



## Annex 1

# Definition of Lao PDR's Energy Products and Flows

The definition of energy products and flows below explains the flow of energy balance table in Annex 4.

### 1. Energy Products

Energy Products	Definition
1. Coal	This includes all coal, i.e. solid fossil fuel consisting of carbonized vegetal matter such as hard coal (cooking coal, other bituminous coal, sub-bituminous coal), anthracite, lignite, and peat.
4. Petroleum Products	These comprise motor gasoline, aviation gasoline, naphtha, jet fuel, kerosene, gas/diesel oil, fuel oil, LPG, refinery gas, ethane, white spirit, lubricants, bitumen, paraffin waxes, petroleum coke, and other petroleum products.
4.1 Motor Gasoline	This is a mixture of some aromatics (e.g. benzene and toluene) and aliphatic hydrocarbons in the C <sub>5</sub> to C <sub>12</sub> range. The distillation range is 25°C to 220°C. Motor gasoline may also contain bio-gasoline products.
4.3 Jet Fuel	This is a blend of kerosene suited to flight conditions, with specifications such as freezing point. The specifications are set down by a small number of national standards committees, most notably ASTM International (USA), Ministry of Defence UK (MOD UK), and GOST (Russia).
4.5 Gas/Diesel Oil	Diesel oils are middle distillates, predominantly of carbon range C <sub>11</sub> to C <sub>25</sub> and with a distillation range of 160°C to 420°C. These products comprise of road diesel and heating or other gas oils.
4.6 Fuel Oil	This comprises residual fuel oils and heavy fuel oils which are usually blended products based on residues from various refinery, distillation, and cracking processes. Residual fuel oil A-5 has a distillation range of 350°C to 650°C and a kinematic viscosity in the range 6 to 55 centistokes (cSt) at 100°C. Their flash point is always above 60°C and their specific gravity is above 0.95.

Energy Products	Definition
4.7 LPG	LPG refers to liquefied propane (C <sub>3</sub> H <sub>8</sub> ) and butane (C <sub>4</sub> H <sub>10</sub> ) or mixtures of both. Commercial grades are usually mixtures of the gases with small amounts of propylene, butylene, isobutane, and isobutylene stored under pressure in containers.
4.10 Other Petroleum Products	These comprise lubricants, bitumen, white spirits and special boiling points industry spirits, paraffin wax, petroleum coke, and other products.
6. Hydro	This refers to the energy content of the electricity produced in hydro power plants. Hydro output excludes output from pumped storage plants.
8. Geothermal, Solar, etc.	<p>Electricity from solar photovoltaics refers to electricity produced by the direct conversion of solar radiation through photovoltaic processes in semiconductor devices (solar cells), including concentrating photovoltaic systems.</p> <p>Heat from concentrating solar thermal refers to high temperature heat produced from solar radiation captured by concentrating solar thermal systems. The high temperature heat can be transformed to generate electricity or drive chemical reactions, or it can be used directly in industrial processes.</p> <p>Heat from non-concentrating solar thermal refers to low-temperature heat produced from solar radiation captured by non-concentrating solar thermal systems.</p>
9. Others (Combustible Renewables and Waste)	<p>These are composed of solid biomass, liquid biomass, biogas, industrial waste, and municipal waste. Biomass is defined as any plant matter used directly as fuel or converted into fuels (e.g. charcoal) or electricity and/or heat. These include fuelwood, wood waste, bagasse, charcoal, other biomass, and biogas.</p> <p>Municipal waste comprises wastes produced by the residential, commercial, and public service sectors that are collected by local authorities for disposal in a central location for the production of heat and/or power. Hospital waste is included in this category.</p>
10. Electricity	This shows final consumption and trade in electricity, which is accounted at the same heat value as electricity in final consumption (i.e. 1 MWh = 0.086 toe).
12. Total	Defined as 1+3+4+6+9+10

LPG = liquefied petroleum gas, MWh = megawatt hour, toe = ton of oil equivalent, UK = United Kingdom, USA = United States of America.

Source: International Standard of Energy Balance Table Format. IEA, IEEJ, 2018.

## 2. Energy Flows

Energy Flows	Definition
1. Indigenous Production	<p>This refers to the production of primary energy, i.e. hard coal, lignite/brown coal, peat, crude oil, NGL, natural gas, combustible renewables and waste, nuclear, hydro, geothermal, solar, and heat from heat pumps, that is extracted from the ambient environment. Indigenous production is calculated after the removal of impurities (e.g. sulphur from natural gas).</p>
2. Imports and 3. Exports	<p>These comprise amounts that have crossed the national territorial boundaries of the country, whether or not customs clearance has taken place.</p> <ul style="list-style-type: none"> <li>• For coal: Composed of the amounts of fuels obtained from or supplied to other countries, whether or not there is an economic or customs union between the relevant countries. Coal in transit should not be included.</li> <li>• For oil and gas: Composed of quantities of crude oil and oil products imported or exported under processing agreements (e.g. refining on account). Quantities of oil in transit are excluded. Crude oil, NGL, and natural gas are reported as coming from the country of origin; refinery feedstock and oil products are reported as coming from the country of last consignment. Re-exports of oil imported for processing within bonded areas are shown as exports of product from the processing country to the final destination.</li> <li>• For electricity: Amounts are considered imported or exported when they have crossed the national territorial boundaries of the country. If electricity is ‘wheeled’ or transited through a country, the amount is shown as both an import and an export.</li> </ul>
4. International Marine Bunkers	<p>These refer to the quantities delivered to ships of all flags that are engaged in international navigation. The international navigation may take place at sea, on inland lakes and waterways, and coastal waters. Consumption by ships engaged in domestic navigation is excluded. The domestic/international split is based on the port of departure and port of arrival, and not on the flag or nationality of the ship. Consumption by fishing vessels and by military forces is also excluded.</p>
13.1 International Aviation Bunkers	<p>These include deliveries of aviation fuels to aircraft for international aviation. Fuels used by airlines for their road vehicles are excluded. The domestic/international split is based on the departure and landing locations and not on the nationality of the airline. For many countries, this incorrectly excludes fuel used by domestically owned carriers for their international departures.</p>

Energy Flows	Definition
5. Stock Changes	These reflect the differences between opening stock levels on the first day of the year and closing levels on the last day of the year of stocks on the national territory held by producers, importers, energy transformation industries, and large consumers. A stock build is shown as a negative number, and a stock draw is shown as a positive number.
6. Total Primary Energy Supply (TPES)	This is equal to indigenous production + imports - exports - international marine bunkers - international aviation bunkers ± stock changes.
8. Total Transformation Sector	Transformation is the process where a part or all of the energy content of a product enters a process to become one or more different product (e.g. coking coal to coke, crude oil to petroleum products, and heavy fuel oil to electricity). The total transformation sector is the sum of transformation input (negative number) and transformation output (positive number) of various energy industries.
8.1 Main Activity Producer	This refers to the generators of electricity and/or heat for sale to third parties as their primary activity. They may be privately or publicly owned. Note that the sale need not take place through the public grid. Columns 1 to 9 show the use of primary and secondary fuels for the production of electricity and/or heat as negative entries. Gross electricity and/or heat produced (including power stations' own consumption) appears as a positive quantity in the electricity and heat column. Transformation losses appear in the total column as negative.
8.8 Charcoal Processing	This refers to the recording of the transformation of fuelwood or other vegetal matter to produce charcoal. The quantity of fuelwood or other vegetal matter input is recorded as negative, while the output of charcoal is recorded as positive.
9. Loss and Own Use	Losses include distribution and transmission losses in gas distribution, electricity transmission, and coal transport. Own use contains the primary and secondary energy consumed by transformation industries for heating, pumping, traction, and lighting purposes [ISIC4 Divisions 10-12, 23, and 40]. These quantities are shown as negative figures. Included here, for example, are own use of energy in coal mines, own consumption in power plants (which includes net electricity consumed for pumped storage), and energy used for oil and gas extraction.
10. Discrepancy	This includes the sum of the unexplained statistical differences for individual fuels as they appear in the basic energy statistics. It also includes the statistical differences that arise because of the variety of conversion factors in the coal and oil columns.
11. Total Final Energy Consumption (TFEC)	This refers to the sum of consumption by the different end-use sectors. Backflows from the petrochemical industry are not included in final consumption.

Energy Flows	Definition
12. Industry Sector	<p>This sector includes the following sub-sectors (energy used for transport by industry is not included here but is reported under transport):</p> <ul style="list-style-type: none"> <li>• Iron and steel industry [ISIC Group 271 and Class 2731];</li> <li>• Chemical (including petrochemical) industry [ISIC Division 24] excluding petrochemical feedstock;</li> <li>• Non-ferrous metals basic industries [ISIC Group 272 and Class 2732];</li> <li>• Non-metallic minerals such as glass, ceramic, cement, etc. [ISIC Division 26];</li> <li>• Transport equipment [ISIC Divisions 34 and 35];</li> <li>• Machinery comprises fabricated metal products, and machinery and equipment other than transport equipment [ISIC Divisions 28 to 32];</li> <li>• Mining (excluding fuels) and quarrying [ISIC Divisions 13 and 14];</li> <li>• Food, beverages, and tobacco [ISIC Divisions 15 and 16];</li> <li>• Paper, pulp, and printing [ISIC Divisions 21 and 22];</li> <li>• Wood and wood products (other than pulp and paper) [ISIC Division 20];</li> <li>• Construction [ISIC Division 45];</li> <li>• Textile and leather [ISIC Divisions 17 to 19];</li> <li>• Other industry (any manufacturing industry not included above) [ISIC Divisions 25, 33, 36, and 37].</li> </ul> <p>Note: The other industry row is also used when there is difficulty in breaking down the industrial sub-sectors. This number should be treated with caution.</p>

Energy Flows	Definition
13. Transport Sector	<p>This includes all fuels used for transport [ISIC Divisions 60 to 62], except international marine bunkers and international aviation bunkers. It also includes transport in the industry sector and covers domestic aviation, road, rail, pipeline transport, domestic navigation, and non-specified transport. Domestic aviation includes deliveries of aviation fuels to aircraft for domestic aviation – commercial, private, agriculture, and the like. It includes use for purposes other than flying, e.g. bench testing of engines, but not airline use of fuel for road transport.</p> <p>The domestic/international split should be based on the departure and landing locations and not by the nationality of the airline. Fuels used for ocean, coastal and inland fishing (included under fishing), and military consumption (see not elsewhere specified – Other sectors) are excluded from the transport sector.</p>
13.2 Domestic Air Transport	<p>This reports on quantities of aviation fuels delivered to aircraft for domestic aviation – commercial, private, agricultural, etc. It includes fuel used for purposes other than flying, e.g. bench testing of engines. The domestic/international split should be based on the departure and landing locations and not on the nationality of the airline. Note that this may include journeys of considerable length between two airports in an economy (e.g. San Francisco to Honolulu). This excludes fuels used by airlines for their road vehicles (see not elsewhere specified – Transport sector) and military use of aviation fuels (see not elsewhere specified – Other sectors).</p>
13.3 Road	<p>This reports on oil used on road vehicles. It includes fuel used on agricultural vehicles on highways and lubricants used on road vehicles. It excludes motor gasoline and diesel used on stationary engines (see not elsewhere specified – Other sectors), diesel oil for non-highway used on tractors (see Agriculture/Forestry – Other sectors), military use (see not elsewhere specified – Other sectors) and gasoline used on engines at construction sites (see Construction – Industry sector).</p>
14. Other Sector	<p>This covers residential, commercial, and public services [ISIC Divisions 41, 50-52, 55, 63-67, 70-75, 80, 85, 90-93, 95, and 99], agriculture [ISIC Divisions 01 and 02], fishing [ISIC Division 05] and others. Others include military fuel used for all mobile and stationary consumption (e.g. ships, aircraft, road, and energy used in living quarters), regardless of whether the fuel delivered is for the military of that country or the military of another country.</p>
14.1 Residential and Commercial	<p>Defined as 15.1.1 + 15.1.2</p>

Energy Flows	Definition
14.1.1 Commercial and Public Services	ISIC Divisions and NACE Divisions 33, 36, 37, 38, 39, 45, 46, 47, 52, 53, 55, 56, 58, 59, 60, 61, 62, 63, 64, 65, 66, 68, 69, 70, 71, 72, 73, 74, 75, 77, 78, 79, 80, 81, 82, 84 (excluding Class 8422), 85, 86, 87, 88, 90, 91, 92, 93, 94, 95, 96, and 99. These refer to oils consumed by businesses and offices in the public and private sectors. Note that oil used at railways, bus stations, shipping piers, and airports should be reported in this category and not shown in the Transport sector.
14.1.2 Residential	This reports on fuels consumed by all households, including households with employed persons (ISIC and NACE Divisions 97 and 98).
14.2 Agriculture	ISIC Divisions 01 and 02 (NACE Divisions 01 and 02). This reports on oil consumption by users classified as agriculture, hunting, and forestry.
15. Non-energy Use	This covers fuels that are used as raw materials in the different sectors and are not consumed as a fuel or transformed into another fuel. Non-energy use is shown separately in final consumption under the heading Non-energy Use.
16. Electricity Output in GWh	This refers to the power generation amount by each power source.

GWh = gigawatt-hour, ISIC = International Standard Industrial Classification, NACE = Nomenclature générale des activités économiques dans les Communautés Européennes, NGL = natural gas liquids.

Source: International standard of Energy Balance Table Format. IEA, IEEJ, 2018.