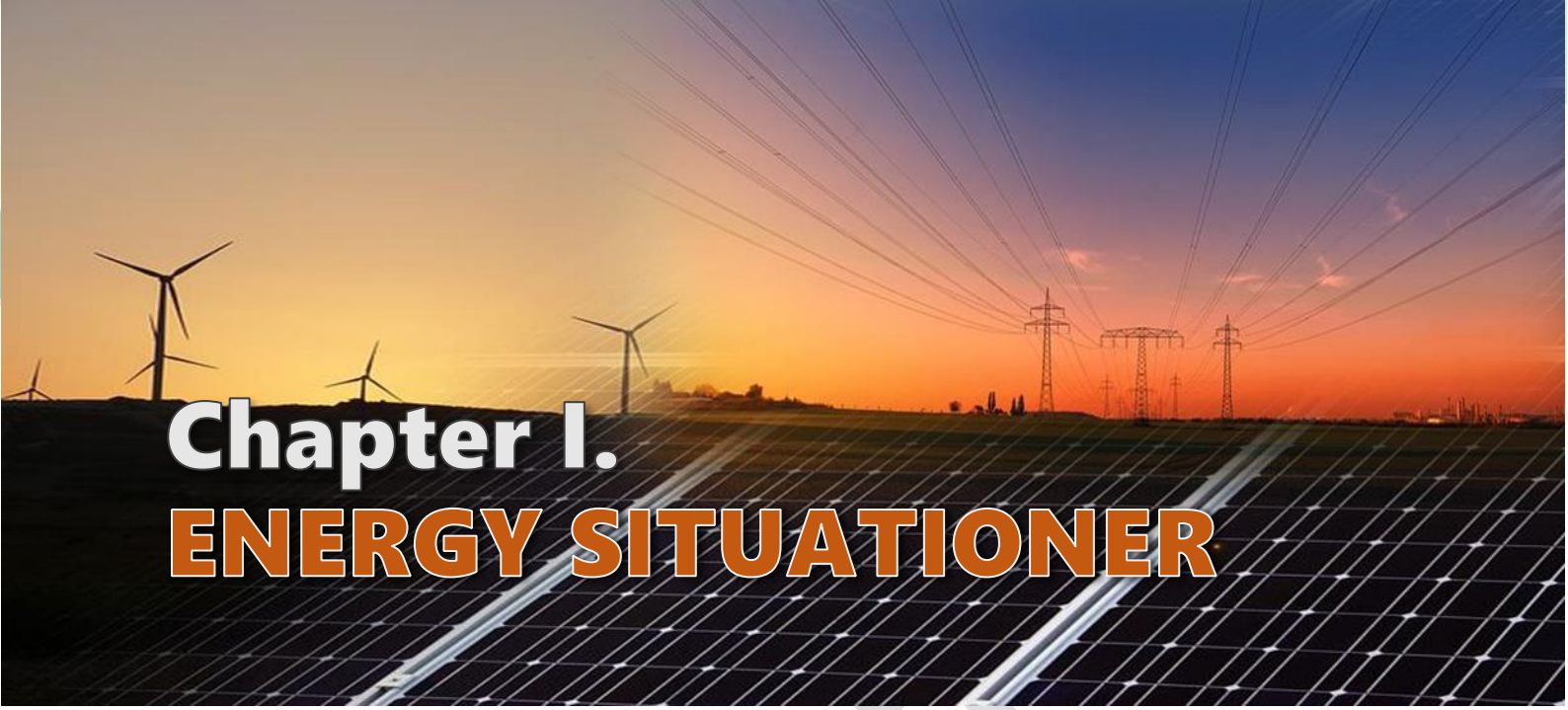
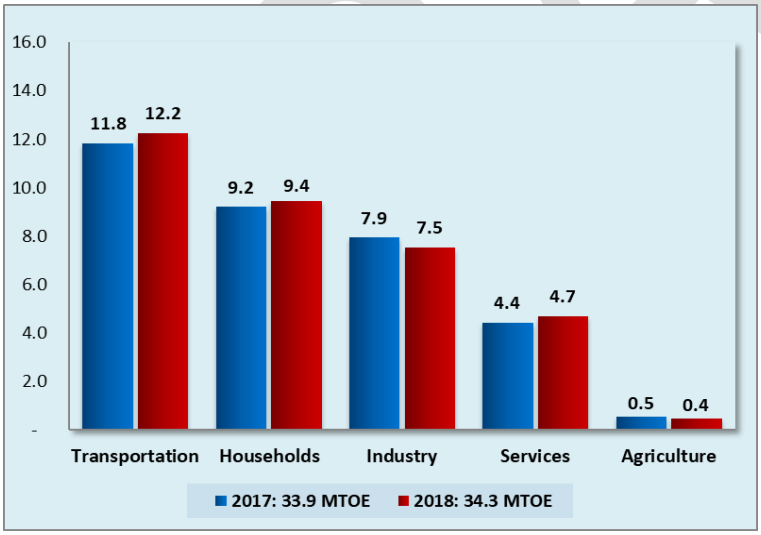


Chapter I.
ENERGY SITUATIONER

A. TOTAL FINAL ENERGY CONSUMPTION

The country's total final energy consumption (TFEC) in 2018 reached 34.3 million tons of oil equivalent (MTOE), up by 1.3 percent from its 2017 level of 33.9 MTOE (*Figure 1*). Energy use in the transportation, households and services[1] sectors increased against the declines registered for the industry and agriculture sectors during the period.

Figure 1. TOTAL FINAL ENERGY CONSUMPTION, By Sector, in MTOE (2017 vs. 2018)



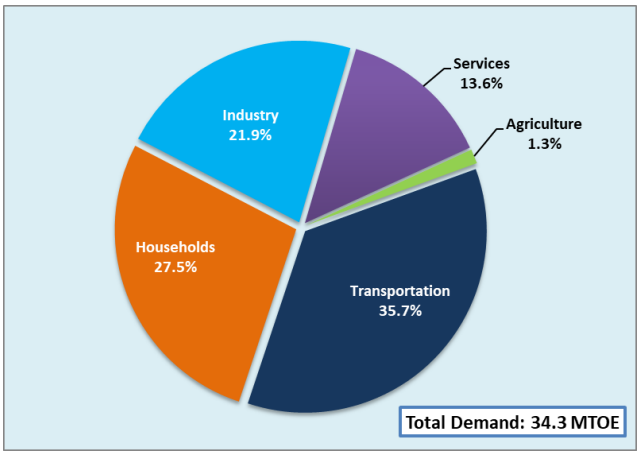
Transport remains as the most energy-intensive sector, accounting for more than one-third (35.7 percent) of total energy consumption. Its aggregate energy demand reached 12.2 MTOE, 3.5 percent higher than its last year's level (*Figure 2*) due to increased utilization of gasoline and diesel for road transport, as well as aviation turbo for domestic air transport.

Household energy consumption contributed 27.5 percent share to the demand mix, as it posted an increase of 2.6 percent to 9.4 MTOE during the period. On the other hand, the slowdown in production output from the industrial sector, particularly from energy-intensive manufacturing sub-sectors, such as non-metallic (including cement) minerals, chemical products and basic metal industries, resulted in a 5.1 percent drop in the sector's energy requirements to 7.5 MTOE in 2018, corresponding to a 21.9 percent share to TFEC. Meanwhile, the resilient performance of the services sector, particularly that of hotels and restaurants, translated to a 6.0 percent hike as its energy consumption reached 4.7 MTOE from its 2017 level of 4.4 MTOE, and contributing a 13.6 percent share to the 2018 demand mix. On the other hand, the registered production cuts in the

[1] Excluding transportation

Agriculture sector caused its energy use to fall by as much as 14.8 percent to 439.6 thousand tons of oil equivalent (kTOE) in 2018.

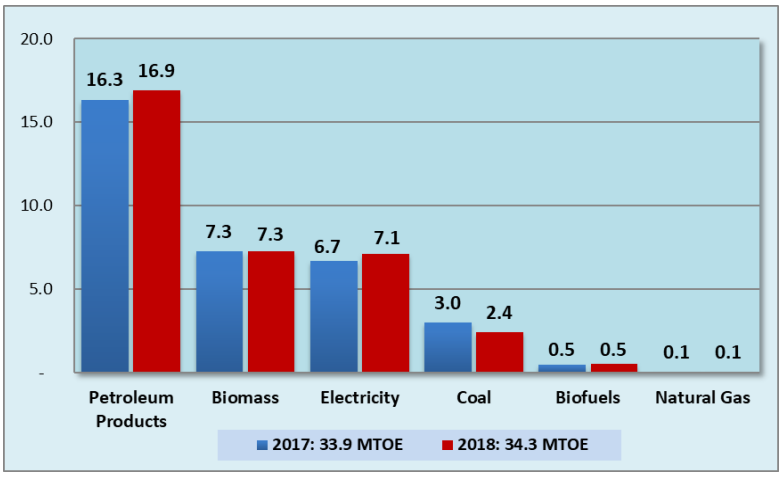
Figure 2. TOTAL FINAL ENERGY CONSUMPTION, By Sector Percentage Shares, 2018



Petroleum products accounted for 49.3 percent share in the country's TFEC, as its consumption went up by 3.4 percent, from last year's level of 16.3 MTOE to 16.9 MTOE in 2018 (*Figure 3*). Notwithstanding the significant fluctuations in prices of oil products during most parts of 2018 brought about by the implementation of the excise tax provision under the Tax Reform for Acceleration and Inclusion Act (TRAIN) law, consumption of gasoline and diesel, primarily for road transport, went up by 3.0 percent and 3.5 percent, respectively. The combined share of the said fuels was nearly 80.0 percent of the total petroleum consumption.

Consumption of biomass[2] for non-power application garnered 21.3 percent share to the total demand in 2018, albeit a measly 0.5 percent growth in its consumption during the period. Of the 7.3 MTOE biomass consumed in 2018, households accounted for bulk at 78.8 percent, while the remaining share was utilized in the services and manufacturing sectors, particularly for sugar and food processing.

Figure 3. TOTAL FINAL ENERGY CONSUMPTION, By Fuel Type, in MTOE (2017 vs. 2018)

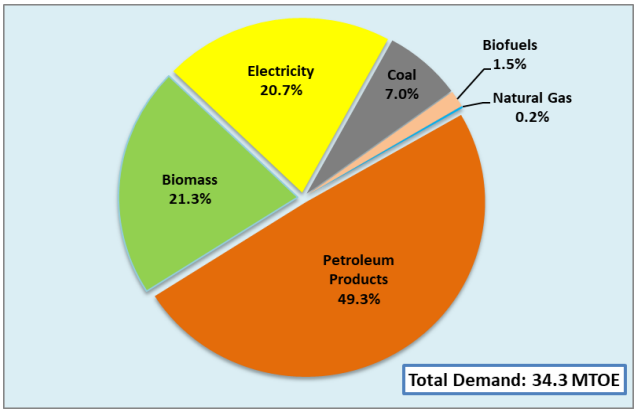


*Close to **two-thirds (63.2%)** of the country's energy consumption in 2018 was for the **movement of goods or people, and for use in our homes**.*

Electricity came in third after oil and biomass, and contributed a 20.7 percent share to TFEC in 2018 (*Figure 4*). Its consumption increased by 6.2 percent to reach 7.1 MTOE from last year's 6.7 MTOE. Both the industrial and household sectors registered close to one-third shares in the total electricity consumption, while 29.1 percent was used in the services sector.

[2] Includes charcoal, fuelwood, rice hull, bagasse, agriculture and animal waste

Figure 4. TOTAL FINAL ENERGY CONSUMPTION, By Fuel Shares, 2018



On the other hand, the consumption of coal registered a decline of 19.8 percent from its previous year's level of 3.0 MTOE to 2.4 MTOE in 2018. This was brought about by the merging of the two firms' local cement producers, Lafarge Republic Inc. and Holcim Philippines Inc. and the surge in imported cement that contributed to the reduction in local cement production during the year.

Meanwhile, utilization of biofuels, coco methyl ester (CME) and ethanol, went up by 2.9 percent, as their combined levels reached 524.0 kTOE in 2018, from 509.2 kTOE in 2017. The consistent trend in biofuels consumption is attributable to the compliance of oil companies with the biofuel blending schedule as mandated by the government under the Biofuels Law of 2006 or Republic Act (RA) 9367.

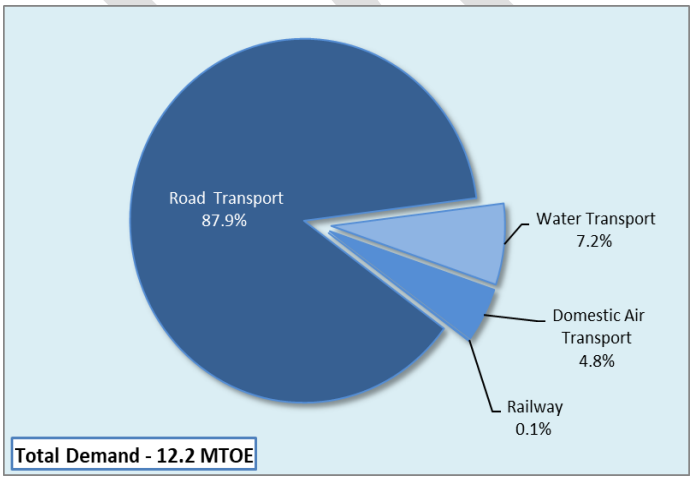
Natural gas use for non-power applications jumped by as much as 13.1 percent in 2018, despite its meager share of 0.2 percent to the TFEC. The recorded increase was attributed to the Philippine Shell Petroleum Corporation (PSPC)'s high gas off-take despite using Liquefied Petroleum Gas (LPG) to fuel its turbine and furnaces throughout the year.

Oil accounts for the biggest share (49.3%) to energy consumption - *increasing by 3.4 percent from its 2017 level.*

Total Final Energy Consumption, by Sector

1. *Transportation*

Figure 5. TRANSPORTATION FINAL ENERGY CONSUMPTION, By Sub-sector (in Percent), 2018



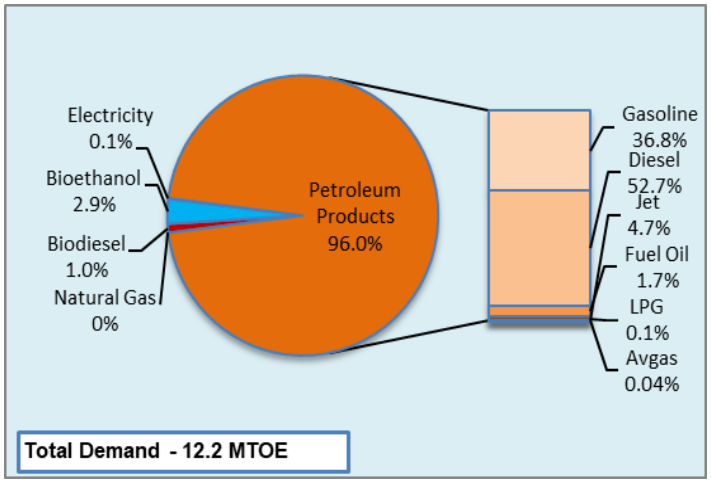
The transportartion sector remained the most energy-intensive sector in 2018 with a total share of 35.7 percent in the final energy demand. Its level of consumption reached 12.2 MTOE during the period, 3.5 percent higher than its year-ago level of 11.8 MTOE.

The energy utilized for road transport went up by 4.1 percent as the number of registered vehicles as of December 2018 stood at 11.6 million, up by 11.4 percent from 10.4 million in the previous year.[3] The high volume of motor vehicles vis-à-vis other transportation modes likewise contributed to the 87.9 percent share of road transport to the sector's aggregate consumption (*Figure 5*). On the other hand, fuel consumption for water transport decreased by 23.6 percent

[3] Land Transportation Office (LTO) Annual Reports for 2017 and 2018

from 265.4 kTOE in 2017 to 202.8 kTOE in 2018 and contributed 1.7 percent share to total transport demand. Domestic air transport, owning a 4.8 percent share in the sector's energy demand, went up by 14.0 percent to 583.6 kTOE in 2018 from the previous year's 511.9 kTOE. The renewed development and promotion of local tourism and cheaper fare offerings by Philippine Airlines and Cebu Pacific and other local airlines contributed to the increase.

Figure 6. ENERGY CONSUMPTION OF THE TRANSPORT SECTOR, By Fuel (in Percent), 2018



Energy consumption for rail transport decreased by 8.4 percent in 2018 from the previous year's level of 11.8 kTOE. This was attributable to the reduction in operating hours and running stock of the Metro Rail Transit Line 3 (MRT3) due to the enforcement of maintenance checks, as well as glitches and breakdowns recorded by the Department of Transportation (DOTr) for this period. Petroleum products continued to be the sector's primary fuel, representing a bulk share of 96.0 percent to the total energy demand of the sector during the period (*Figure 6*). Diesel and gasoline, mainly utilized for road transport, put in an aggregate share of 89.5 percent in the overall demand mix of the sector. In terms of growth rate, gasoline and diesel increased by 3.1 percent and 4.2 percent, respectively. Following the same trend, the usage of biofuels, such as bioethanol and biodiesel, went up by 3.1 percent and 3.2 percent, respectively. Fuel oil consumption decreased by 23.6 percent during the period, mostly consumed for water transport. On the other hand, the declining number of auto-LPG taxi units contributed to the 3.6 percent reduction in the sector's LPG consumption.

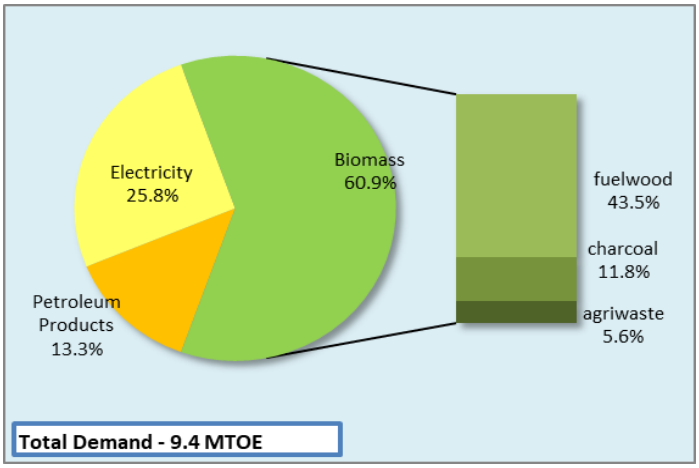
*The **increasing** number of motor vehicles contributes to **nearly 90%** of transport energy consumption.*

2. *Households*

Aggregate energy consumption of hosueholds posted a sluggish 2.6 percent growth from its 2017 level of 9.2 MTOE to 9.4 MTOE in 2018.

Biomass accounted two-thirds (60.9 percent) of the sectors' energy demand mix, as households in most rural areas still prefer fuelwood and charcoal for cooking and heating purposes, owing to its abundance, accessibility and affordability (*Figure 7*). Despite its share, consumption of biomass posted a measly 0.3 percent growth from its year-ago level of 5.7 MTOE.

Figure 7. ENERGY CONSUMPTION OF THE HOUSEHOLD SECTOR, By Fuel (in Percent), 2018

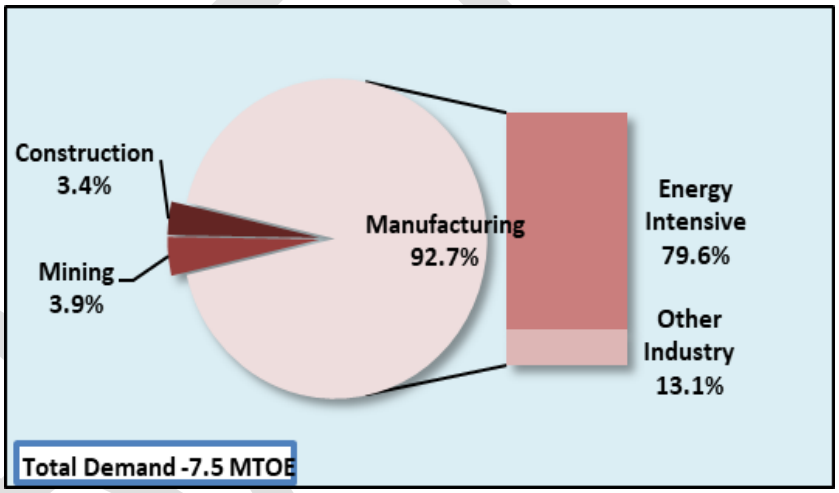


Household electricity consumption, which accounted for 25.8 percent share in the sector's energy demand, increased to 2.4 MTOE in 2018 from 2.3 MTOE in 2017. With 95.3 percent household electrification level[4] and an increase in household income[5] due to lower income tax rates as provided under TRAIN law in 2018, electricity demand increased by 5.5 percent during the period. Also, the relatively stable LPG prices and the convenience associated with its use as cooking and heating fuel vis-a-vis traditional biomass contributed to the 8.6 percent increase in household LPG consumption during the period

3. *Industry*

The industry sector, the third biggest energy consumer after the transport and household sectors, posted an energy demand level of 7.5 MTOE in 2018, down by 5.1 percent than it's a year-ago level of 7.9 MTOE.

Figure 8. ENERGY CONSUMPTION OF THE INDUSTRY SECTOR, By Sub-sector (in Percent), 2018



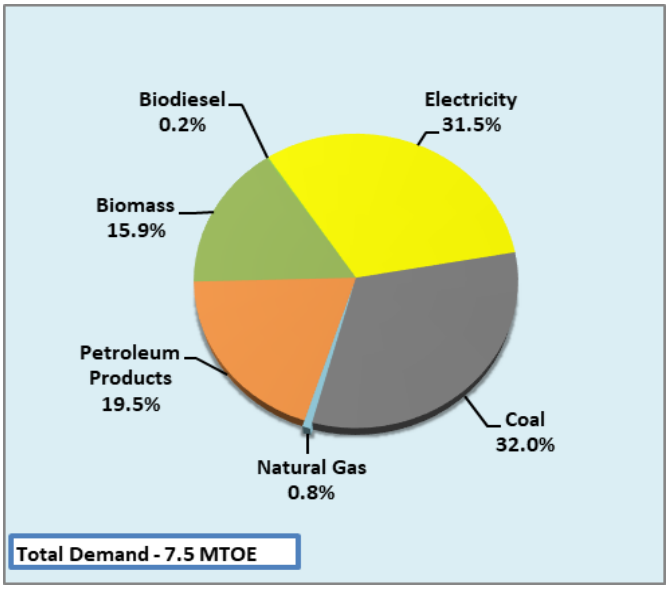
The decline stemmed from the 5.0 percent reduction in the aggregate energy consumption of all manufacturing sectors as production output of energy-intensive sectors, particularly chemical and cement, slowed down in 2018. The manufacturing sub-sector accounted for the lion's share of 92.7 percent *(Figure 8)*, out of which energy-intensive[6] industries took 79.6 percent of the subsector's total energy demand. With a share of 3.9 percent, the mining subsector's energy consumption fell by 10.9 percent in 2018 as the majority of mineral commodities, particularly that of nickel, reported declining output due to closure of several mining pits[7], as well as the doubling of excise taxes imposed on mining firms[8]. Similarly, the construction sub-sector posted a 0.2 percent drop in its energy consumption due to efficient energy use by companies during the period.

***Industries** relied heavily on **electricity and coal**, as both fuel represent **two-thirds (63.5%)** of the energy consumption of the sector.*

Coal, electricity, petroleum products, and biomass are the major fuels for industrial processes *(Figure 9)*. As coal garnered a 32.0 percent share in the demand mix of the sector, the 19.8 percent decrease in its consumption was the major contributor to the drop in the industry sector's energy use for 2018. The decline in coal utilization was due to the slowdown in domestic production of cement due to increased importation, as well as merging of two local cement plants (Lafarge and Holcim) and the closure of one of Holcim's cement plant in Mabini, Batangas. Meanwhile, electricity, as the second most important fuel of the sector, accounted for 31.5 percent share of the total sector's demand with a utilization level of 2.4 MTOE, increased by 7.9 percent from 2017 to 2018.

[4] As December 2018, around 21.9 million households have access to electricity: DOE Energy Sector Accomplishment Report (ESAR), 2018
[5] Improves the capacity of households to acquire power intensive appliances and equipment, communication gadgets and other technologies
[6] food processing, cement production, paper production and printing, chemicals, basic metals and machineries
[7] https://business.mb.com.ph/2019/02/27/phs-mining-sector-earns-higher-at-p122-b-even-with-lower-output/
[8] https://business.inquirer.net/262749/denr-sees-better-year-for-mining-in-2019

Figure 9. ENERGY CONSUMPTION OF THE INDUSTRY SECTOR, By Fuel (in Percent), 2018

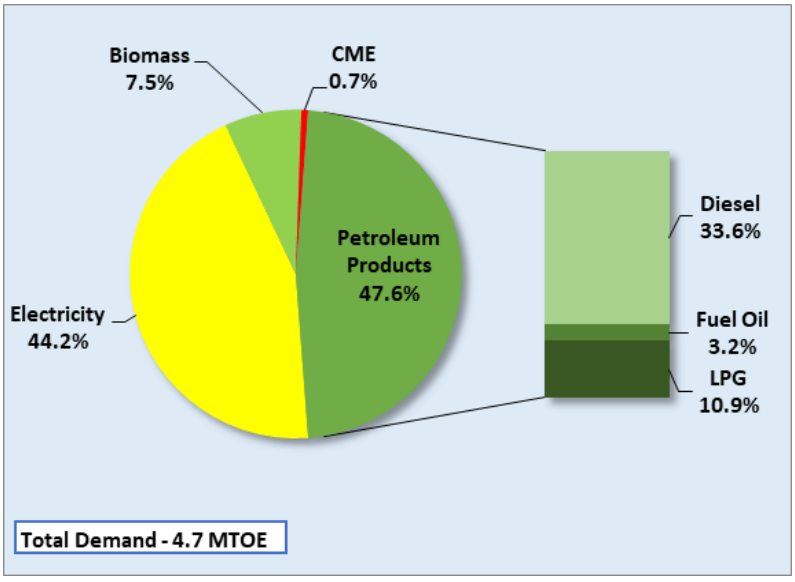


Aggregate consumption of petroleum products reached 1.5 MTOE, equivalent to a 19.5 percent share of the industry's energy demand in 2018. Diesel and LPG were the most consumed among petroleum products, with a combined growth rate of 6.4 percent. Meanwhile, biomass used extensively in food processing and sugar production accounted for a 15.9 percent share to the total demand with a utilization level of 1.2 MTOE, 1.5 percent higher than its year-ago level. On the other hand, a minimal demand for natural gas (59.4 kTOE) for non-power applications and biodiesel (13.4 kTOE) was likewise recorded during the period and contributed a combined share of 1.0 percent in the demand mix of the sector.

4. *Services* [9]

As the major contributor to the country's GDP growth in 2018, the services / commercial (trade and services) sector's 6.8 percent increase in economic output was sustained by 4.7 MTOE of energy consumed during the same year. This level translates to an upward trend of 6.0 percent from its 2017 level of 4.4 MTOE *(Figure 10)*.

Figure 10. ENERGY CONSUMPTION OF THE SERVICES SECTOR, by Fuel (in Percent), 2018



Petroleum products accounted for close to half of the sector's total energy demand, as its consumption went up by 7.2 percent to reach 2.2 MTOE in 2018 from the previous year's 2.1 MTOE. Diesel registered consumption level of 1.6 MTOE, 12.3 percent more than its 2017 level of 1.4 MTOE while accounting for 33.6 percent share to the sector's demand mix. Biodiesel usage exhibited the same growth trend as that of diesel, as it posted a double-digit hike of 10.2 percent to reach 30.4 kTOE during the same period. Consumption of LPG, primarily used as cooking fuel in restaurants and other establishments engaged in the food services business, was 4.7 percent lower in 2018 as compared with its 2017 level of 531.7 kTOE. On the other hand, the sector's demand for fuel oil improved by 1.4 percent from its 2017 level of 145.9 kTOE to 147.9 kTOE in 2018.

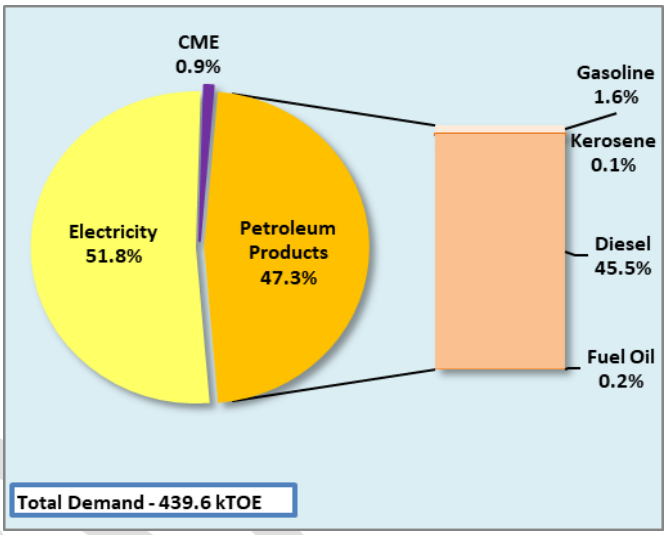
[9] Trade and services, excluding Transport

Electricity supplied 44.2 percent of the total energy demand of the sector. Its level increased to 2.2 MTOE in 2018, higher by 5.5 percent than its year-ago consumption of 2.0 MTOE. Service establishments slightly increase their biomass consumption by 1.5 percent, an increase from 345.0 kTOE in 2017 to 350.2 kTOE in 2018.

5. Agriculture

The agriculture sector posted the biggest downturn in energy utilization among sectors, as its levels went down by 14.8 percent to 439.6 MTOE in 2018 from 515.6 kTOE in 2017 (*Table 1*).

Figure 11. ENERGY CONSUMPTION OF THE AGRICULTURE SECTOR By Fuel (in Percent), 2018



The level of energy requirements for the crop production significantly declined by 15.7 percent due to the waning production of major crops during the 4th quarter of 2018, such as palay, sugarcane and cassava, brought about by typhoons and inadequate irrigation water. On the other hand, the energy consumption of the livestock and poultry sub-sector went up by 4.8 percent in 2018 due to sustained demand from meat processors, hotel and restaurant industries (HRIs) and households coupled with a higher average live weight of marketable hogs and higher farmgate prices. Meanwhile, the fishery sub-sector registered 199.1 kTOE of energy, 24.1 percent lower from the previous level of consumption as output was largely reduced due to rough seas, strong winds, high fuel prices, the encroachment of commercial fishing vessels and lesser appearance of the species in the fishing ground were reported in Davao Region[10]. Similarly, the forestry sub-sector registered lowered consumption of 1.0 kTOE in 2018 from 6.6 kTOE in 2017 due to widespread logging tagged as the culprit for continued deforestation in the country.

Aggregate consumption of petroleum products accounted for 47.3 percent of the sector's total energy consumption, as levels reached 208.0 kTOE, a reduction of 28.3 percent *(Figure 11)*. Roughly all the petroleum products recorded a downtrend in the sector due to the inflationary effect of the rising cost of fuel/petroleum. Diesel, being the most consumed fuel in the sector, registered a significant reduction of 26.1 percent with 200 kTOE level of consumption in 2018 from 270.4 kTOE in 2017. Similarly, gasoline and fuel oil consumption of the sector declined by 41.0 percent and 90.8 percent, respectively. On the other hand, electricity compensated for the decline in the consumption of other fuels as it posted steady growth of 3.5 percent during the same period.

Table 1. AGRICULTURE ENERGY CONSUMPTION, By Subsector

Subsector	2017	2018	Growth Rate (%)
Agri-Industry	**246.68**	**239.37**	**-2.97**
Agri-Crops Product	93.08	78.43	-15.74
Livestock/Poultry	146.33	153.41	4.84
Agri Services	7.27	7.53	3.50
Forestry	**6.58**	**1.04**	**-84.14**
Fishery	**262.36**	**199.14**	**-24.09**
Total	**515.62**	**439.55**	**-14.75**

[10] 2018 Performance of the Philippine Agriculture, PSA

B. TRANSFORMATION

1. Oil Refining

For the year 2018, refining output reached 86.6 million barrels (MMB) from 77.2 MMB in 2017. With two existing oil refineries, the Petron Bataan Refinery in Limay, Bataan and the Pilipinas Shell Oil Refinery located in Tabangao, Batangas City that have a combined maximum working crude distillation capacity of 285.2 thousand barrels/stream day (MBSD), refinery throughput jumped by 12.7 percent from 9.7 MTOE in 2017 to 10.9 MTOE in 2018 (*Figure 12*). The increase was due to the higher utilization rate brought about by rising domestic demand for petroleum products during the period. The total marketable products for the period were composed of diesel (40.9 percent share), gasoline (23.7 percent share) and fuel oil (6.5 percent share). The rest of the products were aviation fuel (9.4 percent), LPG (5.0 percent), kerosene (0.4 percent), and naphtha and other products (14.1 percent).

Figure 12. REFINERY PRODUCTION (in Percent), 2017-2018

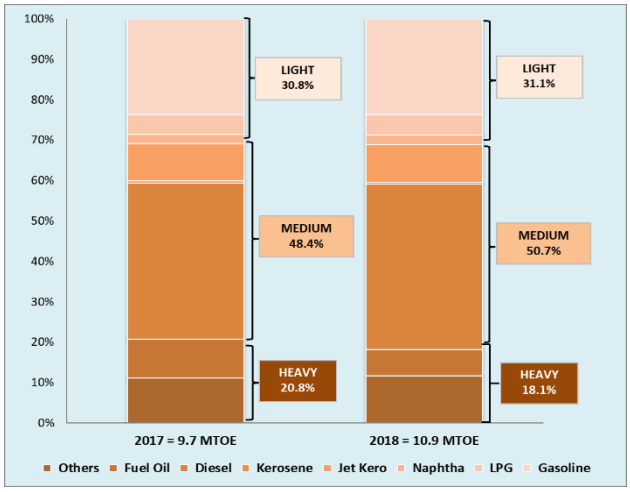
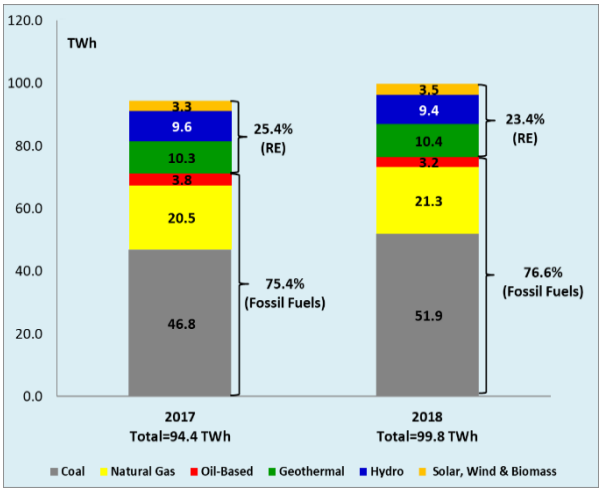


Figure 13. ELECTRICITY GENERATION, By Fuel Type (in TWh), 2017-2018



2. Power Generation

Power generation output increased by 5.7 percent from 94.4 terawatt-hours (TWh) in 2017 to 99.8 TWh in 2018. The bulk of the country's power generation requirement was sourced from coal with a 52.1 percent share to the total power mix. This was followed by natural gas and geothermal with 21.4 percent and 10.5 percent shares, respectively.

***Self-sufficiency** in power generation **dropped by 2.8 pct points to 51.0%** in 2018 due to increased usage of imported coal in power plants.*

The total fuel requirements for power generation grew by 5.5 percent in 2018. Fossil fuels contributed more than half of the total fuel input (60.0 percent), mainly due to the increased share of coal in power generation to offset the reduction in generation output from hydropower plants. Consequently, the demand for renewable energy as input to power generation increased by less than 1.0 percent (0.6 percent) in 2018, pulled up by combined input from wind and solar to power generation.

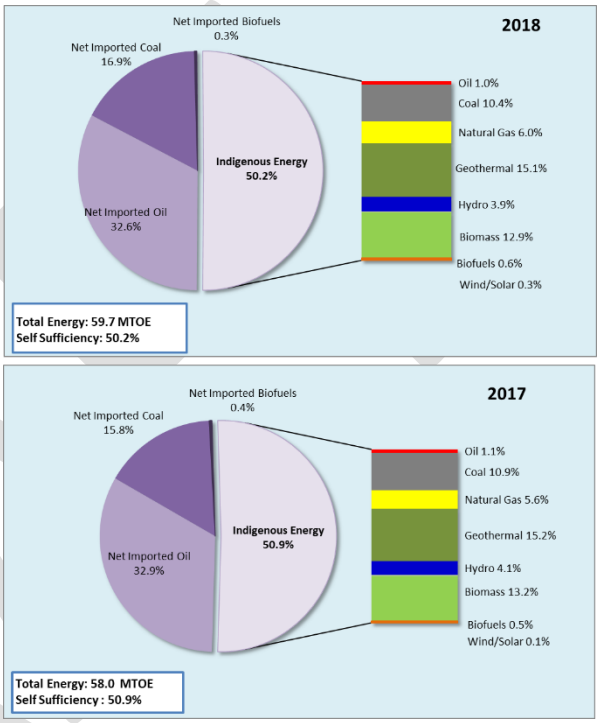
Coal demand (fuel input) for power generation reached 13.8 MTOE in 2018 from 12.3 MTOE in 2018. This level yielded a total generation output of 51.9 TWh, 10.9 percent higher than its 2017 level of 46.8 TWh (*Figure 13*). On the other hand, natural gas continued to contribute a significant share in the total power mix of the country with a 3.8 percent increase in generation output to 21.3 TWh,

while its input reached 3.3 MTOE in 2018. Meanwhile, oil continued to play an important role in augmenting the supply of electricity, particularly during peak demand. However, it accounted for the lowest contribution among the fossil fuel sources for power generation at 3.2 percent share to the total power mix, as oil-fired power plants experienced a 16.2 percent decline in generation output during the same period. This was likewise reflected in the 24.6 percent reduction of oil demand as fuel input in power generation during the period.

C. TOTAL PRIMARY ENERGY SUPPLY

The country's total primary energy supply (TPES) reached 59.7 MTOE, up by 2.9 percent from its 2017 level of 58.0 MTOE. This was attributable to the 4.3 percent hike in net energy importation from 28.4 MTOE in 2017 to 29.7 MTOE in 2018. It compensated the sluggish 1.4 percent growth in aggregate indigenous energy brought about by contraction in production/yield of oil (-4.5 percent), hydro (-2.4 percent), and coal (-1.5 percent). As a result, the 2018 self-sufficiency level, expressed as the ratio of total indigenous energy to total primary supply, was lower by 0.7 percentage points from 50.9 percent in 2017 to 50.2 percent in 2018 (*Figure 14*).

Figure 14. TOTAL PRIMARY ENERGY MIX, By Fuel (% Shares), 2017-2018



Oil continued to be the country's major source of supply. It accounts for about one third (33.6 percent) of the TPES, followed by coal and geothermal, which contributed 27.3 percent and 15.1 percent share, respectively. In 2018, natural gas supply increased the fastest with 11.6 percent, followed by the 5.2 percent hike in coal due to increased importation. From the intensified programs that promote reliable and sustainable RE resources, the aggregate supply of renewable energy went up by 0.6 percent to 19.5 MTOE, representing one-third (33.1 percent) of TPES during the period. Notable increases were reported in the combined levels of wind and solar (4.7 percent), biofuels (2.9 percent) and geothermal (1.6 percent) during the same period.

1. Indigenous Energy

Total indigenous energy production was slightly higher by 1.4 percent from 29.5 MTOE in 2017 to 29.9 MTOE in 2018. Increased domestic production was reported for biofuels (13.4 percent), natural gas (11.6 percent), wind (5.4 percent), solar (4.0 percent) and biomass (0.2 percent). In terms of contribution to total domestic production, geothermal accounted for 30.0 percent share, followed by biomass (25.6 percent), coal (20.7 percent), and natural gas (12.0 percent). Total indigenous resources accounted for 50.2 percent of the country's total energy supply in 2018.

a. Fossil Fuels

i. ***Oil.*** Aggregate domestic oil production, including condensate, declined by 4.5 percent, from 621.8 kTOE in 2017 to 593.8 kTOE in 2018, while its contribution to total indigenous energy supply stood at 2.0 percent share. The reduction was a result of lower production output reported in Nido, Matinloc and Galoc fields during the same period.

ii. ***Coal.*** Indigenous coal supply, with a share of 20.7 percent to total domestic energy production, fell by 1.5 percent to 6.2 MTOE in 2018 from 6.3 MTOE in the previous year. Most of the production came from the country's major coal producer, the Semirara Mining and Power Corporation (SMPC), which accounts for a 99.1 percent share in the total coal production of the country. SMPC's 2018 production reached 6.2 MTOE, 1.5 percent lower vis-a-vis its 2017 level, and offset by production build-ups in other coal mining areas. Aggregate production of private coal mines in Cebu, with a marginal combined share of 0.1 percent to total domestic production, decreased at a rate of 45.0 percent compared with its 2017 level of 6.3 MTOE. Similarly, coal mines in Bicol, Surigao, Zamboanga and small-scale mines located in some parts of the country, with a combined contribution of 0.8 percent share to the country's total coal production, registered improved operations as reflected by the 17.5 percent growth in their production levels from 2017.

iii. ***Natural Gas.*** In 2018, natural gas production stood at 3.6 MTOE, equivalent to a 12.0 percent share to overall indigenous supply. Natural gas production from Malampaya, the country's single source of natural gas, was higher by 11.6 percent compared with its 2017 level of 3.2 MTOE. Effective platform operation that resulted in zero maintenance activity greatly contributed to the hike in the fuel's supply levels.

b. Renewable Energy

i. ***Geothermal.*** The share of geothermal energy in the total indigenous energy supply reached 30.0 percent in 2018, equivalent to 15.1 percent share to the TPES, as its level was 1.6 percent higher at 9.0 MTOE compared with its 2017 level of 8.8 MTOE. The installed generating capacity of geothermal power plants increased by 1.5 percent from the previous year's level. A total of 48 geothermal projects[11] were awarded during the period.

> ***With its 80% share, green energy*** *(natural gas and renewable energy) continues to* ***dominate our domestic energy supply.***

ii. ***Hydro.*** The country's hydropower production in 2018 contributed 7.8 percent share to the total indigenous energy supply or a 3.9 percent share to the TPES. It posted a 2.4 percent decline to 2.3 MTOE in 2018, as generation output likewise went down. The reduction was associated with variation in water availability caused by below normal rainfall conditions that signaled the onset of the El Niño phenomenon in the later months of 2018.

iii. ***Solar.*** The total power generation output from solar grew by 4.0 percent from its 2017 level of 103.3 kTOE to 107.4 kTOE level in 2018, while accounting for 0.2 percent share to the total energy mix in 2018. Solar installed capacity rose from 885 MW in 2017 to 896 MW in 2018, as solar photovoltaic (PV) systems are increasingly becoming popular among consumers and industries across the country.

[11] Energy Sector Accomplishment Report (ESAR) 2018.

iv. ***Wind.*** Production of wind energy stood at 99.1 KTOE, 5.4 percent more than its 2017 level of 94.0 kTOE, albeit a marginal contribution of 0.3 percent to the indigenous energy production. There were 64 wind projects awarded as of December 2018[12] .

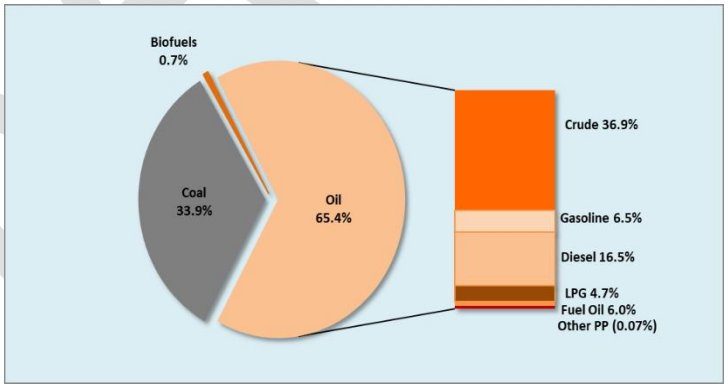
v. ***Biomass.*** Biomass continued to account for around one-fourth (25.6 percent) of the indigenous energy supply in 2018. Biomass supply reached 7.7 MTOE in 2018, slightly higher by 0.2 percent from its 2017 level of 7.7 MTOE. Bulk of the biomass supply was to provide for the requirement of end-use sectors[13], while biomass for power application (fuel input) reached 373.8 MTOE in 2018 due to intensified promotion on the use of renewables for power generation that resulted in the awarding of 59 biomass projects as of December 2018[14].

vi. ***Biofuels.*** The country's aggregate biofuels (biodiesel and bioethanol) domestic supply recorded a 13.4 percent growth, from 298.0 kTOE in 2017 to 337.9 kTOE in 2018, corresponding to a 1.1 percent combined share to the total indigenous energy for the same period. Bioethanol production grew by 29.3 percent from 131.3 kTOE in 2017 to 169.8 kTOE in 2018. The 12 existing ethanol facilities yielded total sales of 303.7 million liters in 2018. On the other hand, the existing 11 biodiesel producers put in a combined sales of about 205.2 million liters in 2018, translating to a supply level of 168.1 kTOE, up by 0.8 percent from its 2017 level.

2. *Net Energy Imports*[15]

Net energy imports reached 29.7 MTOE in 2018, a 4.3 percent hike from its year-ago level of 28.4 MTOE, and with a 49.8 percent share out of the country's total primary energy supply.

Figure 15. NET ENERGY IMPORTS (in percent), 2018



Of the total net imports, oil and oil products account for more than two-thirds (65.4 percent), while coal contributed 33.9 percent share and biofuels with 0.7 percent share. The bulk of the increase was due to the higher net coal importation, as levels went up by 9.7 percent from 9.2 MTOE in 2017 to 10.1 MTOE in 2018 *(Figure 15)*. Oil imports were comprised of 48.5 percent crudes and 51.5 percent petroleum products. Despite the higher crude oil prices and weakened value of the peso vis-à-vis dollar during the year,[16] the volume of imported crude oil increased by 10.6 percent to reach 11.5 MTOE in 2018 from its previous year's 10.4 MTOE. The Middle East continues to be the major source of the country's imported crude at 86.9 percent share, while Russia and nearby countries in the Asia-Pacific region[17] supplied 7.4 percent and 4.1 percent shares, respectively, of the country's total crude oil importation. Higher crude imports contributed to the increase in refinery output to provide for rising domestic demand for oil, particularly in the transport sector, as the aggregate volume of imported finished petroleum products went down by 5.9 percent to 8.5 MTOE in 2018, from 9.0 MTOE in 2017. China, South Korea and Singapore are the major sources of imported

[12] Energy Sector Accomplishment Report (ESAR) 2018.
[13] Biomass demand from the households, servicesl and industry sector was 7.3 MTOE in 2018
[14] ibid
[15] This is derived as total primary energy supply (TPES) less indigenous production. Alternatively, it can also be calculated as the sum of imports and stock change (+/-) less exports and international bunkers (aviation and marine)
[16] Dubai crude oil price per barrel for 2017 was US$54.22, while for 2018 it was US$69.42
[17] Includes Brunei, Malaysia and Australia

petroleum products with 30.2 percent, 28.8 percent and 8.1 percent share, respectively. These countries are also the top export markets of the country.

Exports of finished petroleum products went up by 10.7 percent to 1.8 MTOE in 2018, from the previous year's 1.6 MTOE. On the other hand, exports of crude oil from the Galoc field has been declining for three (3) consecutive years, posting a 24.3 reduction percent in 2018. Similarly, exports of condensate from Malampaya was 3.8 percent higher than its 2017 level of 408.6 kTOE.

*Despite strong domestic coal production, **84% of our total coal supply is imported**. This is to provide for the requirements of power plants for coal with **higher heating value** than those domestically produced.*

The 9.7 percent hike in coal importation was mainly due to higher demand for coal as fuel input in power generation. Coal import volume reached 13.9 MTOE in 2018 vis-à-vis 11.8 MTOE in 2017. Indonesia maintains its position as the country's prime import market with a bulk share of 88.7 percent, while the remaining portion was supplied by Australia, Vietnam, Russia and South Korea.

On the other hand, coal exports were down by 18.1 percent to 2.7 MTOE in 2018 from its 2017 volume of 3.3 MTOE. China, the country's top export market (92.7 percent share) for locally produced coal, recorded a 13.5 percent drop in its demand to 4.9 MMT during the period. This overshadowed the higher requirement for domestic coal from emerging export markets such as Thailand and India.

Meanwhile, ethanol imports went down by 6.0 percent to reach 144.7 kTOE, from its 2017 level of 154.0 kTOE. This was consistent with the requirements for the ethanol-blended as the gasoline import also dropped for this particular period.

D. ENVIRONMENTAL IMPACT

Between 2017 and 2018, total greenhouse gas (GHG) emissions from energy-related activities increased by 4.1 percent, which stood at 123.3 million tons of CO_2 equivalent ($MtCO_2e$) in 2018 from 118.5 $MtCO_2e$ the previous year. The increased activities in all sectors contributed to the rise in GHG, notably in the power generation and transportation, as both are major sectors that supported the robust economic growth during the period. As such, GHG emission from power generation grew the fastest at 9.5 percent and contributing the biggest share in the total GHG emission account from 49.2 percent share in 2017 to 51.7 percent share in 2018 *(Table 2)*.

Aside from the power generation sector, GHG emissions from the transportation and industry sectors contributed the shares of 27.9 percent and 11.3 percent, respectively, to the total. The rest came from other sectors such as agriculture and services / commercial (8.5 percent share), and other energy sector's activities (e.g. oil refining) (0.6 percent share). The considerable increase in GHG emission is mainly brought about by the continued increase in the utilization of oil in the transport sector and coal for power generation *(Table 3)*.

Table 2. GHG INVENTORY FOR THE ENERGY SECTOR in FY 2017-2018, By Sector

Sector	CO_2 Emission ($MtCO_2e$)		$NonCO_2$ Emission ($MtCO_2e$)		Total GHG Emission ($MtCO_2e$)		Percent Change in Total GHG Emission (%)
	2017	2018	2017	2018	2017	2018	2017-2018
Power Generation	57.99	63.48	0.25	0.28	58.24	63.76	9.48
Transportaton	32.99	34.15	0.20	0.21	33.20	34.36	3.49
Industry	16.26	13.91	0.10	0.08	16.36	13.99	-14.47
Other*	9.95	10.41	0.06	0.06	10.01	10.47	4.61
Energy**	0.68	0.74	0.00	0.00	0.68	0.74	8.56
Total	**117.87**	**122.69**	**0.61**	**0.63**	**118.48**	**123.32**	**4.08**
% Distribution							**Change in Distribution**
Power Generation	49.20	51.74	41.19	44.02	49.15	51.71	2.55
Transportaton	27.99	27.83	33.28	33.46	28.02	27.86	-0.16
Industry	13.80	11.34	15.64	12.60	13.81	11.35	-2.46
Other*	8.44	8.48	9.57	9.70	8.45	8.49	0.04
Energy**	0.57	0.60	0.31	0.21	0.57	0.60	0.02
Total	**100**	**100**	**100**	**100**	**100**	**100**	

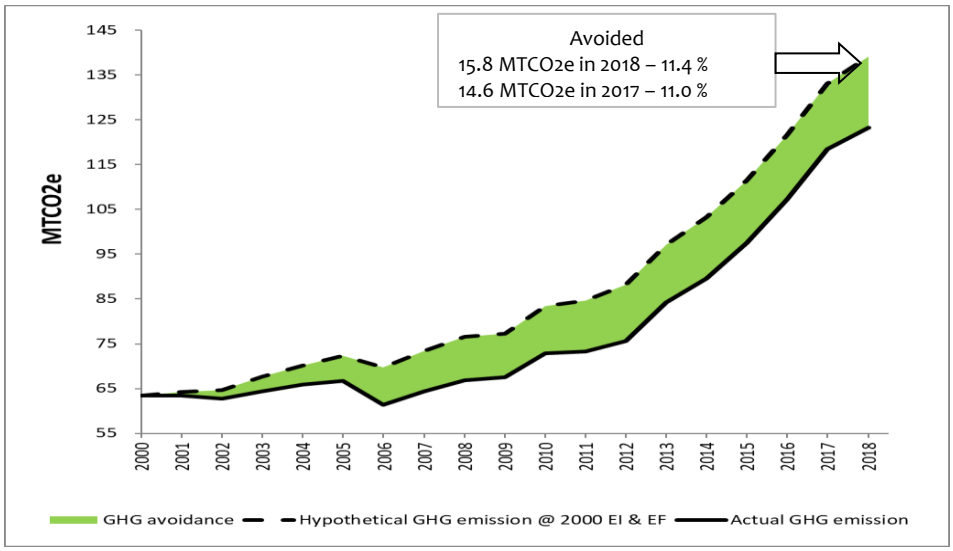
** includes emission from the services (exc transport), households and agriculture sectors*
***includes losses incurred in oil refining*
Note: sum does not add up due to rounding off

Table 3. GHG INVENTORY FOR THE ENERGY SECTOR in FY 2017-2018, By Fuel

Sector	CO_2 Emission ($MtCO_2e$)		Total $NonCO_2$ Emission ($MtCO_2e$)		Total GHG Emission ($MtCO_2e$)		Percent Change in Total GHG Emission (%)
	2017	2018	2017	2018	2017	2018	2017-2018
Oil	50.86	51.43	0.29	0.29	51.15	51.73	1.13
Coal	59.46	62.83	0.32	0.33	59.78	63.16	5.65
Gas	7.54	8.42	0.01	0.01	7.55	8.43	11.64
Total	**117.87**	**122.69**	**0.61**	**0.63**	**118.48**	**123.32**	**4.08**
% Distribution							**Change in Distribution**
Oil	43.15	41.92	47.08	46.73	43.17	41.95	-1.22
Coal	50.45	51.21	51.74	52.00	50.45	51.22	0.76
Gas	6.40	6.86	1.18	1.28	6.37	6.84	0.46
Total	**100**	**100**	**100**	**100**	**100**	**100**	

Figure 16 and *Table 4* showed the avoidance vis-a-vis mitigation measures in the energy sector. For 2018, the combined impact of the demand-side mitigation measures, i.e., efficient use of fossil fuel and electricity, biofuels blending and natural gas contributed 11.0 MtCO2e net GHG reductions, bringing down the GHG emission level by 7.9 percent from the total hypothetical GHG emission (actual plus total avoidance). On the other hand, fuel diversification in power generation through the use of renewables and natural gas contributed 3.5 percent (of the hypothetical GHG emission) further reduction in GHG emission during the same period. With the above-stated mitigation measures, the energy sector has avoided a total 15.8 MtCO2e or 11.4 percent GHG emission reduction in 2018. This level translates to an 8.6 percent improvement from 2017's total avoidance of 14.6 MtCO2e.

Figure 16. ACTUAL GHG EMISSION, GHG EMISSION AVOIDANCE and HYPOTHETICAL GHG EMISSION, 2000-2018



Note: Hypothetical GHG Emission is equivalent to Actual GHG Emission plus GHG Emission Avoidance; GHG Base year is CY 2000 GHG Emission Level

Table 4. CO_2 AVOIDANCE FROM THE MITIGATION MEASURES (in $ktCO_2e$)

GHG Reduction Measures	2017	Reduction Impact* %	2018	Reduction Impact* %	% Change
Demand side	**10,117.14**	**7.60**	**11,031.39**	**7.93**	**9.04**
Efficiency in Electricity Consumption (EEC)	3,076.50	2.31	3,120.95	2.24	1.44
Efficiency in Fossil Fuel Consumption (EEF)	5,363.52	4.03	6,182.36	4.44	15.27
Biofuel	1,677.12	1.26	1,728.07	1.24	3.04
CNG	0.00	0.00	0.00	0.00	0.09
Supply side					
Fuel Diversification in Power Generation @ 2000 GDP & EF*	4,477.37	3.36	4,815.72	3.46	7.56
Total Avoidance (*Demand + Supply - EEC*)	**14,594.52**	**10.97**	**15,847.10**	**11.39**	**8.58**
Actual GHG Emission	118,482.19		123,317.65		4.08
Hypothetical GHG Emission (Actual + Total Avoidance)	133,076.71		139,164.76		

**Note: Refers to the percent reduced emission (Total Avoidance / Hypothetical GHG Emission x 100)*

E. ENERGY – ECONOMY AND ENVIRONMENTAL INDICATORS[18]

*The **Services sector, including the energy-intensive Transport sector,** continues to drive the country's economic growth.*

The country's total economic output, measured in terms of real gross domestic product (GDP), posted a slower 6.2 percent growth in 2018 vis-à-vis 6.7 percent in 2017 as prices of basic commodities significantly increased due to new or higher excise taxes on consumption and food supply concerns. The Services[19] sector, with 57.8 percent share of real GDP, remains the major contributor to GDP growth. Despite the slightly weakened performance of domestic trade and other services sub-sectors, including banks, insurance and real estate, the sector's aggregate value-added managed to sustain its 6.8 percent in 2018 buoyed by the double-digit growth in government services. On the other hand, growth in the Industry sector, with a share of 34.1 percent of GDP, was slower at 6.7 percent as a result of the slump in manufacturing output despite the robust 14.9 percent expansion in the construction sub-sector. Similarly, the Agriculture sector, which had the least contribution to real GDP at 8.1 percent share, posted a sluggish 0.9 percent increase in gross value added (GVA) as the production of major crops and the fisheries sub-sector contracted during the same period. On the demand side, the slowdown in consumer spending due to inflation was compensated by increased government spending, particularly on infrastructure, and higher capital investments on durable equipment and intellectual property products (primarily on software and knowledge materials).

1. Energy Intensity

The country's economy-wide energy intensity level reached 6.4 tonnes of oil equivalent per million pesos of real GDP (TOE/MPhp) in 2018, lower by 3.4 percent than the 6.7 TOE/MPhP in 2017. Similarly, oil intensity dropped by 5.0 percent to 1.7 barrel per P100,000, while electricity intensity was 0.5 percent lower at 10.8 Wh/PhP. Reduction in the country's energy intensity can be attributed to improving efforts in energy efficiency across all economic sectors.

***Improving efforts in energy efficiency** across all economic sectors contributed to the **3.4 % reduction in energy intensity to 6.4 tonnes of oil equivalent per million pesos of real GDP in 2018**.*

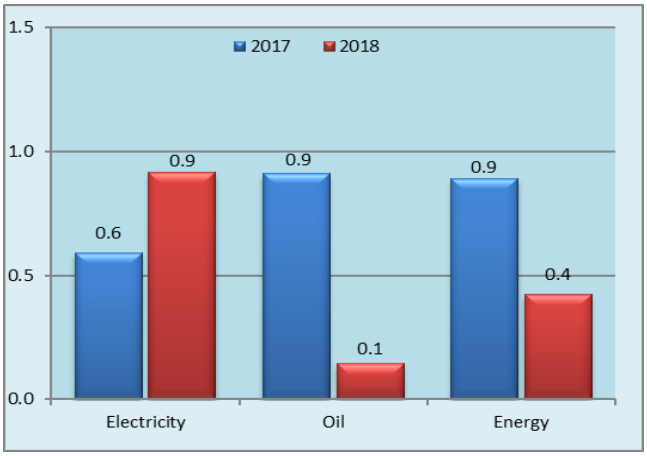
All sectors registered declines in their respective energy intensities. Energy intensity in the Industry sector dropped by 6.11 pecent to 1.8 TOE/MPhp in 2018 as the reduced production output, particularly in the manufacturing sub-sector, translated to less energy consumed. Similarly, energy intensity in the agriculture sector went down by 9.9 percent, albeit being the lowest at 0.1 TOE/MPhp as the sector's energy consumption for crop production and fisheries went down during the same period. On the other hand, the Services sector posted energy intensity level of 2.6 TOE/MPhp, a slight reduction of 1.8 percent than its year-ago level as due to efficiency gains that slowed down energy consumption of commercial establishments in 2018. Meanwhile, household energy intensity also went down by 2.4 percent to 1.9 TOE/MPhp during the same year.

[18] GDP figures as based on the PSA-NSCB's National Accounts of the Philippines (NAP), as of April 2018, 2000-based series
[19] In the PSA's National Accounts, Services includes the Transportation sub-sector

2. *Energy Elasticity*

The energy-to-GDP elasticity was reported at 0.4 units in 2018, while oil supply to GDP elasticity registered 0.1 units, whereas electricity registered higher elasticity values of 0.9. As all values are all positive and less than one (1), it indicates that primary energy demand[20] was least affected by proportionate changes in economic output *(Figure 17)*.

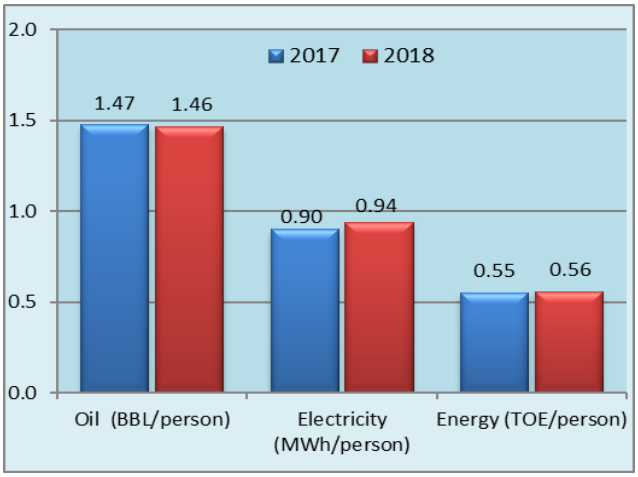
Figure 17. ENERGY ELASTICITIES, 2017 vs. 2018



3. *Energy Per Capita*

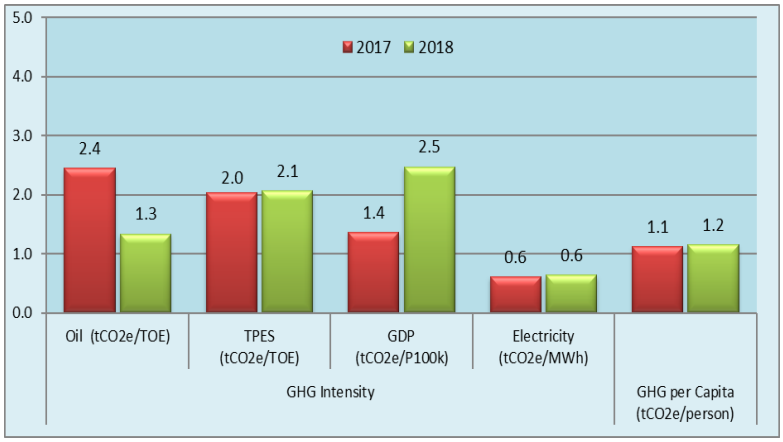
Energy per capita level went up by 1.0 percent to 0.56 TOE/person in 2018, from last year's 0.55 TOE/person. Similarly, electricity per capita posted 4.1 percent growth from the previous year's level to reach 936 kWh/person, while oil per capita posted was at 1.46 barrel/person, albeit 0.7 percent lower than its 2017 level. Improved energy and electricity per capita levels in 2018 reflect increased access to energy services due to the extensive promotional efforts of the government and stakeholders in the energy sector. On the other hand, the slight drop in oil per capita can be attributed to the slower consumption caused by skyrocketing of domestic oil prices during the year *(Figure 18)*.

Figure 18. ENERGY PER CAPITA, 2017 vs. 2018



4. *GHG Emission*

Figure 19. ENVIRONMENTAL EMISSION INDICATORS, 2017 vs. 2018



For 2018, total GHG emission for every Php 100,000 of the country's economic output (measured in terms of real GDP) stood at 1.34 tons of CO_2 equivalent (tCO_2e), 2.0 percent lower than the previous year's level of 1.37 tCO_2e *(Figure 19)*. This was attributable to the tapered activities of all end-use sectors which require less energy, particularly the industry sector, as their aggregate GHG emission levels went down by 14.5 percent during the period in review. The same trend was likewise reflected in the 2.4 percent uptake in the amount of GHG per capita to 1.16 tCO_2e/person from 1.13 tCO_2e/person a year ago. Similarly, with fossil fuels' 62 percent share in the energy mix,

[20] Includes total final energy consumption net of electricity, fuel input to power generation, energy own-use and loss (net of electricity); 2016 total primary demand increased by 6.3 percent vis-à-vis real GDP growth of 6.9 percent.

the GHG intensity of the TPES was 2.07 tCO_2e/TOE, 1.2 percent more than its 2017 level of 2.04 tCO_2e/TOE, while GHG emission per TOE of oil consumption was registered at 2.5 tCO_2e in 2018. On the other hand, as generation output of coal-fired power plants increased vis-à-vis output from renewable energy power plants in 2018, GHG emission per megawatt-hr (MWh) of electricity generation went up by 3.6 percent to 0.64 tCO_2e in the same period.