in Figure 5. Overall, crude oil is the most-popular resource for generating energy, representing 46.77% of the total energy mix. The main reason for this is the generation of subsidies provided by the government. The renewable energy contribution is around 5%.

Figure 5. 2011 Total Energy Mix[11]



To promote renewable energy based power plant, government released some fiscal incentives to the industry.

1.4 Telecommunication

1.4.1 Subscriber and Penetration[12]

The Telecom market in Indonesia has reached almost 37% market penetration in Q4 2012 and more than 278.3 million connections in the network, with a SIM per subscriber ratio of 2.63.

9 State Ministry for Development Planning – www.bapennas.go.id
10 Ministry of Energy and Mineral Resources – www.esdm.go.id
11 Ministry of Energy and Mineral Resources – www.esdm.go.id
12 Wireless Intelligent

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Figure 6. Subscriber Growth

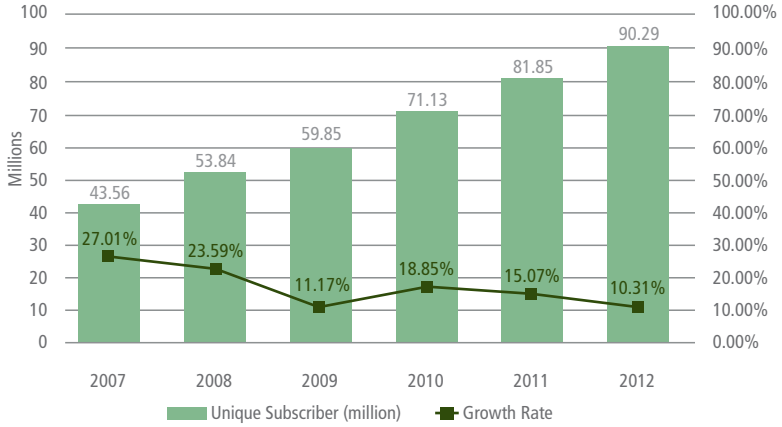

Figure 7. Market Penetration

Indonesia has about 90.29 million unique subscribers with a market penetration below 50%. **The interesting point is that the number of SIMs per subscriber has reached almost 3 SIMs per subscriber.** It shows that subscribers are using multiple SIMs to get the benefit from MNO's discount tariff offered in the market whereas the subscriber growth rate has declined for the past 3 years[13].

1.4.2 Managed Services

Managed services or operational outsourcing is the day to day operation and management responsibilities awarded to a managed services provider or operations partner, based on certain SLAs and KPIs agreements. The managed services providers in Indonesia are led by Telecom equipment vendors and some local maintenance companies with the support of sub-contractors at the field level.

The operational outsourcing scope varies from MNO to MNO. Some major MNOs have given their end-to-end maintenance responsibilities to OEM providers while other MNOs are outsourcing only a part of the operations, including field maintenance activities to Local Maintenance Companies. Outsourcing the operations and maintenance of telecom and power equipment can benefit MNOs by increasing their focus on marketing and customer experiences activities to boost their revenue.

On power maintenance, Managed Services or Local Maintenance Companies need to maintain the equipment up time based on agreed SLA/KPIs. But for Managed Services Companies the scope of work to maintain an operator's network can be included with some OPEX target and Spare Parts Management System (SPMS).

1.4.3 Tower Company

The Tower Company business model is growing in Indonesia, but the paradigm of tower business has not yet changed as Tower Companies – as service providers – are still focusing only on renting space and not yet moving as total infrastructure provider model, including energy service providers as their tenants.

Nowadays, MNOs are facing challenges to expand their coverage due to land availability and community issues. To eliminate those issues, the government has released Act No. 02/PER/M.KOMINFO/03/2008 from Ministry of CIT to mandate site sharing concept[14].

13 Wireless Intelligence
14 Ministry of CIT – www.kominfo.go.id

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The GSMA estimates that more than 25,000 towers are identified as owned by Tower Companies with an average tenancy ratio of 1.5 – 1.6, and about 40,000 Base stations are installed at those towers sites[15].

1.5 Eco-system and Fiscal Incentive

1.5.1 Industry Structure

The Telecom infrastructure industry in Indonesia is represented by MNOs or Tower Companies who own the tower assets, as well as by telecoms equipment vendors who supply telecom sites with power equipment and solutions. The site maintenance is led by the managed services providers with support from sub-contractors at the field level.

The ownership structure between MNOs, Tower Companies and Local Maintenance providers is presented below. The MNOs still owns the majority of the towers although transferring tower assets to tower companies is becoming a trend in the market.

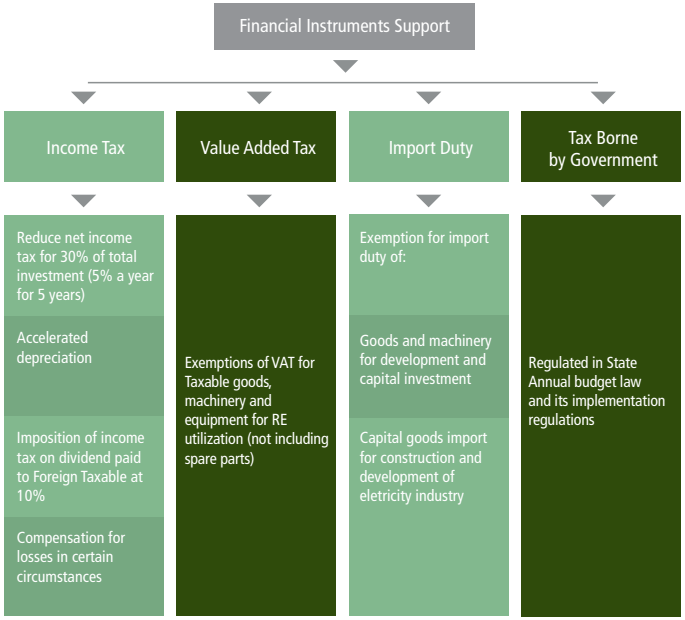
Table 4. Tower Ownership

	MNO	Tower Company	Telecom Vendor	Power Vendor	Managed Services/ O&M
Who owns the tower assets?	•	•			
Who owns the power equipment?	•			•	
Who provides Power equipment & solution?			•	•	
Who manages power?	•			•	•
Who plans the power equipment?	•				
Who manages site operations?	•	•			•

1.5.2 Incentives to Promote Green Technology

On promoting renewable energy in the country, the government released fiscal incentives for investors. The first act from the Ministry of Finance is Act no 21/PMK.011/2010 on tax and custom facilities for renewable energy utilisation[16].

Figure 8. Financial Instruments Support



Another Act from the Ministry of Finance, no 130/PMK.011/2011, mentions tax exemption for pioneer industry. The industries that can have this facility need to comply with a short list of criteria such us below:

- Pioneer industry
- Having a new investment plan minimal IDR 1 billion or equal US$100 million[17]
- Placing funds in Indonesia banking minimum 10% from the total capital investment
- Exists as Entity in Indonesia

15 GPM Analysis and Research
16 Ministry of Finance, www.depkeu.go.id
17 1 USD = 10,000 IDR

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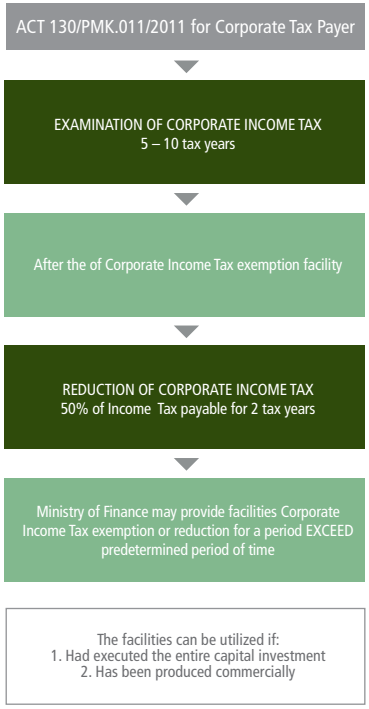
The pioneer industry criteria as per Act no 130/PMK.011/2011 are:

- Basic metals manufacture industry
- Industry of oil refining and/or basic organic chemical resources from oil and natural gas
- Machinery industry
- Renewable resources industry
- Communication equipment industry

Provision of exemption facilities or income tax reduction as mentioned by the Act are presented below:

Figure 9. Exemption Facilities



2. Powering Telecom: Current Approach

2.1 Current State of Deployment

Around 90,699 tower sites are serving the islands across the country. Based on the current power situation, 4,930 sites (5% of total tower sites) are off-grid and more than 4% (3,834 tower sites) are unreliable grid sites[18].

This said, the power situation in Indonesia is different from one island to another island. Java and Bali islands have more reliable power grid connection than the other islands, with an electrification ratio of more than 78% and an average outage of less than 16 hours a year[19].

The 8,764 sites per island with distribution issues are shown on figure 10.

Figure 10. Problematic Sites Distribution

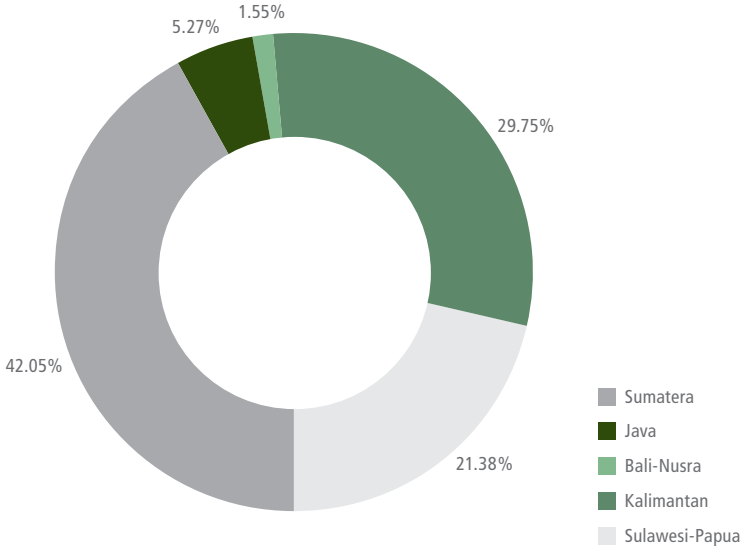


Figure 10 shows that MNOs are suffering in Sumatera where 42.05% of the problematic sites are located, followed by Kalimantan with 29.75%.

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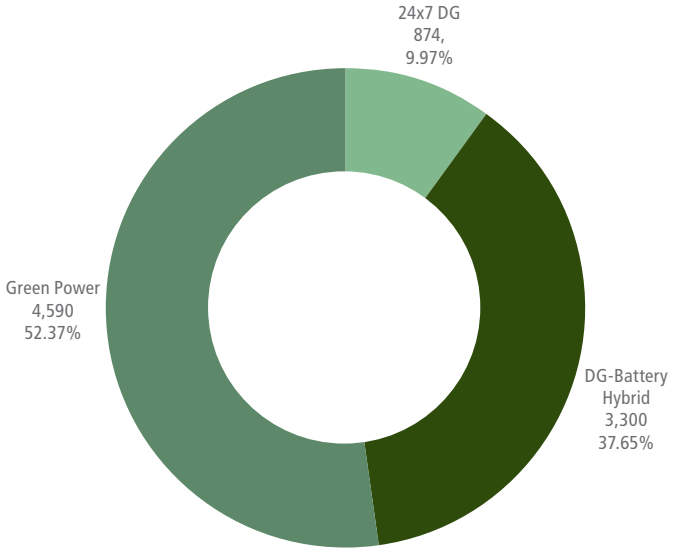
To address the challenges of unreliable grid connection, MNOs try to implement energy efficiency solutions for those sites. DG battery hybrid solutions are common for areas with unreliable grid. The number of current deployments for problematic sites and their power source is shown on figure 11.

More than 52% of sites are green sites and around 37% of them are using DG battery hybrid solution by optimizing batteries on site[20].

Figure 11. Current Power Solution Deployment for Problematic Sites



2.2 Cost of Powering the Telecom Sector

The cost of powering the telecom sector will depend on the power connections available for each site. Bad or unreliable power connections have led MNOs to rely on diesel generators to power the site. Diesel cost varies across sites depending on the geography and location.

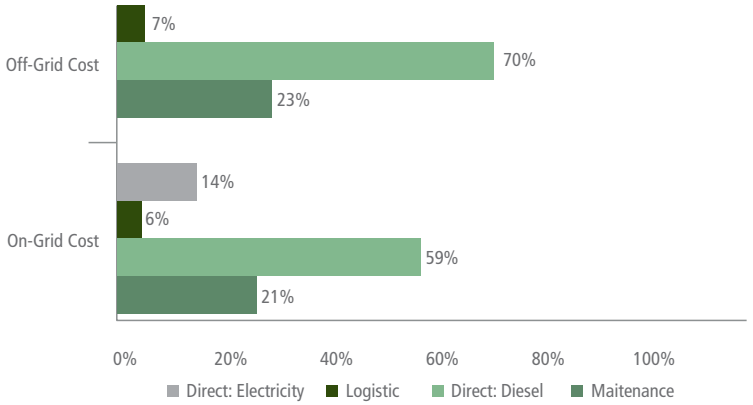
The cost of powering Telecom sites can be divided into direct and indirect as below:

- **Direct cost** : cost of diesel and electricity
- **Indirect cost** : cost of maintenance for the equipment including diesel generator and other power system, and overheads

As shown in figure 12, the cost structure varies by component between off-grid sites and on-grid sites. The major difference is the electricity cost that is relevant only for on-grid sites.

The overall cost structure shows that diesel costs are the major component in both scenarios. For off-grid cost structure the diesel constitutes 70% of the total cost and 59% for on-grid site[21]

Figure 12. Powering Cost Structure



20 GPM Research
21 GPM Research (the cost modelling for Java island structure)

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3. Powering Telecom: Green Telecom and Market Sizing

This section describes the potential of green technology and the available options in Indonesia. It also analyses the levels of adoption of green power sources in the Telecom industry.

3.1 Green Technology Options

Indonesia has a wide range and variety of renewable resources, from geothermal, hydro, mini hydro, nuclear, biomass, wind and solar energy. According to the Ministry of Energy and Mineral Resources, renewable energy resources have a potential to contribute to national electrification as shown on table 5.

Table 5. Non Fossil Fuel Energy Resources[22]

Non Fossil Energy	Potential Capacity
Hydro	75,670 MW
Mini/Micro Hydro	1,013.5 MW
Geothermal	29,038 MW
Biomass	49,810 MW
Uranium	3.000 MW
Solar Energy	4.80 kWh/m2/day
Wind Energy	3 – 6 m/s

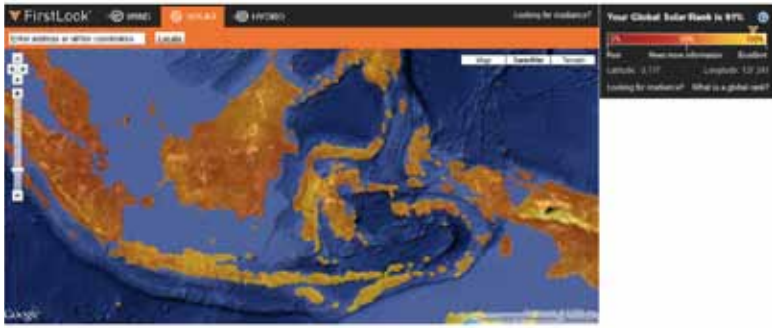
Hydro technology has the potential to be implemented on most of the larg islands across the country. Kalimantan and Papua have more than 20,000 MW hydro power generation potential. Kalimantan is called the island of a thousand rivers.

About 276 geothermal locations have been identified in Indonesia; most of them are located in Sumatera, Java and Sulawesi. And the rest are located in Kalimantan, Maluku and South Nusa.

Indonesia has a strong potential for biomass gasification. The most common biomass resources available in the country are rice husk, crop residue, wood, animal waste, municipal waste, sugarcane bagasse etc. Rice husk and animal residue might be some of the most promising biomass energy resources in Indonesia.

Indonesia also has a big potential for solar energy deployments as the daily average solar insolation is 4.8 kWh/sq. m/day. Figure 13 shows that the southern part of the country receives the highest solar radiation.

Figure 13. Solar Radiation in Indonesia[23]



The average wind speed in Indonesia is 3 – 4 m/s, but the southern part of Indonesia has an average wind speed of 5 -6 m/s which may be suitable for small scale Telecom applications[24].

Figure 14. Wind Speed in Indonesia

Fuel cells based on hydrogen have massive deployments and are well known in the Telecom industry since more than 500 sites are up and running in Sumatera and Java islands. The supply chain issue for hydrogen and methanol is taken care of by third party fuel cell suppliers, based on supply and maintenance agreements.

22 Ministry of Energy and Mineral Resources – www.esdm.go.id
23 Tier – www.3tier.com/firstlook
24 Meteorology, Climatology and Geophysical Department – www.bmkg.go.id

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The table below describes the market availability for each choice and the potential for adoption of the particular green technology in the Telecom industry.

Table 6. Green Power Choices in Indonesia

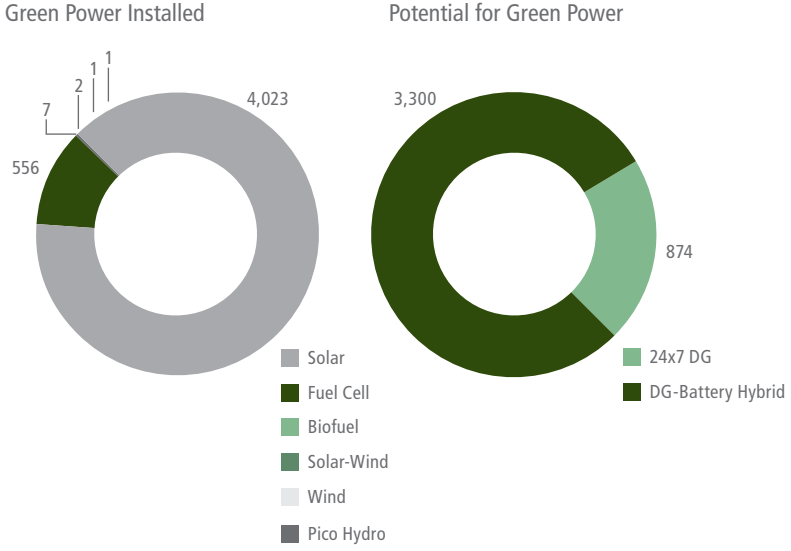
Factors	Solar	Biomass	Wind	Fuel Cell	Pico Hydro
Solution Availability	Very Good	Poor	Poor	Very Good	Good
Reliability	Good	Good	Good	Good	Good
Market Acceptance	Good	Poor	Poor	Good	Poor
Supply Chain Readiness	Good	Poor	Poor	Good	Good
Stage of Adoption	Commercial	N/A	Commercial	Commercial	Commercial
Resource Potential	Moderate	Good	Low	Moderate	Low
Barriers to Adoption	- High CAPEX on initial stage - Space requirement	- Supply chain challenges - Unproven operational trial in telecom field - Business model offering	- Low scalability only limited on coastal area - High initial CAPEX	- Supply chain availability for hydrogen or methanol - Suitable only for unreliable sites	- Number of sites near the river flow location - High initial CAPEX - Operational challenges
Risks to Adoption	- Reliability issues due to distance from the nearest O&M based - Vandalism of battery and panel theft	- Biomass supply and sustainability - Scalability of solution for telecom load	- Operational risk due to wind speed availability - Unreliable power generation due to wind speed characteristic	- High replacement cost of fuel cell	- Operational risks associated with limited knowledge and readiness

3.2 Market Sizing

In Indonesia, the CAPEX model is the only existing option for MNOs to put green technology solutions in their network. Meanwhile the OPEX model is only running for DG lease agreements on energy outsourcing model between MNOs and suppliers.

GSMA has identified that from 90,699 tower sites in Indonesia, 5% or 4,590 sites, are deployed with green power solution and 4,174 additional sites have the potential to be converted to green sites[25]. Of these potential sites, 79% are unreliable grid sites with outage in excess of more than 8 hours a day while the remaining 21% of sites which are completely off-grid with only diesel generators and batteries to power the system.

Figure 15. Current Deployment



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3.3 Potential OPEX Saving

With 4,174 potential sites, there may be room for significant savings by implementing green power technology. **GSMA estimates that MNOs can save around US$56.4 million per year by going green.** This will require a CAPEX of around US$35,500 per site. The total investment requirement is of about US$148 million for the 4,174 potential sites[26].

4. Powering Telecom: The Way Forward

4.1 Short Term

MNOs have short term plans to reduce their operational cost as well as carbon footprint in their network by becoming energy efficient. Converting off-grid sites that are running a diesel generator 24 hours per day to green power will have a huge impact on savings. Some equipment modernisation to low power BTS, replacing indoor BTSs to outdoor BTSs or replacing existing air conditioners with fan cooling unit (FCU) are some examples of energy efficiency enhancements that most MNOs do.

GSMA records that out of 90,699 sites across the country, 874 sites are located in off-grid areas and 3,300 more sites are on-air, in unreliable grid conditions. To power up 90,699 sites, it will require around 1.58 billion kWh on an annual basis.

GSMA estimates that the potential OPEX saving, by converting the 874 off-grid sites from 24x7 DG run systems to DG-battery hybrid solutions, will create a saving of more than US$5.8 million every year. The savings can be achieved more by optimising DG and batteries configuration.

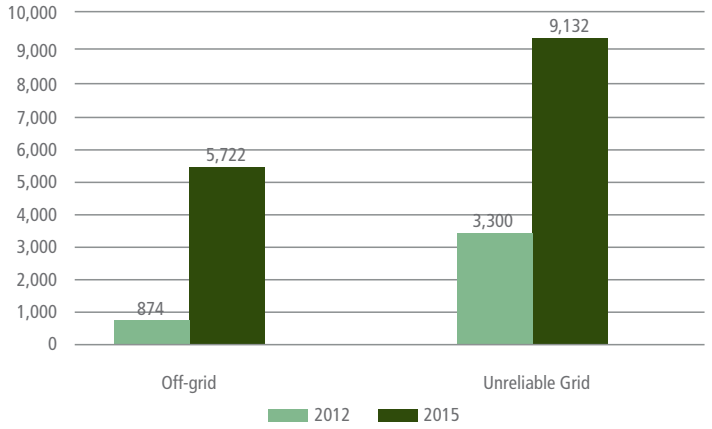
4.2 Long Term

In the long term, considering the market penetration growth from 37% to 65%, as well as site sharing/leasing trends and the 2% of networking blocking ratio, GSMA estimates tower site growth to be at 134,426 sites in the next 3 years.

Regarding off-grid and unreliable grid sites, GSMA estimates that 5,772 new sites will still be off-grid sites and 9,132 sites will have unreliable grid connectivity by 2015. Except for certain MNOs that have corporate social responsibility laws on deploying USO in remote rural area, the number of off-grid site will increase accordingly.

Figure 16. Site Growth[27]

Figure 17. Off-Grid and Unreliable Grid Sites Growth



The long term strategy will be in line with OPEX reduction and energy optimisation programme by ensuring technology solutions and their benefits, as well as creating a positive environmental impact.

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4.3 Site Sharing/Leasing

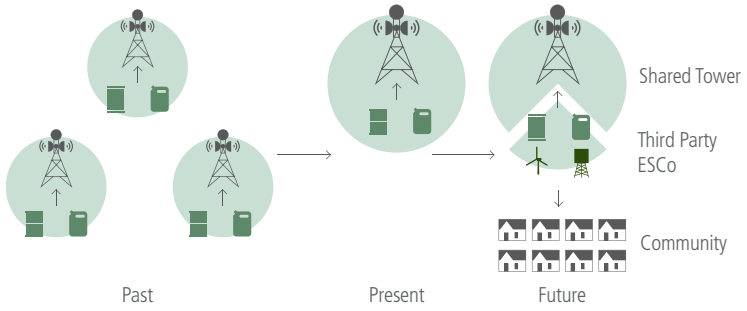
The site sharing or site leasing business model has become one of the most strategic options for MNO to reduce their capital cost on infrastructure part. Site sharing business models currently have a concept of one to one swap deal between two operators, which is different from site leasing business models where MNO needs to go to tower companies to match their BTS planning with tower company's infrastructure.

On site leasing, Tower companies provide passive infrastructure to support MNOs. The emerging trend is that MNOs will try to sell their towers to tower companies and MNOs will lease them back from the tower companies.

4.4 Future Business Model

Indonesia's market is unique with regards to tower sharing mechanisms. MNOs will bring their own power systems on the lease premises. In some parts of the world, the trend has shifted in terms of the business model and infrastructure ownership. Tower companies will provide passive infrastructure for MNOs. **It means MNOs do not need to spend their time and capital on providing power systems to the sites and they can therefore focus on their core business to maintain their market share and customer satisfaction.**

Figure 18. Business Model Trends



The transformation has only just started- Energy Service Companies (ESCO) are yet to fully emerge to provide reliable power outsourcing to MNOs or tower companies when available. The ESCO can act as an energy provider to both tower companies and MNOs. An ESCO not only takes responsibility for financing the equipment, but also the full provision of power to the tower. The ESCO business and energy service models that are being considered, developed and tested in the market place include:

- *Power Purchase Agreement (PPA),* the ESCO will install the renewable energy power system and sells power to the MNOs at an agreed per kWh rate.
- *Energy Saving Agreement (ESA),* the ESCO will install the renewable energy power system on existing site and the MNOs fee is based on portion of verified energy cost 'savings'.
- *Fixed Fee Operating Lease,* the ESCO will install the renewable energy power system and sell monthly power to the MNO at a fixed cost. The main benefit from this scheme is that MNOs will not have any variable budget on their expenditure.

The ESCO model will allow MNOs to make some savings. The saving for 4,174 potential sites was of about US$11.1 million in 2012 and will be of US$82.6 million by 2015, for MNOs that have not invested any CAPEX. The potential market for the ESCO model reached US$6.4 million in 2012 and will reach up to US$22.7 million for 14,854 sites by 2015[28].

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5. Conclusion

Indonesia, as the biggest mobile network in South East Asia, has contributed 4,590 green sites across the country. Solar and fuel cell technologies are the most preferable choices for MNOs to green their network. Some incentive trials and studies on the possibility for wind energy solutions are needed before powering the Telecom networks. On energy efficiency, DG battery hybrid solutions are the most practical ones in Indonesia for Telecom networks as they work by optimising batteries life cycle on site and reducing generator run hours.

Indonesia has targeted to reduce Green House Gas emission (GHG) by 26% (767 million TOE) through its own effort and 41% with international support by 2020. To boost the green technology penetration, the government has implemented some incentives for the industry starting with income tax reduction, exemption of VAT and some waiver on import duty.

However to green the network and create a positive environmental impact, proper planning is required to deploy a new plan in the network, with the government's support as a regulator in the industry.