



NOTA **TEKNIKAL** *TECHNICAL* *NOTES*

1.0 Skop & Liputan

Penyusunan MySEEA PSUT Tenaga 2016 hingga 2021 adalah selaras dengan metodologi yang ditetapkan dalam Manual SEEA Central Framework 2012, SEEA Energy and International Recommendations for Energy Statistics (IRES) yang dikeluarkan oleh United Nations (UN). Akaun ini juga menggunakan prinsip residen yang digariskan dalam System of National Accounts (SNA). Klasifikasi produk tenaga yang digunakan adalah berdasarkan Standard International Energy Product Classification (SIEC) yang turut diguna pakai oleh United Nations Statistics Division (UNSD) dan International Energy Agency (IEA). Unit fizikal yang digunakan dalam akaun ini adalah kilo tonne of oil equivalent (ktoe).

2.0 Konsep & Definisi

2.1 Tenaga daripada Alam Semula Jadi

Tenaga daripada alam semula jadi merangkumi aliran tenaga daripada pergerakan dan perolehan tenaga dari alam sekitar oleh residen unit ekonomi. Aliran ini termasuk tenaga daripada mineral (cth: minyak, gas asli, arang batu, dll.), dan input daripada sumber tenaga boleh diperbaharui (cth: solar, hidro, biomass, dll.).

2.2 Produk Tenaga

Produk tenaga merujuk kepada produk yang digunakan (atau mungkin digunakan) sebagai sumber tenaga. Ia merangkumi:

1.0 Scope & Coverage

The compilation of MySEEA PSUT Energy 2016 to 2021 are in accordance with methodology set forth in the SEEA Central Framework Manual 2012, SEEA Energy and International Recommendations for Energy Statistics (IRES) published by United Nations (UN). This account also uses resident principle which is outlined in the System of National Accounts (SNA). The classification of energy products used are based on the Standard International Energy Product Classification (SIEC) which is also adopted by the United Nations Statistics Division (UNSD) and the International Energy Agency (IEA). Physical units used in this account is kilo tonne of oil equivalent (ktoe).

2.0 Concept & Definition

2.1 Energy from Natural Inputs

Energy from natural inputs comprise flows of energy from the removal and capture of energy from the environment by resident economic units. These flows include energy from mineral (e.g. oil, natural gas, coal, etc), and inputs from renewable energy sources (e.g. solar, hydro, biomass, etc).

2.2 Energy Products

Energy products refer to products that are used (or might be used) as a source of energy. It comprises:

- i. Bahan api yang dihasilkan/dijana oleh unit ekonomi (termasuk isi rumah) dan digunakan (atau mungkin digunakan) sebagai sumber tenaga;
- ii. Elektrik yang dijana oleh unit ekonomi (termasuk isi rumah); dan
- iii. Haba yang dijana dan dijual kepada pihak ketiga oleh unit ekonomi. Produk tenaga termasuk tenaga daripada biomas dan sisa pepejal yang dibakar untuk pengeluaran elektrik dan/atau haba. Sesetengah produk tenaga boleh digunakan untuk tujuan bukan tenaga.

2.3 Transformasi Produk Tenaga

Transformasi merupakan satu proses menghasilkan produk tenaga lain menggunakan produk tenaga daripada sumber semula jadi. Sebagai contoh, produk arang batu (diekstrak oleh sektor Perlombongan & pengkuarian) digunakan dalam sektor utiliti untuk menghasilkan tenaga elektrik.

- i. *Fuels that are produced/generated by an economic unit (including households) and are used (or might be used) as sources of energy;*
- ii. *Electricity that is generated by an economic unit (including households); and*
- iii. *Heat that is generated and sold to third parties by an economic unit. Energy products include energy from biomass and solid waste that are combusted for the production of electricity and/or heat. Some energy products may be used for non-energy purposes.*

2.3 Transformations of Energy Products

Transformation is a process of producing other energy products using energy products from natural sources. For example, coal products (extracted by Mining & quarrying sector) are used in the utility sector to produce electricity.

2.4 Natural Gas

Natural gas is a mixture of gaseous hydrocarbons, primarily methane, but generally also including ethane, propane and higher hydrocarbons in much smaller amounts and some noncombustible gases such as nitrogen and carbon dioxide.

The majority of natural gas is separated from both "non-associated" gas originating from fields producing hydrocarbons only in gaseous form, and "associated" gas produced in association with crude oil.

The separation process produces natural gas by removing or reducing the hydrocarbons other than methane to levels which are acceptable in the marketable gas. The natural gas liquids (NGL) removed in the process are distributed separately.

Natural gas also includes methane recovered from coal mines (colliery gas) or from coal seams (coal seam gas) and shale gas. When distributed it may also contain methane from anaerobic fermentation or the methanation of biomass.

Natural gas may be liquefied (LNG) by reducing its temperature in order to simplify storage and transportation when production sites are remote from centres of consumption and pipeline transportation is not economically practicable.

2.5 Liquefied Natural Gas (LNG)

Liquid or liquefied hydrocarbons converted from natural gas in separation facilities or gas processing plants. Natural gas liquids include ethane, propane, butane (normal and iso-), (iso) pentane and pentanes plus (sometimes referred to as natural gasoline or plant condensate).

2.6 Crude Oil

Crude oil refers to a mineral oil of fossil origin extracted by conventional means from underground reservoirs, and comprises liquid or near-liquid hydrocarbons and associated impurities such as sulphur and metals. Crude oil exists in the liquid phase under normal surface temperature and pressure, and usually flows to the surface under the pressure of the reservoir. This is termed "conventional" extraction. Crude oil includes condensate from condensate fields, and "field" or "lease" condensate extracted with the crude oil. The various crude oils may be classified according to their sulphur content ("sweet" or "sour") and API gravity ("heavy" or "light"). There are no rigorous specifications for the classifications but a heavy crude oil may be assumed to have an API gravity of less than 20° and a sweet crude oil may be assumed to have less than 0.5% sulphur content.

2.7 Coal & Coke

Coal & coke includes the solid, cellular, infusible material remaining after the carbonisation of certain coals. Various cokes are defined according to the type of coal carbonised and their conditions of carbonisation or use: coke oven coke, gas coke, coke breeze and semi cokes.

2.8 Petrol

Petroleum distillate used as fuel in spark-ignition internal combustion engines. Distillation range is within 30°C and 250°C.

2.9 Diesel

Diesel distillation falls within 200°C to 340°C. Diesel fuels for high-speed diesel engines (automotive) are more critical of fuel quality than diesel for stationary and marine diesel engines. Marine oil usually consists of a blend of diesel oil and some residual (asphaltic) material.

2.10 Fuel Oil

Fuel oil comprises residual fuel oil and heavy fuel oil. Residual fuel oils have a distillation range of 350°C to 650°C and a kinematic viscosity in the range 6 to 55 cSt at 100°C. Their flash point is always above 60°C and their specific gravity is above 0.95. Heavy fuel oil is a general term describing a blended product based on the residues from various refinery processes.

Other names commonly used to describe fuel oil include: bunker fuel, bunker C, fuel oil No.6, industrial fuel oil, marine fuel oil and black oil. Residual and heavy fuel oil are used in medium to large industrial plants, marine applications and power stations in combustion equipment such as boilers, furnaces and diesel engines. Residual fuel oil is also used as fuel within the refinery.

2.11 Liquefied Petroleum Gases (LPG)

LPG refers to liquefied propane (C₃H₈) and butane (C₄H₁₀) or mixtures of both. Commercial grades are usually mixtures of the gases with small amounts of propylene, butylene, isobutene and isobutylene stored under pressure in containers.

The mixture of propane and butane used varies according to purpose and season of the year. The gases may be extracted from natural gas at gas separation plants or at plants re-gasifying imported liquefied natural gas. They are also obtained during the refining of crude oil. LPG may be used for heating and as a vehicle fuel.

2.12 Kerosene

Kerosene refers to mixtures of hydrocarbons in the range C₉ to C₁₆ and distilling over the temperature interval 145°C to 300°C, but not usually above 250°C and with a flash point above 38°C. The chemical compositions of kerosene depend on the nature of the crude oils from which they are derived and the refinery processes that they have undergone. Kerosene obtained from crude oil by atmospheric distillation are known as straight-run kerosene. Such streams may be treated by a variety of processes to produce kerosene that are acceptable for blending as jet fuels.

Kerosene are primarily used as jet fuels. They are also used as domestic heating and cooking fuels, and as solvents. Kerosene may include components or additives derived from biomass when blended.

2.13 Aviation Turbine Fuel (ATF)

ATF refers to light hydrocarbons for use in aviation turbine power units, distilling between 100°C and 250°C. They are obtained by blending kerosene and gasoline or naphtha in such a way that the aromatic content does not exceed 25 per cent in volume, and the vapour pressure is between 13.7 kPa and 20.6 kPa. Gasoline-type jet fuel is also known as “aviation turbine fuel”.

2.14 Aviation Gasoline (AV Gas)

AV gas prepared especially for aviation piston engines with additives which assure performance under flight conditions. Aviation gasolines are predominantly alkylates (obtained by combining C4 and C5 isoparaffins with C3, C4 and C5 olefins) with the possible addition of more aromatic components including toluene. The distillation range is 25°C to 170°C.

2.15 Non Energy Products

Non energy products mainly refers to naphtha bitumen and lubricants, which are obtained by the refinery process from petroleum but used for non-energy purposes. Naphtha is a refined or partly refined light distillate, which is further, blended into motor gasoline or used as feed-stock in the chemical industry. Bitumen is a viscous liquid or solid, non-volatile and possesses waterproofing and adhesive properties. Lubricating oil is used for lubricating purposes and has distillation range within 380°C to 500°C.

2.16 Refinery Gas

Refinery gas refers to the gas released during the distillation of crude oil and comprises methane, ethane, propane and butane. Most refinery gas is retained in the refinery and used as fuel in plant operations.

2.17 Hydropower

Hydropower is electricity generation using the power of falling water.

2.18 Solar

Solar refers to electricity that can be generated through different processes such as: the conversion of energy contained in falling or streaming water, wind or waves; the direct conversion of solar radiation through photovoltaic processes in semiconductor devices (solar cells); or by the combustion of fuels.

2.19 Biomass

Biomass refers to waste material from plants or animals that is not used for food or feed. It can be waste from farming (rice husks, rice stems, palm fronds, coconut shells) or horticulture (yard waste), food processing (corn cobs), animal farming (manure rich in nitrogen and phosphorus), or human waste from sewage plants.

2.20 Biogases

Biogases refers to gases arising from the anaerobic fermentation of biomass and the gasification of solid biomass (including biomass in wastes). The biogases from anaerobic fermentation are composed principally of methane and carbon dioxide and comprise landfill gas, sewage sludge gas and other biogases from anaerobic fermentation. Biogases can also be produced from thermal processes (by gasification or pyrolysis) of biomass and are mixtures containing hydrogen and carbon monoxide (usually known as syngas) along with other components. These gases may be further processed to modify their composition and can be further processed to produce substitute natural gas.

The gases are divided into two groups according to their production: biogases from anaerobic fermentation and biogases from thermal processes. They are used mainly as a fuel but can be used as a chemical feedstock.

2.21 Electricity

Electricity refers to the transfer of energy through the physical phenomena involving electric charges and their effects when at rest and in motion.

Electricity can be generated through different processes such as: the conversion of energy contained in falling or streaming water; the direct conversion of solar radiation through photovoltaic processes in semiconductor devices (solar cells); or by the combustion of fuels.

2.22 Eksport dan Import

Eksport merujuk kepada jumlah tenaga yang dijual oleh residen kepada bukan residen manakala Import pula meliputi jumlah tenaga yang dibeli daripada bukan residen oleh residen.

2.22 Imports and Exports

Exports refer to the amount of energy sold by a resident to a nonresident while the Imports cover the amount of energy purchased from non-resident by the resident.

2.23 Isi Rumah

Isi rumah meliputi seorang atau sekumpulan orang yang bersaudara dan/atau orang yang tidak bersaudara yang biasanya tinggal bersama dan membuat peruntukan yang sama untuk makanan dan keperluan hidup yang lain.

2.23 Households

Households comprises a person or a group of related and/or unrelated persons who usually live together and make common provisions for food and other essentials of living.

2.24 Analisis Intensiti

Analisis intensiti mengukur kecekapan tenaga yang digunakan bagi menghasilkan satu unit output mengikut sektor ekonomi.

Intensiti tenaga =
$$\frac{\text{Penggunaan tenaga (toe)}}{\text{Nilai ditambah (RM) pada harga malar}}$$

2.25 Analisis Pengganda

Analisis pengganda mengukur kesalingbergantungan secara langsung dan tidak langsung antara satu sektor dengan keseluruhan ekonomi yang melibatkan pembelian dan penjualan antara sektor.

3.0 Klasifikasi Sektor

Pengkelasan sektor ekonomi adalah berdasarkan Piawaian Klasifikasi Industri Malaysia (MSIC) 2008 Ver. 1.0. Bagi tujuan laporan ini, ia dikategorikan kepada lima sektor utama seperti berikut:

- i. Pertanian;
- ii. Perlombongan & pengkuarian;
- iv. Pembuatan;
- v. Pembinaan; dan
- vi. Perkhidmatan.

2.24 Intensity Analysis

Intensity analysis measure the energy efficiency used to produce one unit output by economic sector.

*Energy intensity =
$$\frac{\text{Energy Use (toe)}}{\text{Value Added (RM) at constant prices}}$$*

2.25 Multiplier Analysis

Multiplier analysis measures directly and indirectly the interdependence between one sector and the rest of the economy that involves in purchasing and selling between the sectors.

3.0 Sectors Classification

The classification of the economic sector is according to the Malaysia Standards Industrial Classification (MSIC) 2008 Ver. 1.0. For the purpose of this report, the classification is categorised into five main sectors as follows:

- i. Agriculture;*
- ii. Mining & quarrying;*
- iii. Manufacturing;*
- iv. Construction; and*
- v. Services.*

4.0 Sumber Data

Penyediaan MySEEA PSUT-Tenaga adalah merupakan sumber data sekunder iaitu Statistik Imbangan Tenaga Nasional (NEB) yang disusun oleh Suruhanjaya Tenaga.

4.0 Data Source

The preparation of MySEEA PSUT-Energy is as based on secondary data sources namely National Energy Balance (NEB) statistics compiled by the Energy Commission.

5.0 Pembundaran

Perbezaan mungkin berlaku pada jumlah subkomponen dan jumlah besar disebabkan pembundaran angka.

5.0 Rounding

Differences may occur between the sum of sub-components and the totals due to rounding figure.

6.0 Singkatan/ Abbreviations

ATF	<i>Aviation Turbine Fuel</i>
cth	<i>contoh</i>
dll.	<i>dan lain lain</i>
e.g.	<i>example</i>
etc	<i>etcetera</i>
i.e.	<i>that is</i>
IEA	<i>International Energy Agency</i>
IPP	<i>Independent Power Producers</i>
IRES	<i>International Recommendations for Energy Statistics</i>
ISIC	<i>International Standard Industrial Classification</i>
ktoe	<i>kilo tonne of oil equivalent</i>



LNG	Gas Asli Cecair/ <i>Liquefied Natural Gas</i>
LPG	Gas Petroleum Cecair/ <i>Liquefied Petroleum Gas</i>
MSIC	Piawaian Klasifikasi Industri Malaysia/ <i>Malaysia Standard Industrial Classification</i>
NEB	Imbangan Tenaga Nasional/ <i>National Energy Balance</i>
PSUT	Jadual Fizikal Penawaran & Penggunaan/ <i>Physical Supply & Use Table</i>
RM	Ringgit Malaysia
SEB	<i>Sarawak Energy Bhd.</i>
SEEA	<i>System of Environmental-Economic Accounting</i>
SESB	<i>Sabah Electricity Sdn. Bhd.</i>
SIEC	<i>Standard International Energy Product Classification</i>
SNA	<i>System of National Accounts</i>
SUT	<i>Supply & Use Table</i>
TNB	<i>Tenaga Nasional Berhad</i>
Toe	<i>tonne of oil equivalent</i>
UN	<i>United Nations</i>
UNSD	<i>United Nations Statistics Division</i>

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