ENERGY AND CARBON EMISSION BASELINE STUDY FOR TELECOMMUNICATIONS SECTOR (TELCOS)

FOR
MALAYSIAN COMMUNICATIONS & MULTIMEDIA COMMISSION (MCMC),
MALAYSIAN TECHNICAL FORUM SDN BHD (MTFSB)

FINAL REPORT

BY

SUSTAINABLE ENERGY DEVELOPMENT AUTHORITY (SEDA MALAYSIA)

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CONTENT

1 GLOSSARY

ICT	Information Communications Technology
Telco	Telecommunications
GHG	Green House Gas
ARPU	Average Revenue Per User
MNVO	mobile virtual network operators
DSL	Digital Subscriber Line
NBN	National Broadband Network
HSBB	High Speed Broad Band
SMS	Short Message Service
BTS	base transceiver stations
PV	Photovoltaic
RE	Renewable Energy
MCMC	Malaysia Communications and Multimedia Commission
MTFSB	Malaysia Technical Standards Forum Bhd
ITU	International Telecommunication Union
CDM	Clean Development Mechanism
MGTC	Malaysian Green Technology Corporation

2 EXECUTIVE SUMMARY

This study is part of the Low Carbon ICT Project, conducted by Sustainable Energy Development Authority (SEDA) Malaysia in collaboration with Malaysia Green ICT Committee, Malaysian Technical Forum Sdn Bhd (MTFSB), which is an agency under the Malaysian Communications and Multimedia Commission (MCMC) to study the carbon footprint of the Telco Industry. Emphasis is on the carbon footprint of the electrical energy used by the ICT equipment of the Telco Industry. As such, this project is the Low Carbon Telco ICT Baseline Study.

The members of the Telco Industry were invited to participate in this study. The members are all in the private sector. The total electricity information used by the individual companies was submitted. The electricity consumed was calculated from the electrical bills for the time period from January 2013 to December 2014, a period of 2 years.

The electricity used information was used to calculate the carbon footprint size of the individual Telco Industry organization and also the Telco Industry. This is then referred to as the "Baseline". Figure 2.1 below shows Carbon emissions by company for 2014.
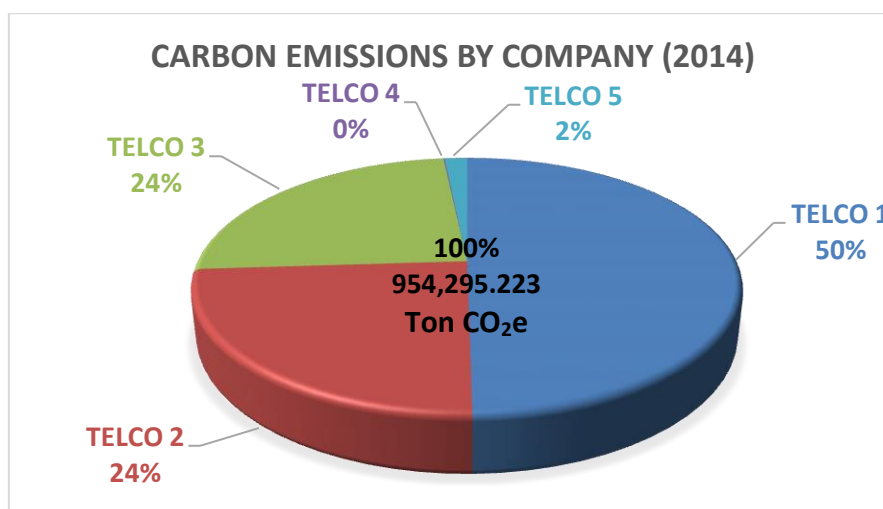

Figure 2.1 Carbon emissions by company for 2014

Below is the graph that shows the energy consumption used in the telcos buildings and networks.
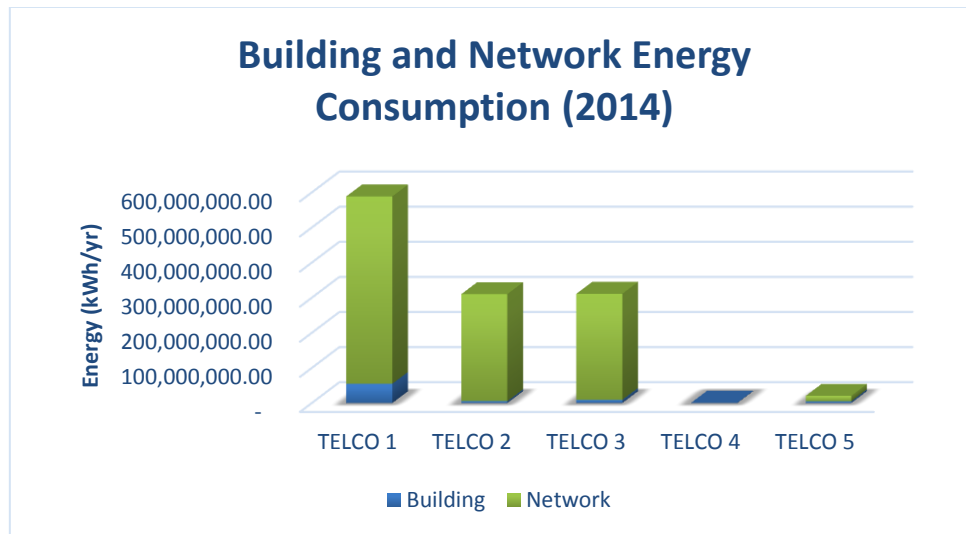

Figure 2.2 Building and Network Energy Consumption for 2014

From the analysis, Telcos energy consumption and CO_2e can be summarized as below:

Telcos	Energy Consumption (kWh/year)		Ton CO_2e	
	2013	2014	2013	2014
Telco 1	657,980,807	636,005,135	491,511.663	475,095.836
Telco 2	275,117,293	310,098,740	205,512.618	231,643.759
Telco 3	307,951,486	311,101,998	230,039.760	232,393.192
Telco 4	No Data Available	1,109,549	No Data Available	828,833
Telco 5	20,297,773	20,297,773	15,162.437	15,162.437
Total	1,261,347,359	1,277,503,646	942,226.477	954,295.223

Table 2.3 Summary of Energy Consumption and Carbon Emission

From the above table, total energy consumption for both year 2013 and 2014 is 1,261,347,359 kWh/year and 1,277,503,646 kWh/year. While carbon emission contribution for 2013 and 2014 is 942,226.477 and 954,295.223 Ton CO_2e. However different Telcos have their own different system and operations, energy consumption and carbon emission collected here represents baseline for a wide range of Telcos in Malaysia.

Based on data limitations and significance of study, it is recommended that this study to be held on annual basis.

3   INTRODUCTION

The Low Carbon Telecommunications (Telco) Information Communication Technology (ICT) Baseline Study quantitatively assesses the Greenhouse Gas (GHG) emissions arising from the operations of the Malaysian Telecommunications (Telco) industry. Using the calendar year January 2013 to December 2014, as a baseline, the report focuses only on the sources of emissions over which the industry has the most control. In this study, the focus is on the carbon emissions of greenhouse gas (GHG) associated from the use of electricity.

The sources of the direct (and controllable) emissions that form the carbon footprint of the Telco Industry comes from the use of electricity, diesel generators, the vehicle fleet in petrol and diesel-powered types and also refrigerant gas. Compressed Natural Gas (marketed as Natural Gas for Vehicles [NGV] in Malaysia is also a source of carbon emissions for those Telco Industry members which have moved to incorporate this hydro-carbon fuel into their fleet vehicle pool. For this study, only the carbon emission from electrical energy usage is measured. The other GHG sources will be briefly explored in Chapter 7 – Exclusions from the Low Carbon Telco ICT Baseline Study.

The study has looked into quantifiably assessing the carbon footprint from the carbon emissions of the Telco ICT industry. The focus only within the electricity consumption used by the ICT equipment as boundary.

Environmental operations are not the primary importance for corporations, whose main body of work is not in the ecology. Efficient services and structured expenditure being the over-riding operational- and capital expenditure consideration, reducing carbon emissions frequently is given minor attention. Instead of viewing it as just an additional expense, increasingly, many organisations are seeing that cost savings can be successfully found with emphasis on reducing energy consumption.

Global consultants Gartner estimate that ICTs presently account for approximately 0.86 metric gigatonnes of carbon emissions annually, or just about 2% of global carbon emissions. The International Telecommunication Union (ITU) has estimated the contribution of ICTs (excluding the broadcasting sector) to climate change at between 2% and 2.5% of total global carbon emissions. The main contributing sectors within the ICT industry include the energy requirements of PCs and monitors (40%), data centres, which contribute a further 23%, and fixed and mobile telecommunications that contribute 24% of the total emissions.

The logical step to reducing energy consumption is to first measure the Telco sector's collective and individual organisation's carbon footprint. This carbon footprint for the time period of January 2013 to December 2014, a 2 year period, provides the measured value of the Telco Industry for the Low Carbon Telco ICT Baseline Study.

Measuring the carbon footprint of the Telco industry was an important step towards reducing energy bills and carbon emissions in a cost-effective framework.

Five telcos took part in this study.

DiGi	Digi
TM	Telekom Malaysia
P1	P1Max
TIME	TIME
maxis	Maxis
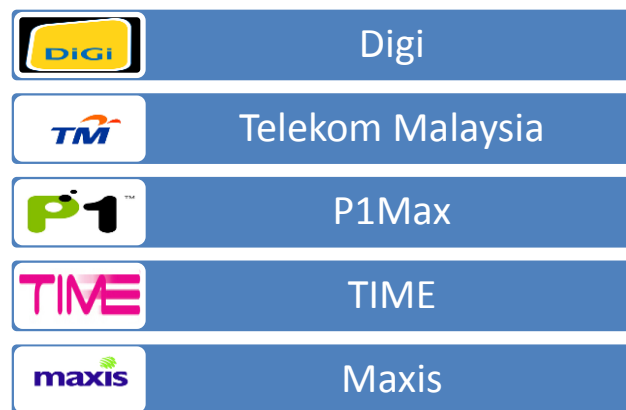
4   Background

4.1   Definition of "Baseline"

A baseline is a line (or mark) that is the basis (or base) for measurement (or point of reference). It is a standard that is repeatable and verifiable with data available. It can also be a comparable reference of the whole building, organization, industry or country.

4.2   Carbon Footprint

The carbon footprint model has been developed to help in quantifying and understanding the impact of a product, an activity or an organisation on the ecology. The full and complete scope of impacts on the ecology is very varied, and is a complex and difficult calculation. A carbon footprint greatly makes easier the process by concentrating on emissions of Greenhouse Gases (GHGs). These emissions have the greatest effect on climate change and global warming. Carbon footprints use a standardised unit of measure. The unit is called carbon dioxide equivalent (CO_2e). This allows for comparisons over time.

4.3   Motivations for Carbon Footprint Measurement

There are 3 main factors driving an organisation/country to implement measures to reduce their carbon footprint. They are:

1. Cost Saving – in most organisations, the greatest source of carbon emissions is from energy consumption. Energy consumption is also a major expenditure. We can use the carbon footprint to pin-point significant causes of energy consumption and opportunities to reduce usage.

2. Role in a Future of Lower Carbon – it is now a socially moral obligation to challenge and face head-on climate change for all organisations and countries. As a significant energy user in the nation, the Telco industry has a responsibility to justify and lower its emissions.

3. Leader and Pace-setter – The private sector is often seen as lagging concerning environmental responsibility and emissions reporting. Many corporations and profit-oriented organisations in other industries are now stating their environmental footprints.

4.3.1 Industry Activities

The Telco industry spans the entire country, with thousands of employees across the nation. There are currently just under a dozen companies in the Telco industry. These include Telekom Malaysia, Maxis Communications, Celcom, DiGi.com, Time dotcom, Axiata, U Mobile, Asiaspace, Packet One Networks, REDtone, YTL Communications, Fibrecomm and more.

While there has been strong growth in the mobile sector, the growth is not consistent in the fixed-line sector. The fixed-line services have been stagnating at about 4 million subscribers (14%) and growth at almost zero. There is little indication that the fixed-line market will increase, even with strong governmental support. The public sector backing the fixed-line service remains an important element in the building of a national telecom infrastructure.

Mergers and acquisitions have caused the mobile services industry to have been effectively reduced the number of operators. The 3 biggest movers in the mobile services sector, which includes mobile virtual network operators (MNVOs) and privately-held mobile operators like U Mobile, are Celcom, Maxis and DiGi. Between them, over 80% of the subscribers are their customers. The mobile services operators have grown rapidly. A booming market, currently there are over 44 million mobile services subscribers. Of the other industry players, U Mobile appears to have a significant lead over Tune Talk, XOX Bhd, redONE and others.

High speed broadband first came into the local market in 2008. The slow initial subscriber development surged after 3G and 3G LTE became available in 2012. By March 2012, there were about 5.8million broadband subscribers with around 64% of these wireless-based. With the greater take-up in data packages, the Average Revenue Per User (ARPUs) has greatly increased.

The wireless broadband services overwhelmed a market previously dominated by fixed-line Digital Subscriber Line (DSL) technology. The dominant broadband service provider the, Telekom Malaysia, has seen its market share eroded as the market opened up and wireless broadband became more widespread.

A major boost to the country's broadband strategy occurred when the government chose Telekom Malaysia to roll out a National Broadband Network (NBN). In what was referred to as the High-Speed Broadband (HSBB) project, Telekom Malaysia (TM) was busy building a fibre-based open system. The roll out is on target and TM had already signed up some major players to make use of capacity on its network. In the meantime, TM had also signed up 400,000 customers to its own HSBB-based UniFi service.

Most significantly the HSBB has put Malaysia ahead of countries such as Singapore, Australia and New Zealand in terms of NBN rollout and especially customer connections. Driven by

the High Speed Broad Band (HSBB) project, household broadband penetration in Malaysia has passed 70%, in figures released by the industry regulator, MCMC.

In terms of revenue, in Q1 2015, the three top players registered total mobile service revenue of RM5.39 billion, compared with RM5.4 billion in Q1 2014. This does not include the sales of devices or the fixed-line business. The shortfall came from a decline in voice and Short Message Service (SMS) business. This decline is likely driven by the increasing adoption of smartphones and the sky-rocketing popularity of messaging apps such as Whatsapp, WeChat and KakaoTalk.
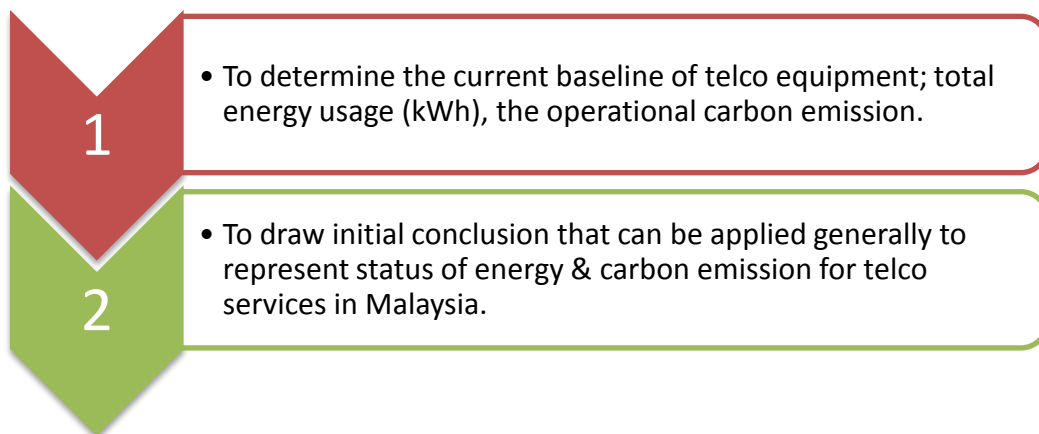
This rapid expansion of the telco services nationwide, whether fixed-line or mobile-service, has seen the energy usage by the industry also increase greatly. It is to quantify the usage of energy in the industry that the Low Carbon Telco ICT Baseline Study has been put into action.

We can see from the background information on the industry activities above that a simple and direct correlation between the number of industry subscribers and the total amount of energy used by the industry would be in-accurate. A better metric for the energy usage could possibly be to benchmark the baseline energy against the total amount of data packets transmitted within the network.

4.3.2 Major Sources of Emissions

The vast majority of Telco sites use electricity bought from the National Grid. These include offices, retail outlet, operations centres, and base transceiver stations (BTSs). The number of BTSs of a network provider is far higher than the total number of offices, retail outlets and operation centres put together.

5 Objective

1 • To determine the current baseline of telco equipment; total energy usage (kWh), the operational carbon emission.

2 • To draw initial conclusion that can be applied generally to represent status of energy & carbon emission for telco services in Malaysia.

6   SCOPE OF WORKS AND TIMELINE

Scope of works and study timeline are as below:

	Cadangan Pelan Kerja Projek ICT Rendah Karbon (Pembangunan Baseline Telco) 2014																									
		2014									2015													2016		
Bil.	Aktiviti	Q2			Q3			Q4			Q1			Q2			Q3			Q4			Q1		
		4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	Penyediaan kertas cadangan untuk kelulusan Jawatankuasa Kerja GICT																								
1.1	- Penyediaan Deraf bajet dan aktiviti parameter utama untuk baseline.																								
1.2	- Pembentangan kertas konsep kepada Jawatankuasa Kerja GICT (SKMM)																								
1.3	- Pelantikan SEDA M'sia oleh SKMM (30% pembayaran)																								
2	Perancangan Awal																								
2.1	Mesyuarat Kick -Off Program dengan semua telco & GICT WG																								
3	Pengumpulan Data & Analisa Data																								
3.1	- Pengumpulan data dari pihak Telco & muktamadkan perjanjian NDA dengan bantuan dan melalui SKMM/MTSFB																								
3.2	- Analisa data, profiling & wujudkan baseline																								
4	Penyediaan Laporan kajian projek perintis & Baseline																								
4.1	- Penyedian Laporan Keseluruhan																								
4.2	- Penyediaan slide dan nota																								
4.3	- Final Report Submission (70% pembayaran)																								
4.4	- Pembentangan kepada Jawatankuasa Kerja GICT																								

Table 6.1 Scope of Work and Study Timeline

7   SCOPE OF STUDY

This study conducted by Sustainable Energy Development Authority (SEDA) Malaysia and The Malaysia Technical Forum Standards Bhd (MTFSB), in collaboration with the Malaysia Communications and Multimedia Commission (MCMC), plans to study the carbon footprint of the Telco Industry. Emphasis was on the carbon footprint of the electrical energy used by the ICT element of the Telco Industry. As such, this project is the Low Carbon Telco ICT Baseline Study.

The members of the Telco Industry were invited to participate in this study. The members are all in the private sector. However only 5 Telcos committed in their participation. They had submitted the total electricity used by the individual companies. The electricity consumed was calculated from the electrical bills for the time period from January 2013 to December 2014, a period of 2 years.

The electricity used information then being used to calculate the amount of carbon emissions released. The National Five Fuel Policy began in the Rancangan Malaysia Ke-8 (RMK8) where the mix of oil, coal, gas, hydro and renewable energy would be the energy types used to generate electricity for the national grid.

The different mix ratio of fuels used by the power plants in Semenanjung, Sabah and Sarawak results in the relationship between the amount of carbon dioxide (CO_2) released for every kilowatthour (kWh) generated by the power plants. The values, from the Clean Development Mechanism (CDM) Baseline Report Malaysia prepared by the Malaysian Green Technology Corporation (MGTC) are given below in Table. 7.1.

Region	Year 2011
Semenanjung	0.747 kg CO_2 / kWh
Sabah	0.531 kg CO_2 / kWh
Sarawak	0.841 kg CO_2 / kWh

Table 7.1 Relationship between the use of energy and the carbon emissions

Sabah has a larger portion of gas turbine power plants and use less coal compared to Semenanjung and Sarawak. As such, the power generated in Sabah is "cleaner" and releases lower amounts of carbon emissions into the environment measured against the power generated in Semenanjung and Sarawak. However it was expected that power generated in Sarawak will be much cleaner followed the completion of Bakun dam.

With the above values, the amount of electricity used by the Telco Industry players was converted into values that show the carbon emissions for the operations of the organisations. The values are not and cannot be a comparative study between the industry members as the different organisations are of widely varying sizes, with vastly different staff manpower, customer base, services (whether fixed, mobile or data) provided and the size of areas (hectares) covered.

The size of the Telco ICT carbon footprint is directly related to the amount of electricity used to operate the equipment. The ICT equipment ranges from being located in the network operations centres, the administration offices, the data centres and the base transceivers stations (BTS).

Many Telco companies often share, lease or rent common areas for the setting up and operations of BTS which may be in remote or rural locations. In this case, the company that pays for the electricity declared the carbon emissions as under their own organisation.

The size of an organisation's carbon footprint is related to the amount of electrical energy consumed.   Reducing the amount of electricity used will see also a reduction in the carbon footprint size.

8   EXCLUSIONS FROM THE STUDY

Growth in the Telco network may be caused an increase in the land area coverage of fixed, mobile and data service. It could also be increased by the growth in clients/customers using the services provided in the Telco Industry. Growth then is linked to increase in energy usage. This study only looks at the carbon footprint from the electricity usage in the Telco Industry and not the other carbon releasing activities of the Telco Industry.

The direct and controllable sources of carbon emissions from the operations in the Telco Industry are electricity, vehicle fleet, generators and refrigerant gas.

Here, in this chapter, the other sources of emissions are not covered in this study. A vehicle fleet, possibly made up of light, medium and heavy vehicles, may be powered by petrol or diesel engines. The vehicles would release carbon into the atmosphere when in operation. In Malaysia, the transport sector contributed almost 25% of the national carbon emissions in year 2013. Of the almost 25% above, heavy vehicles (trucks and buses) are responsible for about 25% of carbon emissions from road transport.

In rural areas, the power supply from the utilities may perhaps be intermittent. BTSs operating in these areas might have available a back-up generator for power supply. To power the generator, the burning of diesel will release carbon emissions. Not very efficient machines, the generators commonly release 800 – 900 grammes of carbon per kWh.

Some Telco Industry members have paired PV and diesel generators for power supply in areas where the utility supply is often interrupted and/or disrupted. This hybrid back-up power supply is recommended and encouraged. The power from the PV will help to off-set the carbon emissions from the diesel generator.

On-site electricity generation is an option that can be further researched. This might possibly be in the form of photo-voltaic (PV) or micro-hydroelectric renewable energy (RE) electricity generator. A pico-hydroelectric electricity generator might not generate sufficient energy for the air-conditioning system. These RE sources could perhaps be regarded as reducing the total amount of electric energy drawn from the utilities energy network. For powering base transceiver stations (BTS) in rural areas, a combined PV & micro-hydro electric generator is a viable possibly at sites with access to fast –flowing water sources. A water sources with a high head (height difference between water level and generator level) is also a possible source for locating a micro-hydroelectric generator.

The direct emissions from a Refrigerant and Air-Conditioning (RAC) system are related to the loss of refrigerant from the system through leakage, during maintenance or during end-of-life decommissioning. Many refrigerants are very powerful GHGs, so even a small leak can have a significant environmental impact. It is estimated that for the average RAC systems, the GHG from leakage is almost 20% of the total GHG from the electrical energy to operate the RAC yearly.

9 TELCO INFORMATION AND DESCRIPTION

9.1 General Review

In total, 5 telcos took part in the study. There are just under a total of 12 telcos in the country at present. Of these 5, only 3 gave a full 2 years compilation of their energy consumption of both the commercial office buildings and network base stations.

9.2 Offices

The commercial office building is where operations and administration of the telco industry are based. For the larger telco, there are administration buildings in various states and a large amount of service centres throughout the districts and towns. For the smaller, telcos, they mainly have 1 main administration building and service centers throughout the country.

Figure 9.1 A Telco payment outlet

Below is a list of the types of energy consuming equipment in telcos. The equipment is classified under two categories, the first being ICT equipment and the second utilities to operate the ICT centres.

Typical ICT Equipment in Telco Buildings:

1. Servers
2. Computers
3. Routers

Typical Utilities in Telco Buildings:

1. Air Conditioning System
2. Lighting
3. Computers
4. Television
5. Paging System
6. Printers

9.3   Base Station

Figure 9.2 Base Transceiver Station

Base transceiver stations (BTS) are located throughout the country. The majority in highly-dense areas and fewer in rural areas. Most BTSs are located along major highways. In urban areas, BTSs are sometimes located on top of buildings such as shown in figure 9.3.

Figure 9.3 Base Transceiver Station on building

BTSs usually have the following types of equipment as listed below. The equipment again are classified under two categories, ICT equipment and utilities to operate the BTSs.

Typical ICT Equipment in Base Station:

1. Power Amplifier
2. Transceivers
3. Multiplexers & De-multiplexers
4. Antennas
5. Combiner

Typical Utilities in Base Station:

1. Air Conditioning Equipment
2. Back-up Diesel Generators Solar & Storage Batteries
3. Lighting

10 RESULT AND FINDINGS

10.1 Annual Energy Consumption

The figure 10.1 below shows the energy used by the 5 companies for the year 2013 and 2014. There is a very large difference between the company with the smallest and the biggest energy bills.

In Telco 1, there is a total of 3% lower energy consumption in 2014 when compared to 2013. Telco 1 might have implemented energy efficiency measures in 2013. This might have caused the energy consumed to be lowered in 2014.

In Telco 2, there is a total of 11% higher consumption in 2014 when compared to 2013. There might have been a rise in the customer base in 2014. To service this higher number of customers, the network might have needed to be upgraded in capacity.

In Telco 3, there is 1% rise in the energy usage in 2014 when compared to 2013. In Telco 4, no data was received in 2013. In Telco 5, the data for 2013 was similar to 2014.
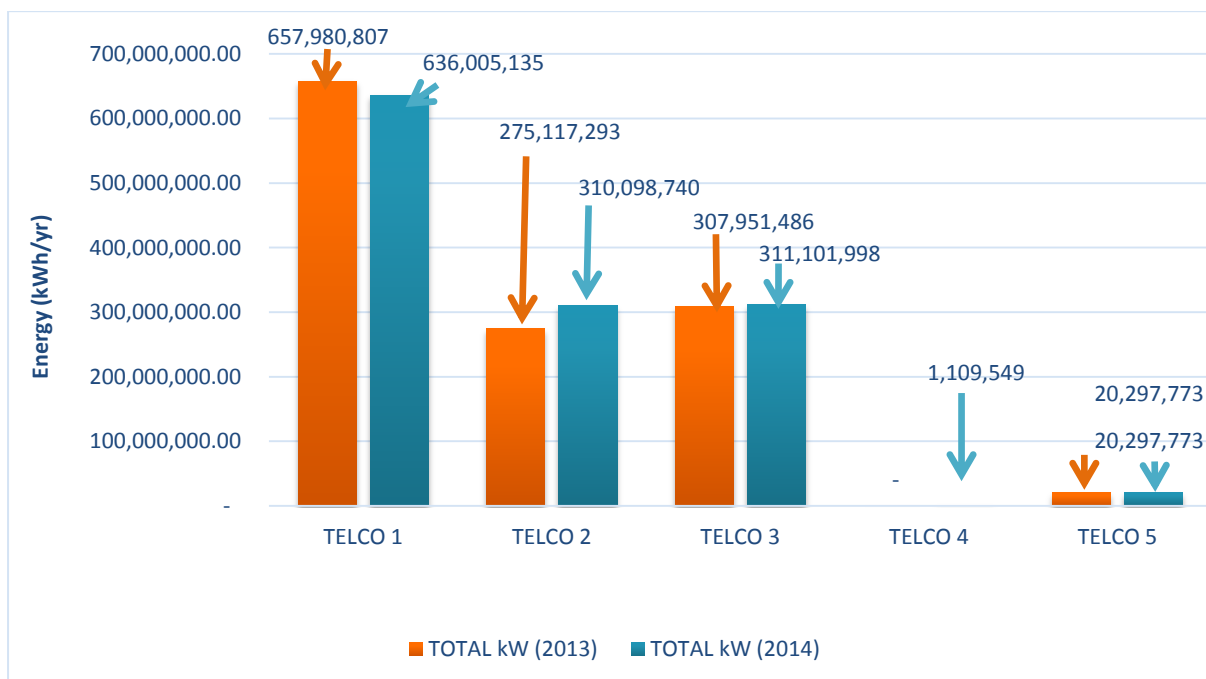

Figure 10.1 Energy consumption by the 5 Telco companies in the year 2013 and 2014

10.2 Carbon Emissions per year

From the chart in figure 10.2.1, it can be seen that the carbon emissions for telco 1 and 3 in 2013 are higher than they are in 2014, but for telco 2, it was lower.
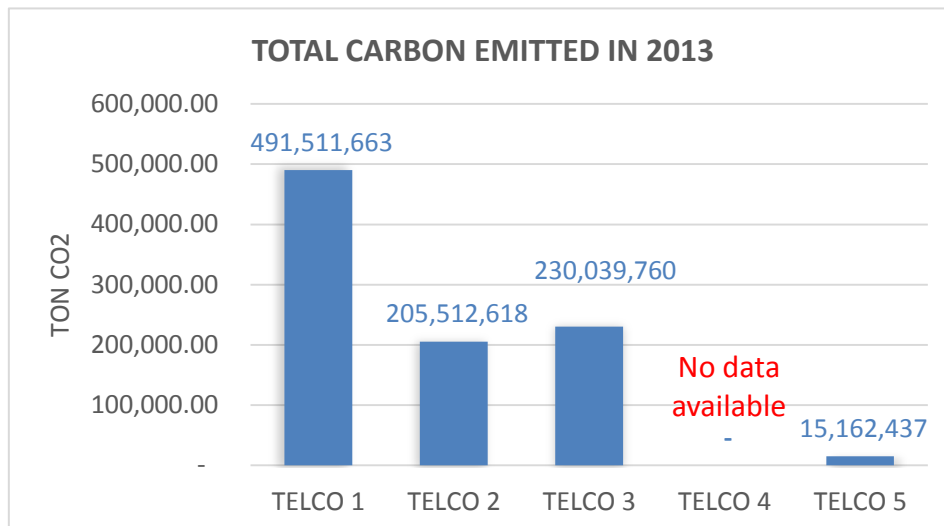

TOTAL CARBON EMITTED IN 2013

491,511,663
205,512,618
230,039,760
No data available
15,162,437

TON CO2

TELCO 1   TELCO 2   TELCO 3   TELCO 4   TELCO 5

Figure 10.2.1 Carbon Footprint of the 5 Telco companies in the year 2013

TOTAL CARBON EMITTED IN 2014

475,095,836
231,643,759
232,393,192
828,833
15,162,437

TON CO2

TELCO 1   TELCO 2   TELCO 3   TELCO 4   TELCO 5
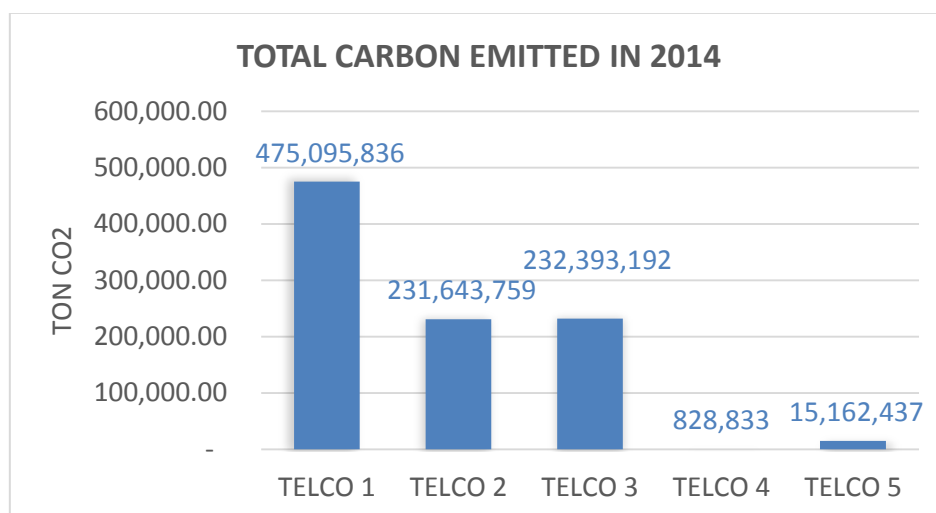
Figure 10.2.2 Carbon Footprint of the 5 Telco companies in the year 2014

10.3 Carbon Emissions by Company per year

The pie chart Figure 10.3.1 shows the carbon footprint share breakdown for the Telco Industry 2013. 98% of the carbon emissions of the Telco Industry sector are generated by just 3 companies.
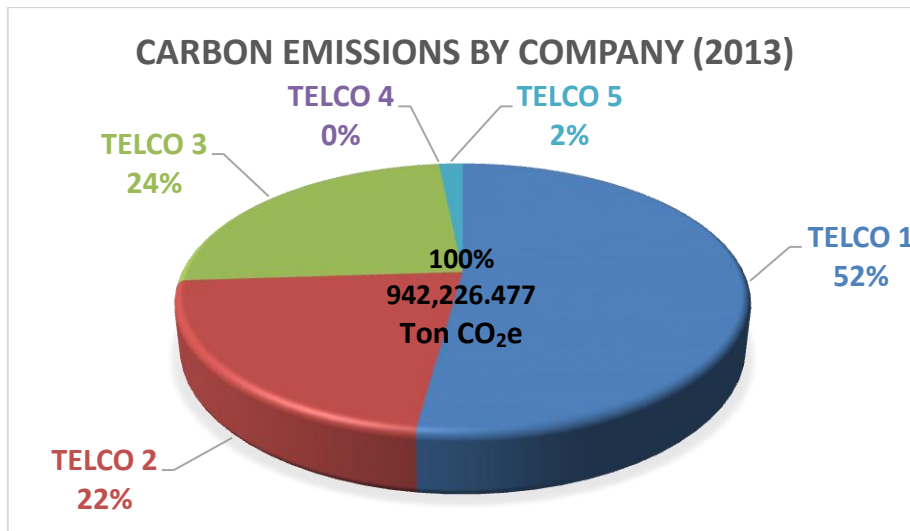

Figure 10.3.1 shows the carbon footprint share breakdown for the Telco Industry 2013.

The pie chart Figure 10.3.2 shows the carbon footprint share breakdown for the Telco Industry 2014. 98% of the carbon emissions of the Telco Industry sector are generated by just 3 companies. This is unaffected by the energy efficiency measures, the increase in customer number and other possible causes that affect the energy consumption, which affects the carbon footprint size directly.
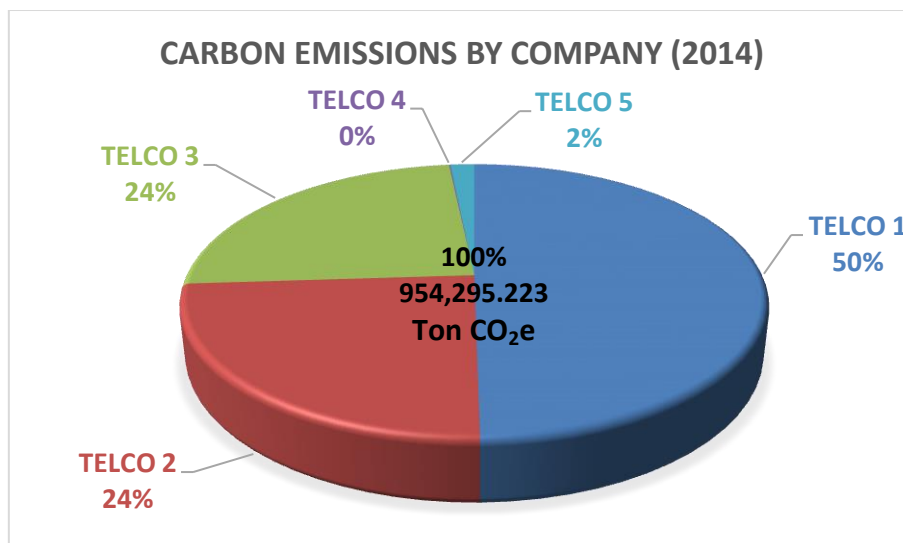

Figure 10.3.2 shows the carbon footprint share breakdown for the Telco Industry 2015.

10.4 Building and Network Energy Consumption per year

The bar graph Figure 10.4.1 and 10..4.2 below shows the amount of energy consumed to power the network is very much greater than the energy used for the buildings.
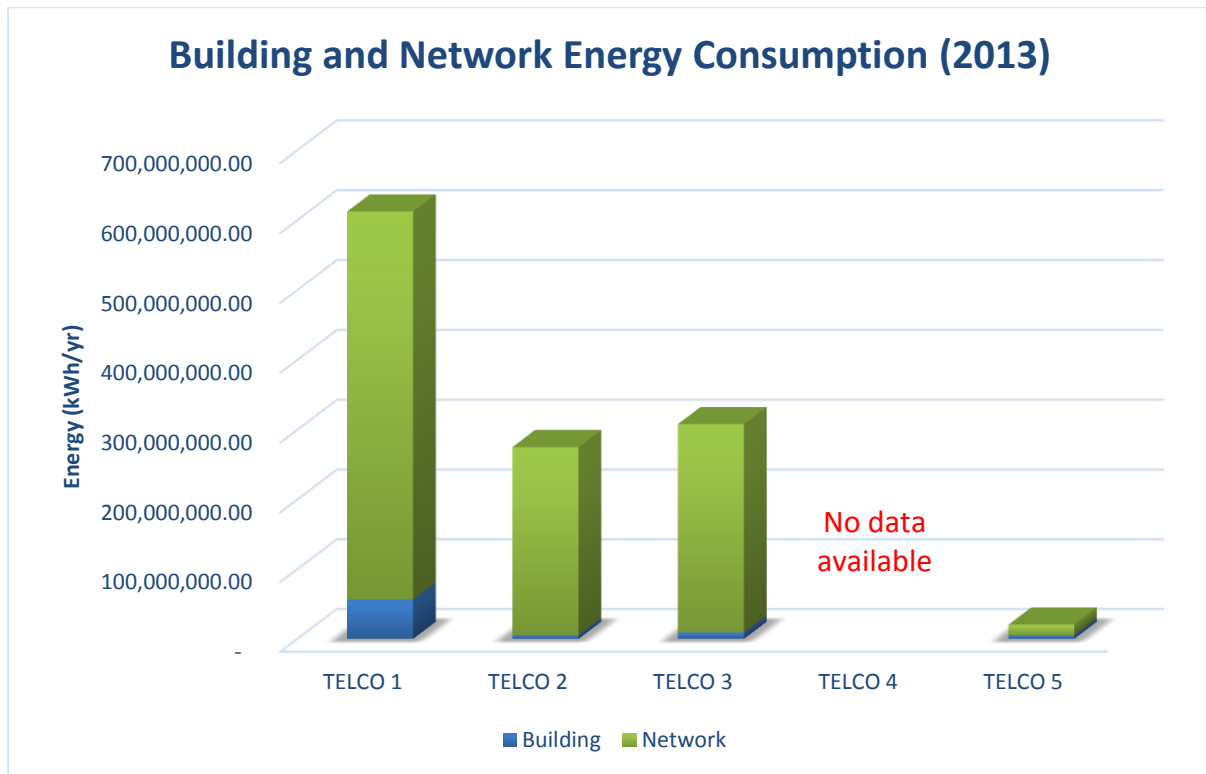

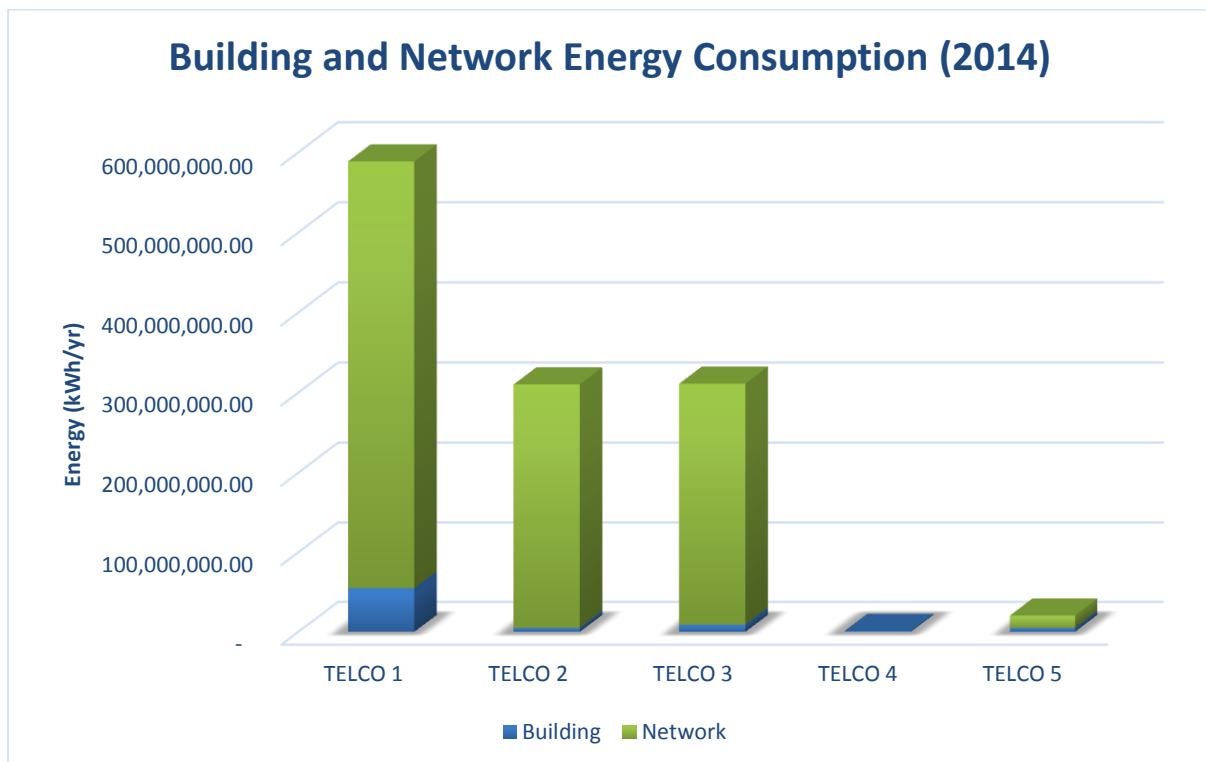**Figure 10.4.1 Energy usage comparison between the buildings and the network**

Figure 10.4.2 Energy usage comparisons between the buildings and the network

10.5 Total Energy Consumption by Company per year

The pie chart 10.5.1 and 10.5.2 below shows the amount of energy consumed. For both year 2013 and 2014, the highest consumption is by Telco 1.
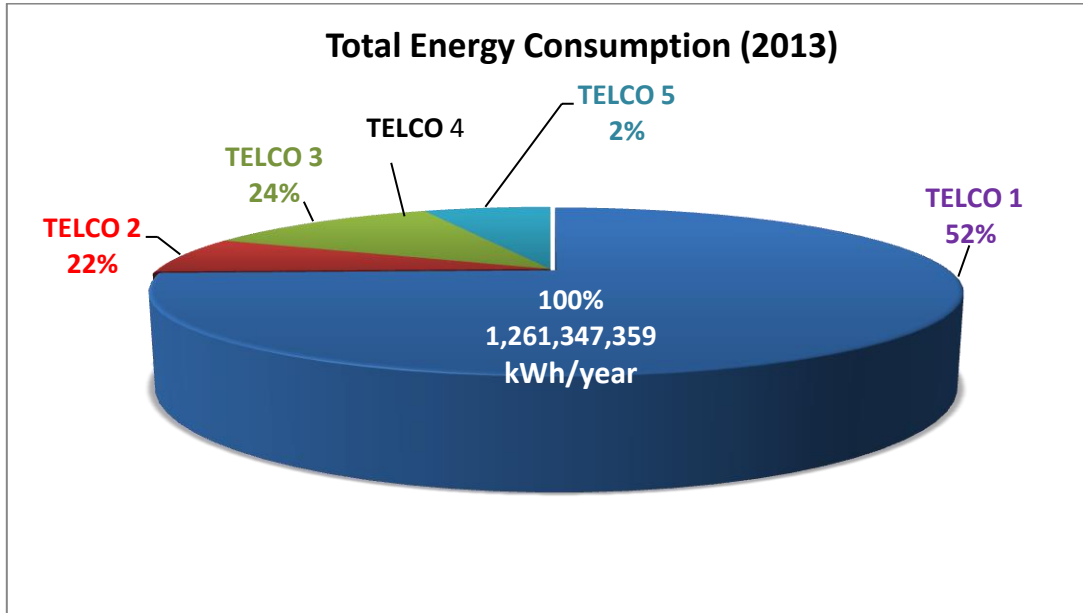
Total Energy Consumption (2013)

TELCO 5
2%

TELCO 4

TELCO 3
24%

TELCO 2
22%

TELCO 1
52%

100%
1,261,347,359
kWh/year

Figure 10.5.1 Energy usage comparisons between the buildings and the network

Total Energy Consumption (2014)

TELCO 5
2%

TELCO 4
0.08%

TELCO 3
24%

TELCO 2
24%

TELCO 1
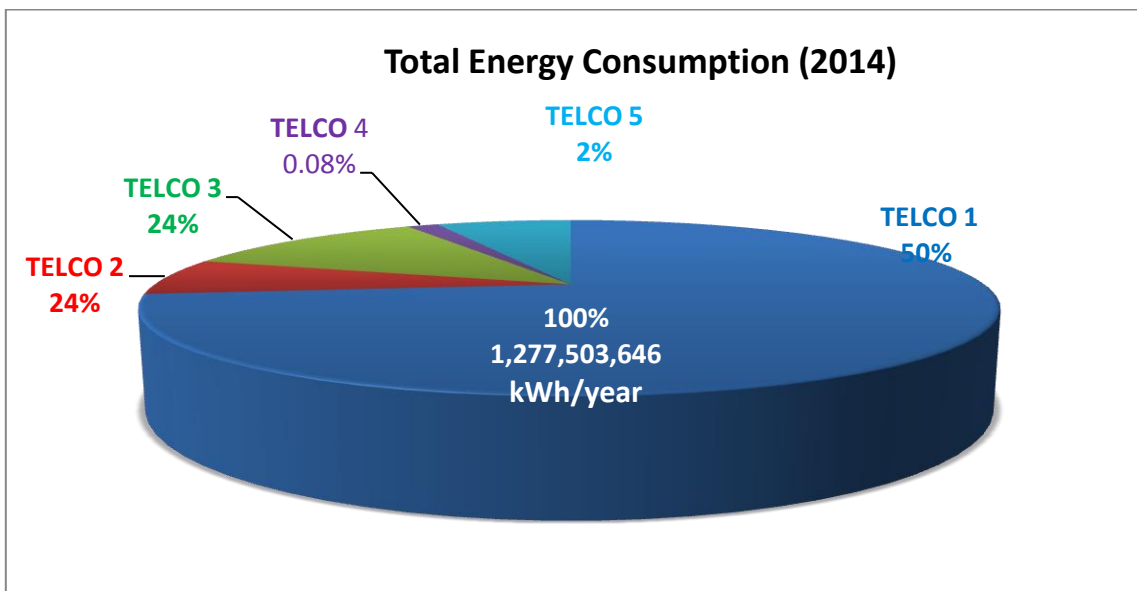50%

100%
1,277,503,646
kWh/year

Figure 10.5.2 Energy usage comparisons between the buildings and the network

11 SUMMARY

The electrical energy information made available for the study comes from organisations of widely-different sizes by staff manpower, client base, services (fixed, mobile and data) provided and size of area under the organisation's network.

The electricity consumed does not appear to be a suitable metric for carbon emissions measurement. Further improvement on a baseline study can be centred on the amount of data packets sent in the network.

From the analysis, Telcos energy consumption and CO_2e can be summarized as below:

Telcos	Energy Consumption (kWh/year)		Ton CO_2e	
	2013	2014	2013	2014
Telco 1	657,980,807	636,005,135	491,511.663	475,095.836
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Table 11 Summary of Energy Consumption and Carbon Emission

From the above table, total energy consumption for both year 2013 and 2014 is 1,261,347,359 kWh/year and 1,277,503,646 kWh/year. While carbon emission contribution for 2013 and 2014 is 942,226.477 and 954,295.223 Ton CO_2e. However different Telcos have their own different system and operations, energy consumption and carbon emission collected here represents baseline for a wide range of Telcos in Malaysia.

12 APPENDICES

Appendix 1 Telco Energy Use by Section
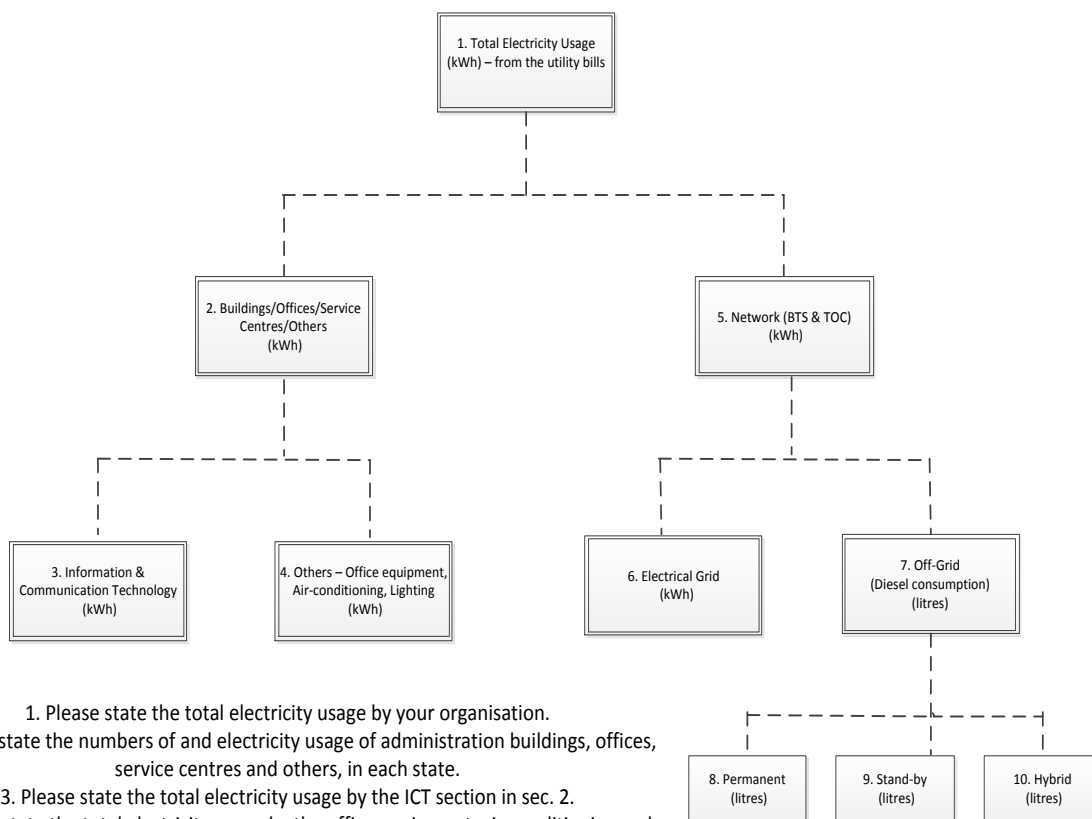
1. Please state the total electricity usage by your organisation.
2. Please state the numbers of and electricity usage of administration buildings, offices, service centres and others, in each state.
3. Please state the total electricity usage by the ICT section in sec. 2.
4. Please state the total electricity usage by the office equipment, air-conditioning and lighting in sec. 2.
5. Please state the numbers of and electricity usage of network centres, BTS & TOC and others, in each state
6. Please state the total electricity usage by the Network elements in sec. 5.
7. Please state the diesel consumption by the Off-Grid elements in sec. 7.
8. Please state the diesel usage by the purpose of usage in sec. 8, 9 and 10.

Appendix 2 Telco Baseline Study Form

LOW CARBON ICT PROJECT
TELCO EQUIPMENT BASELINE STUDY

COMPANY INFORMATION	
Company Name	
Address	
Person-incharge	
Division	
Contact Info (Tel & Fax)	

1. TOTAL COMPANY'S ELECTRICITY USAGE	
Total Electricity Usage (kWh) 2013	-
Total Carbon Emission (kg CO2)	-
Total Chilled-Water Usage (RT-h) *if available	-
Total Diesel (litre) *if available	-

2. BUILDING/OFFICE/SERVICE CENTRE/OTHERS INFORMATION (please refer "2.Building" worksheet)	
Total No. of Building/Office/Service Centre	
Total Electricity Usage (kWh)	
Total Electricity Bill (RM)	
Total Chilled-Water Usage (RT-h) *if available	

3. ICT INFORMATION (OPTIONAL)	
Total Electricty Usage (kWh)	

4. OTHERS -OFFICE EQUIPMENT, AIR-CONDITIONING, LIGHTING (OPTIONAL)	
Total Electricity Usage (kWh)	

5. NETWORK (BTS & TOC) INFORMATION (please refer "5.Network" worksheet)	
Total No. of BTS &TOC	
Total Energy Usage (kWh)	
Total Electricity Bill (RM) *if available	
Total Diesel (litre) *if available	

6. ON GRID/ELECTRICITY SUPPLY (OPTIONAL)	
Total Electricity Usage (kWh)	

7. OFF-GRID/REMOTE AREA (OPTIONAL)	
Total Diesel Consumption (litre)	