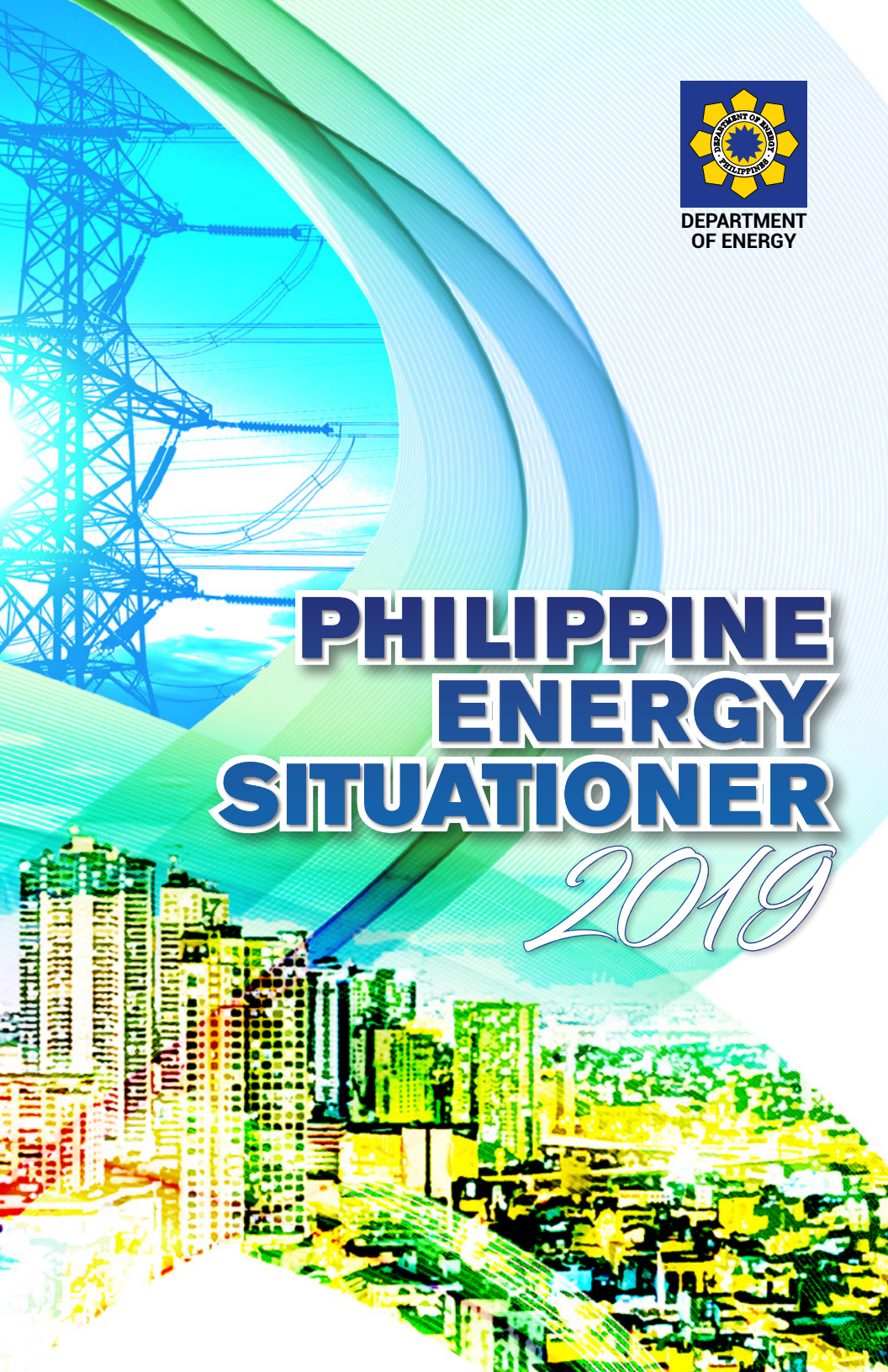
PHILIPPINE ENERGY SITUATIONER & KEY ENERGY STATISTICS

DEPARTMENT OF ENERGY

PHILIPPINE ENERGY SITUATIONER

2019



This issue presents an analysis of energy supply and demand situation in the Philippines for 2019 vis-à-vis 2018. The energy data used herein are based on the Energy Balance Table (EBT) *(as of 23 June 2020)* as generated by the Policy Formulation and Research Division (PFRD), unless otherwise stated. Kindly note that *Non-Energy Use* is included in the discussion for Total Final Energy Consumption (TFEC) per sector in this report. Per DO2018-004-009, data revisions after cut-off date (15 July 2020) shall be reflected in the updating of the succeeding year's EBT (i.e. 2020).

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ABBREVIATIONS and ACRONYMS USED

TFEC	Total Final Energy Consumption
TPES	Total Primary Energy Supply
MTOE	Million tons of oil equivalent
kTOE	Thousand tons of oil equivalent
TOE	Tons of oil equivalent
TWh	Terra-watt Hour
GWh	Gigawatt-Hour
MW	Megawatt
MWh	Megawatt-hour
kWh	Kilowatt-hour
BBL	Barrels
MB	Thousand Barrels
MMB	Million Barrels
MMMT	Million Metric Tons
ROM	Run of Mine
MMSCF	Million Standard Cubic Feet
MMT	Thousand Metric Tons
GHG	Greenhouse gas
tCO_2e	tons of carbon dioxide equivalent
$ktCO_2e$	thousand tons of carbon dioxide equivalent
$MtCO_2e$	million tons of carbon dioxide equivalent
DOTr	Department of Transportation
MRT	Metro Rail Transit
LRT	Light Rail Transit
GDP	Gross Domestic Product
GVA	Gross-value added

TOTAL FINAL ENERGY CONSUMPTION

The country's total final energy consumption (TFEC) in 2019 went up by 1.6 percent to 36.3 million tons of oil equivalent (MTOE) from its year-ago level of 35.7 MTOE *(Figure 1)*. End-use economic sectors registered increments in their energy consumption, except for Industry which posted a 1.8 percent contraction in 2019. On the other hand, ensuing calls to reduce single-use plastics and the pause in construction activities during the first quarter led to the decline in the aggregate volume of fuels used as feedstock and raw materials[1] in industries, particularly in the manufacture of plastics and metal.

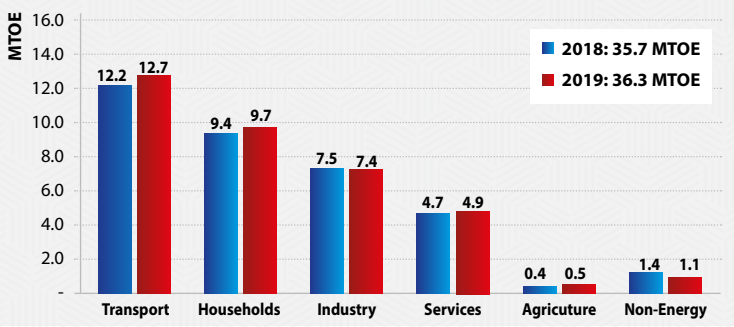


Figure 1: Total Final Energy Consumption, By Sector In MTOE: 2018 vs. 2019

With its 34.9 percent share to TFEC, transport maintains its position as the most energy-intensive sector. Gasoline and aviation fuels were the biggest contributor to the 3.7 percent hike in the sector's energy consumption, which totalled to 12.7 MTOE in 2019 *(Figure 2)*. Next to transport, the household sector acquired more than a fourth (26.7 percent share) of demand mix, utilizing 9.7 MTOE or 3.0 percent higher than the previous year. Meanwhile, a strong retail trade industry and increased business activities resulted to a 5.3 percent rise in the services[2] sector's energy consumption to 4.9 MTOE in 2019, while contributing 13.5 percent share to TFEC. Higher yield from the crops and fisheries subs-sector pushed energy use in the agriculture sector by 7.3 percent to 471.7 kTOE in 2019. On the other hand, the slowdown in production output from energy-intensive manufacturing sub-sectors, particularly paper and paper product and non-metallic mineral products, pulled down aggregate industrial energy consumption by 1.8 percent to 7.4 MTOE in 2019, translating to a 20.3 percent share to TFEC.

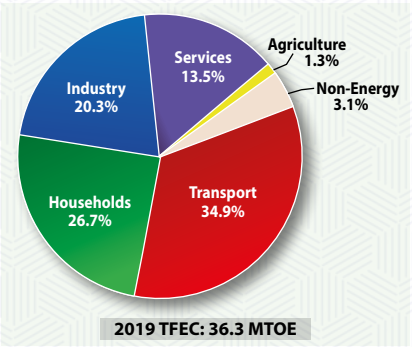


Figure 2: Total Final Energy Consumption, By Sector Shares (In Percent): 2019

[1] asphalt, naphtha, etc.
[2] Excluding Transport

A. Total Final Energy Consumption, by Fuel

By type of fuel, oil products continued to dominate the country's TFEC with a bulk share of 51.0 percent or 18.5 MTOE, up by 1.9 percent from last year's level of 18.2 MTOE *(Figure 3)*. Despite the implementation of 2nd round of excise tax provision under the Tax Reform for Acceleration and Inclusion Act (TRAIN) law, domestic pump prices moved more steadily in 2019 than 2018. This boosted the consumption of gasoline and diesel, primarily used for road transport, which went up by 8.2 percent and 2.7 percent, respectively, with a combined share of 80.1 percent to the total oil consumption during the year.

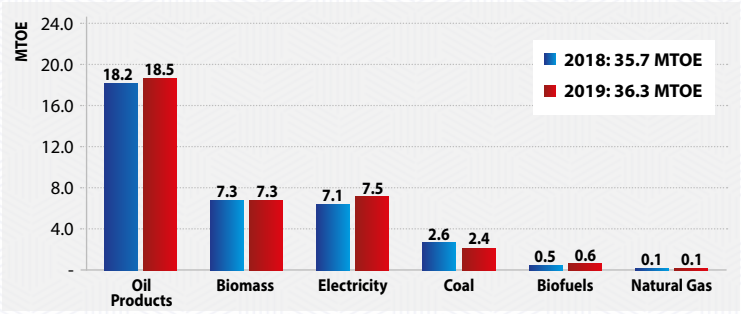


Figure 3: Total Final Energy Consumption, By Fuel (In MTOE): 2018 vs 2019

Consumption of electricity reached 7.5 MTOE in 2019, 5.4 percent higher than its year-ago level of 7.1 MTOE. With a share of 20.6 percent to TFEC, electricity was the second most utilized fuel. Households and industries each accounted for more than one-third of total electricity consumption, while the services sector's requirements represented a 29.2 percent share.

Next to oil and electricity, biomass[3] for end-use applications contributed 20.2 percent share to the total demand. Of the 7.3 MTOE of biomass consumed in 2019, households accounted for the bulk at 78.7 percent. Establishments engaged in food services and industries involved in sugar and food processing accounted for the remaining shares to biomass consumption *(Figure 4)*.

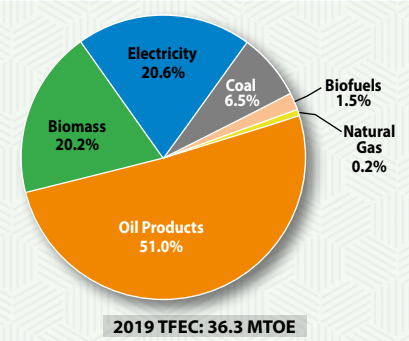


Figure 4: Total Final Energy Consumption, By Fuel Shares (In Percent): 2019

Utilization of coal for end-use applications registered an 8.0 percent slump from its previous year's level of 2.4 MTOE to 2.2

[3] Includes charcoal, fuelwood, ricehull, bagasse, agricultural and animal wastes

MTOE in 2019. This is attributable to the slack in product volumes amidst the slowdown in construction activities, as well as delays in priority public infrastructure projects due to the late passage of the national budget[4].

Consumption of biofuels (biodiesel and bioethanol) was 6.6 percent higher in 2019, from 524.0 kTOE in 2018 to 558.4 kTOE during the period. Higher demand for gasoline and diesel vis-à-vis strict compliance to blending schedule[5] contributed to the consistent upward trends in biofuel consumption.

The Pilipinas Shell Petroleum Corporation (PSPC), the lone user of natural gas for end-use application, reported an increase of 3.6 percent in its natural gas consumption. Despite the increase in volume, its consumption slowed down vis-à-vis its 13.1 percent hike in 2018 due to the scheduled shutdown for maintenance purposes implemented in October 2019 for all natural gas-fired power plants, including refineries.

B. Total Final Energy Consumption, by Sector

1. Transport

Total energy consumption in the transport sector went up by 3.7 percent from 12.2 MTOE in 2018 to 12.7 MTOE in 2019 *(Figure 5)*. This was driven by the 3.7 percent increase in energy utilized for road transport, albeit slower compared to the previous year. Road transport captured 88.0 percent share or 11.2 MTOE of the total sector's consumption.

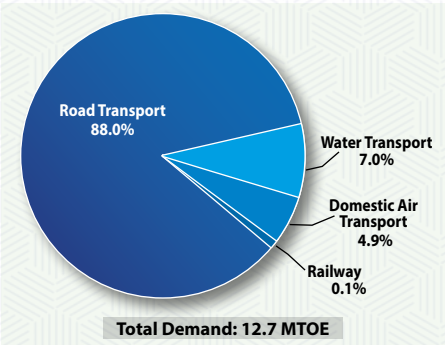


Figure 5: Transport Final Energy Consumption, By Sub-Sector Shares (In Percent): 2019

Consolidated reports from the three major automotive associations: Chamber of Automotive Manufacturers of the Philippines, Inc. (CAMPI), Truck Manufacturers Association (TMA) and Association of Vehicle Importers and Distributors, Inc. (AVID)[6] indicated a slowdown in new vehicle sales for 2019. Only 14,834 units were sold during the year, a modest 3.7 percent hike as the motor vehicle industry took on the impact of the TRAIN law that rationalized taxation of vehicles and mandated additional excise taxes on petroleum products, particularly gasoline and diesel, during the year. The increase in the number of registered vehicles for 2019 likewise slowed down to 1.1 million units vis-à-vis 1.2 million in 2018[7].

[4] Cement makers build profits despite PH's unstable infra targets https://business.inquirer.net/282038/cement-makers-build-profits-despite-phs-unstable-infra-targets#ixzz6QQxlTjj7
[5] Biofuels Law of 2006 or Republic Act (RA) 9367
[6] https://www.autoindustriya.com/auto-industry-news/philippine-auto-industry-sold-416-637-units-in-2019.html
[7] Number of registered vehicles (million units and year): 10.4 (2017), 11.6 (2018) and 12.7 (2019) (LTO Annual Reports)

On the other hand, energy consumption for inland water transport reported a minimal increase of 0.9 percent to 890.8 kTOE in 2019 from last year's 882.7 kTOE. Domestic shipping operators had to adjust to higher vessel operating costs brought about by new excise taxes on fuels[8]. Domestic air transport used 626.3 kTOE of fuel, 4.9 percent share to total sector, and 7.3 percent higher than its previous year's level of 583.6 kTOE. A robust domestic tourism and affordable tour packages and fares offered by travel agencies and domestic airline, i.e. Philippine Airlines and Cebu Pacific Airlines, contributed the increase in the number of passengers on domestic flights from 27.3 million in 2018 to 29.5 million in 2019[9]. Having the least share of 0.1 percent to total transport consumption, rail transport went up by 2.8 percent from 10.7 kTOE in 2018 to 11.1 kTOE in 2019 due to improvements made in maintenance, and increased number of trains running during operating hours of Metro Rail Transit Line 3 (MRT3).

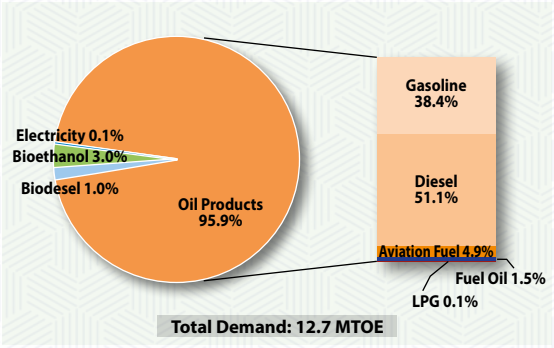


Figure 6: Transport Final Energy Consumption, By Fuel Shares (In Percent): 2019

The transport sector continued to rely heavily on oil products, as aggregate levels accounted for 95.9 percent of the sector's total energy demand during the year *(Figure 6)*. Consumption of gasoline went up by 8.1 percent, despite imposition of additional excise taxes due to higher saturation of passenger cars in road transport, as well as the 124% surge in sales of motorcycles in 2019[10]. On the other hand, diesel utilization registered a sluggish 0.4 percent increase, coincided on the period that the government implemented higher excise taxes. Bioethanol and biodiesel went up by 8.6 percent and 0.2 percent, respectively, following the movement of consumption pattern of gasoline and diesel based on the mandated blending schedule. As domestic shipping companies aimed to reduce their operating costs in which the biggest component is fuel cost, it contributed to the downtrend in fuel oil consumption of 7.2 percent in 2019. Meanwhile, the waning viability of auto-LPG taxies effectively reduced the consumption of LPG by 12.1 percent during the same year.

2. Households

Household energy consumption in the residential sector grew by 3.0 percent from its 2018 level of 9.4 MTOE to 9.7 MTOE in 2019.

[8] https://www.portcalls.com/outlook-ph-cargo-transport-2019-mixed-bag-hopes-fears/
[9] Scheduled Domestic Passenger Traffic: 2000-2019 http://www.cab.gov.ph/statistics/category/domestic-3
[10] https://www.bworldonline.com/car-sales-bounce-back-in-2019/

Utilization of biomass as traditional cooking and heating fuel, particularly in rural areas, posted a measly 0.4 percent increment to reach 5.8 MTOE in 2019, equivalent to a 59.4 percent share in the household sector's demand mix. Among biomass fuels, fuelwood contributed 42.2 percent while the remaining 17.2 percent came from charcoal and agri-waste *(Figure 7)*.

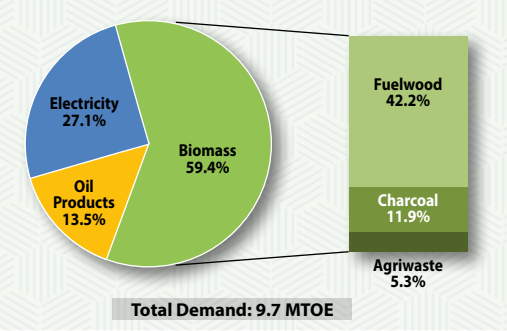


Figure 7: Household Final Energy Consumption, By Fuel Shares (In Pecent): 2019

As of December 2019, an additional 1.1 million households gained access to electricity[11]. This development in household electrification hiked the sector's electricity consumption by 8.1 percent to 2.6 MTOE, representing a 27.1 percent share in the sector's energy demand. Relatively lower LPG prices that prevailed in 2019 vis-à-vis 2018 encouraged households to consume 1.2 MTOE of LPG or 5.4 percent more than its previous year's consumption. Despite the declining prices of kerosene, its utilization dropped by 8.1 percent against the evident preference for electricity and LPG as fuels for household activities.

3. Industry

Energy consumption in the industry sector, which came in third after transport and household sectors, stood at 7.4 MTOE in 2019, 1.8 percent lower than its year-ago level of 7.5 MTOE.

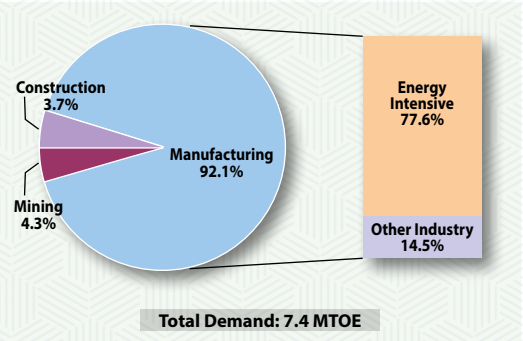


Figure 8: Industry Final Energy Consumption, By Sub-Sector Shares (In Percent): 2019

Energy-intensive manufacturing subsectors recorded a 6.5 percent drop in its energy utilization. This led to the 2.4 percent contraction in the manufacturing sector's aggregate consumption as levels reached 6.8 MTOE in 2019, translating to 92.1 percent share *(Figure 8)* to total industrial energy consumption. Of this level, energy intensive[12] industries took 77.6 percent of

[11] Number of electrified households as of December 2019 was 23.23 million, from 22.09 million as of December 2018
[12] food processing, cement production, paper production and printing, chemicals, basic metals and machineries

the sub-sector's total energy demand. The mining subsector reversed its year-ago contraction with a 4.9 percent hike in energy consumption for 2019 coinciding with its 5.9 percent growth in gross value-added (GVA) during the same period[13]. This was attributable to the efforts of mining companies to maximize the sector's potential without compromising environmental protection and ensure the sustainability of mining practices. In the near future, the operation of five (5) mining projects in the country will increase the contribution of the mining sector to the economy[14]. On the other hand, the `continuous spending on large-scale transportation infrastructures and energy projects under the Build, Build, Build (BBB) program propelled the construction sub-sector's energy use as it registered a 6.4 percent increase during the period.

Coal, electricity, oil products, and biomass[15] are the major fuels for industrial processes *(Figure 9)*. Coal consumption went down by 8.0 percent to 2.2 MTOE, translating to a 30.0 percent share in the industry's demand mix for 2019. Despite reporting higher profits in 2019 due to higher cement prices that prevailed in 2019, major cement companies had lower sales volumes vis-à-vis the previous year due to sluggish private and public construction activities, aggravated by adverse weather conditions in December 2019 that affected Luzon and Visayas[16]. Meanwhile, electricity, which is widely used among industrial processes and machineries, accounted for 32.8 percent share of the total sector's demand. This is equivalent to consumption level of 2.4 MTOE, up by 2.2 percent from its 2018 level.

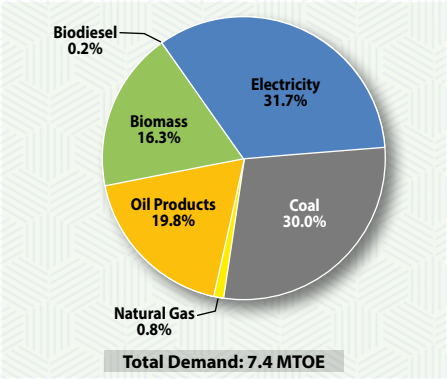


Figure 9: Industry Final Energy Consumption, By Fuel Shares (In Percent): 2019

Consumption of oil products reached 1.5 MTOE, equivalent to 19.8 percent share to the industry's energy demand in 2019. Combined levels of diesel and fuel oil in food processing, basic metals and machinery industries increased by 1.5 percent. Biomass consumption, primarily in food processing and sugar industries, accounted for a 16.3 percent share to the sector's total demand as it posted a 0.7 increment in utilization level of 1.2 MTOE from the previous year. PSPC's natural gas consumption for non-power application contributed 0.8 percent share to total industry's energy consumption.

[13] Mining and Quarrying, gross-value added (GVA) for 2019 (base year 2000) PSA
[14] https://businessmirror.com.ph/2019/09/12/five-projects-seen-boosting-growth-of-philippine-mining-sector/
[15] Includes fuelwood, bagasse, ricehull, agriculture and animal wastes
[16] https://www.cemexholdingsphilippines.com/-/chp-reports-fourth-quarter-2019-results

4. Services[17]

Energy use among services/commercial establishments increased by 5.3 percent to 4.9 MTOE in 2019 from its previous year's level of 4.7 MTOE. This level of energy consumption contributed to the robust performance of the retail trade and supported increased activities in other service establishments such as banks and financial institutions, hotels, restaurants and other services.

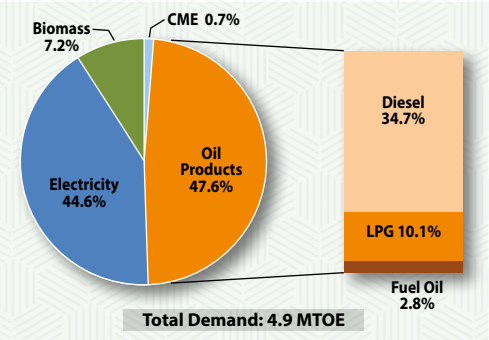


Figure 10: Services Final Energy Consumption, By Fuel Shares (In Percent): 2019

Oil products such as diesel, fuel oil, and LPG accounted for almost half of the sector's demand (47.6 percent). As diesel is primarily used to ensure uninterrupted power supply among establishments and for logistics purposes (services vehicles), its consumption registered an 8.8 percent hike to 1.7 MTOE in 2019, equivalent to 34.7 percent share to the sector's demand mix. Likewise, biodiesel posted an increase of 8.3 percent from last year's level of 30.4 kTOE to 32.9 kTOE in 2019. Aside from diesel, LPG and fuel oil are important petroleum products used in the commercial sector albeit declining by 2.3 percent and 7.2 percent, respectively, in 2019. The drop in LPG consumption may be attributable to the shift towards electricity as cooking fuel among establishments, aside from its utilization for space cooling and lighting. As such, electricity consumption increased by 6.1 percent to 2.2 MTOE in 2019 from its previous year' level of 2.1 MTOE. On the other hand, biomass contributed 7.2 percent share in the commercial sector energy consumption with a minimal increase of 0.7 percent to reach 352.6 kTOE in 2019.

5. Agriculture

The agriculture sector's energy utilization went up by 7.3 percent, from its previous year's level of 439.6 kTOE to 471.7 kTOE in 2019 *(Table 1)*. All sub-sectors registered higher energy consumption during the year.

Table 1. Agriculture Energy Consumption, By Subsector

Subsector	2018	2019	Growth Rate (%)
Agri-Industry	**239.4**	**254.0**	**6.1**
• Agri-Crops Product	78.4	84.3	7.5
• Livestock/Poultry	153.4	161.7	5.4
• Agri Services	7.5	7.9	5.4
Forestry	**1.0**	**1.1**	**8.0**
Fishery	**199.1**	**216.6**	**8.8**
Total	**439.6**	**471.7**	**7.3**

[17] Trade and services, excluding Transport

Energy use for crop production went up by 7.5 percent due to more usage of high yielding variety seeds coupled with good weather conditions during the cropping period. In Davao Region, sufficient application of salt fertilizer provided by the Philippine Coconut Authority (PCA)[18] contributed to the output increment. Likewise, energy consumption of the livestock and poultry sub-sector went up by 5.4 percent in 2019 due to the increase in slaughtering activities and early disposals of stocks in Cagayan Valley, MIMAROPA Region and Zamboanga as part of the efforts to combat the spread of the African Swine Fever (ASF). Meanwhile, the fishery sub-sector registered 216.6 kTOE of energy consumption, 8.8 percent higher than its 199.1 kTOE level in 2018. Similarly, the forestry sub-sector registered higher energy consumption during the period to reach 1.1 kTOE from 1.0 kTOE in 2018.

Electricity garnered more than half of the total consumption of the sector (50.9 percent) at 239.9 kTOE, an increase of 5.4 percent from its year-ago level. The sector's consumption of oil accounted for 48.0 percent, as its level reached 227.6 kTOE with an increase of 9.4 percent from its previous year's level *(Figure 11)*.

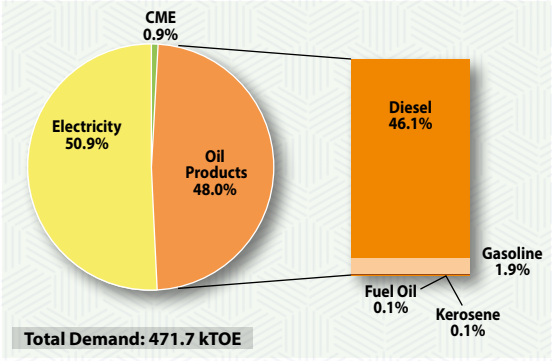


Figure 11: Agriculture Final Energy Consumption, By Fuel Shares (In Percent): 2019

Among oil products, diesel was the most consumed fuel in the sector, as it registered an increase utilization rate of 8.8 percent from its year-ago level of 199.9 kTOE to 217.5 kTOE in 2019, while biodiesel increased by 8.3 percent to 4.2 kTOE during the period. Likewise, gasoline consumption increased by 28.0 percent from 7.1 kTOE in 2018 to 9.0 kTOE for the year. On the other hand, fuel oil and kerosene usage in the agriculture sector declined by 7.2 percent and 5.1 percent, respectively for the year.

[18] 2019 Performance of Philippine Agriculture

TRANSFORMATION

A. Oil Refining

Combined refining output from the country's two (2) operational refineries – Petron Bataan Refinery in Limay, Bataan and the Filipinas Shell Oil Refinery located in Tabangao, Batangas City reached 61.2 million barrels of oil (MMB), a sharp decline of 29.3 percent, from its year-ago level of 86.6 MMB. Due to the 6.1 magnitude earthquake that shook parts of Luzon in April 2019, Petron refinery went on an emergency shutdown that lasted until August 2019. As such, the level of total marketable products posted a double-digit reduction of 30.5 percent from 10.9 MTOE in 2018 to 7.6 MTOE in 2019 *(Figure 12)*. Petron and Shell refineries have a combined maximum working crude distillation capacity of 163 thousand barrels/stream day (MBSD). The total marketable products for the period were composed of diesel (41.4 percent), gasoline (23.7 percent) and fuel oil (8.8 percent). The rest of the products were aviation fuel (10.5 percent), LPG (4.0 percent), kerosene (0.4 percent), and naphtha and other products (11.1percent).

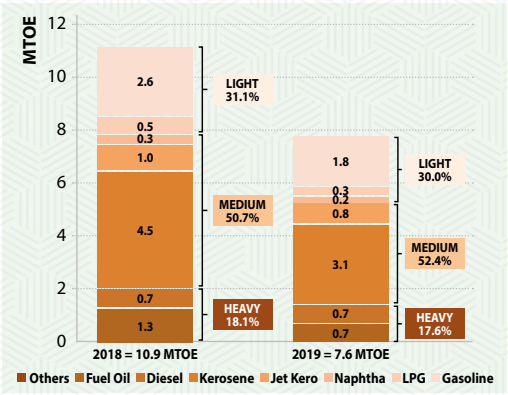


Figure 12: Refinery Production, by Fuel
(In MTOE and Percent Shares): 2018 vs 2019

B. Power Generation and Fuel Input

Aggregate generation output of power plants in the country posted an increase of 6.3 percent from 99.8 tera-watt hours (TWh) in 2018 to 106.0 TWh in 2019 *(Figure 13)*. Of this total, coal power plants supplied more than half at 57.9 TWh (54.6 percent share), while natural gas and geothermal contributed 22.4 TWh (21.1 percent) and 10.7 TWh (10.1 percent share), respectively.

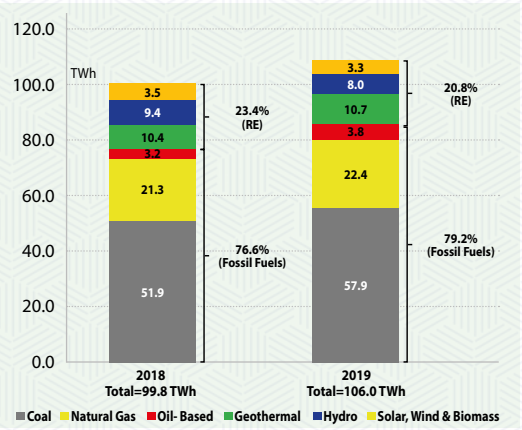


Figure 13: Power Generation, by Fuel
(In TWh and Percent Shares): 2018 vs 2019

On the other hand, the total amount of fuel input for power generation grew by 4.3 percent to 31.1 MTOE in 2019 *(Figure 14)*. Among fossil fuels that comprised the 62.0 percent share to total fuel input, coal accounted for the bulk at 48.7 percent share. Coal as input for power generation increased its level by 9.8 percent from 13.8 MTOE in 2018 to 15.1 MTOE in 2019. Meanwhile, the volume of natural gas and oil used as input for power generation went up by 2.6 percent and 1.1 percent to 3.4 MTOE and 0.7 MTOE, respectively. Given the higher utilization of fossil fuels, RE as input for power generation dropped by 1.3 percent to 11.8 MTOE during the same period. Geothermal was the biggest RE input for power generation at 9.2 MTOE, an increase in its utilization rate of 2.4 percent in 2019, followed by hydro power plants at 2.0 MTOE, albeit lower than its previous year's input of 2.3 MTOE. The combined inputs from solar, wind and biomass contributed 1.9 percent share to the fuel input mix at a level of 0.6 MTOE.

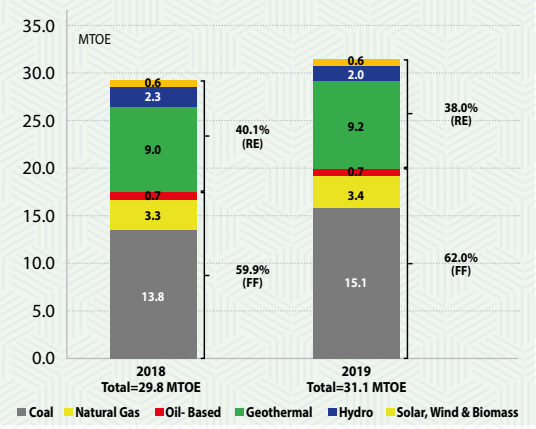


Figure 14: Fuel Input to Power Generation, by Fuel (In MTOE and Percent Shares): 2018 vs 2019

TOTAL PRIMARY ENERGY SUPPLY

The country's total primary energy supply (TPES) registered a sluggish 0.6 percent increase from its year-ago level of 59.7 MTOE to 60.1 MTOE in 2019. The total indigenous energy went up by 3.0 percent, while the level of net energy imports dropped by 1.7 percent. Crude oil importation slowed down due to the emergency and scheduled maintenance/ turnaround of Petron's Bataan Refinery from April to August 2019. With the reduction in net importation, energy self-sufficiency improved by 1.2 percentage points from 50.2 percent in 2018 to 51.4 percent in 2019 *(Figure 15)*.

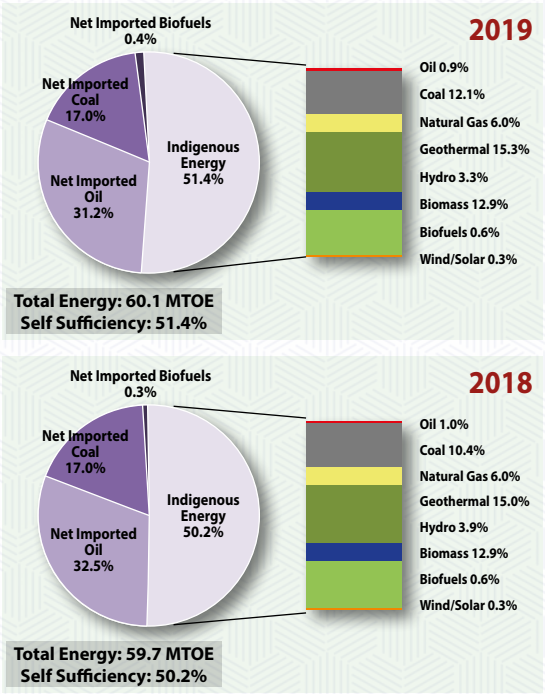


Figure 15. Total Primary Energy Mix, by Fuel Shares (In Percent): 2018 vs 2019

Fossil fuel accounted for 67.2 percent share to TPES in 2019, as oil maintained its position as the country's major energy source with close to one-thirds (32.1 percent) share to TPES despite a 3.5 percent reduction due to cuts in both domestic production and net importations. Coal supply increased by 6.9 percent owing to the hike in its domestic production and contributed 29.1 percent share to TPES, while the level of natural gas supply registered a measly 0.7 percent increase to 3.6 MTOE in 2019. On the other hand, aggregated supply of RE dropped by 0.4 percent to 19.7 MTOE, representing 32.8 percent of TPES during the period.

A. Indigenous Energy

Aggregate indigenous energy production reached 30.9 MTOE in 2019, 3.0 percent higher than its year-ago level of 30.0 MTOE in 2018. Coal contributed to the bulk of the increase with its 17.0 percent hike in domestic production, while notable increments were registered in production levels of geothermal (2.4 percent) and biofuels (2.7 percent). In terms of contribution to total indigenous production, geothermal accounted for 29.8 percent share, followed by biomass (25.1), coal (23.5 percent), and natural gas (11.7 percent).

1. Fossil Fuels

i. Oil

Domestic oil production, which includes crude oil and condensate, dropped by as much as 12.0 percent in 2019. Crude oil production plunged by 38.6 percent to 104.3 KTOE in 2019 from 169.8 kTOE in 2018 since oil wells located in Nido, Matinloc and North Matinloc have ceased operation. Condensate sourced from the Malampaya gas field, which is wholly exported, likewise reported a 1.4 percent decline in levels for 2019.

ii. Coal

Bulk of the domestic production of coal, which registered at 7.3 MTOE in 2019, came from the Semirara Mining and Power Corporation (SMPC), the country's major coal producer. It registered a significant increase of 17.3 percent as its level reached 13.7 million metric tons at 10,000 British Thermal unit per pound (MMMT@10,000BTU/lb). However, despite SMPC's gains, aggregate output from other coal mines fell by 33.4 percent in 2019.

iii. Natural Gas

Natural gas production from Malampaya, the country's single large scale source of natural gas, went up by 0.7 percent to 3.6 MTOE in 2019. The almost same level of natural gas production is attributable to the maintenance implemented during the year, which affected the operation of all natural gas power plants including the PSPC refinery.

2. Renewable Energy

i. Geothermal

Geothermal energy continues to account for the largest portion of total indigenous energy supply at 29.8 percent in 2019, which translates to a 15.3 percent share to the TPES. Geothermal output went up by 2.4 percent to 9.2

MTOE compared to its 2018 level of 9.0 MTOE. Installed generating capacity of geothermal power plants reached 1,918 MW, while two (2) service contracts were awarded in 2019[19].

ii. Hydro

Hydropower production in 2019 reached 2.0 MTOE, down by 14.5 percent from its year-ago level of 2.3 MTOE, while contributing 6.5 percent share to the total indigenous energy supply or 3.3 percent share to the TPES. The reduction in hydro supply is attributable to El Niño that persisted until the first semester of 2019, particularly affecting provinces in Luzon and Mindanao[20]. Given better climate conditions, hydro supply levels are expected to improve with the five (5) newly-installed hydro plants for 2019 with a total capacity of 48.6 MW[21].

iii. Solar

Solar for power generation contributed a 0.2 percent share to the total energy mix in 2019, despite a 0.2 percent reduction in levels 107.4 kTOE to 107.1 kTOE. Solar Philippines commenced the operation of its 150-MW solar plant in April 2019 in Tarlac, which is considered as the largest solar farm in the country, while solar photovoltaic (PV) systems were being widely utilized by consumers and industries across the Philippines.

iv. Wind

Production of wind energy stood at 89.6 KTOE, 9.7 percent lower than its 2018 level of 99.1 kTOE, albeit a marginal contribution of 0.3 percent to the indigenous energy production. Despite the reduction, wind power is expected to pick up as the Puerto Galera Wind Power Plant, which is located in Mindoro and developed by the Phil. Hybrid Energy Systems, Inc., commenced commercial operation in November 2019 with an installed capacity of 16 MW. Aside from this, there were 16 wind projects awarded in 2019[22].

v. Biomass

Next to geothermal, biomass[23] accounted for the second largest share at 25.1 percent of the indigenous energy supply in 2019. Aggregate biomass supply for power and non-power applications reached 7.7 MTOE in 2019, slightly higher by 0.9 percent from its 2018 level. The constant promotion on the use of biomass for power generation resulted to the installation of six (6) biomass power plants

[19] https://www.doe.gov.ph/renewable-energy/bioethanol?q=renewable-energy/Summary-of-Projects
[20] El Nino Advisory No. 7 (Final), DOST-PAGASA
[21] Energy Annual Report (EAR) 2019
[22] https://www.doe.gov.ph/renewable-energy/bioethanol?q=renewable-energy/Summary-of-Projects
[23] Includes charcoal, fuelwood, rice hull, bagasse, agriculture, animal and municipal wastes

in 2019 with total capacity of 118.1 MW[24]. Included among these projects is the Victorias Milling Company (VMC)'s 40-MW biomass plant, the largest stand-alone biomass plant, inaugurated in May 2019[25].

vi. Biofuels

Domestic supply of biofuels (biodiesel and bioethanol) posted a 2.7 percent increment from last year's 337.9 kTOE to 347.2 kTOE in 2019. This is equivalent to a 1.1 percent share to the total indigenous energy during the period. Biodiesel supply went up by 6.0 percent due to higher production output from the eleven (11) existing biodiesel producers whose total sales volume reached 217.5 million liters in 2019, from 205.2 million liters in 2018. On the other hand, bioethanol supply levels increased by 8.6 percent to 380 kTOE in 2019. The twelve (12) existing ethanol facilities that were operational during the year registered slightly lower total sales of 302.3 million liters in 2019 from its year-ago volume of 303.7 millon liters, while import volume dropped by 18.3 percent. In order to meet the strong demand for bioethanol from the transport sector, the estimated volume of withdrawal from bioethanol stocks registered an all-time high of 165.8 million liters in 2019.

B. Net Energy Imports[26]

Net energy imports, which accounted for 48.6 percent share to TPES, fell by 1.7 percent to 29.2 MTOE in 2019 from last year's level of 29.7 MTOE. Oil and oil products contributed 64.3 percent, while coal contributed 35.0 percent share. Lastly, biofuels held 0.8 percent share to total net energy imports *(Figure 16)*.

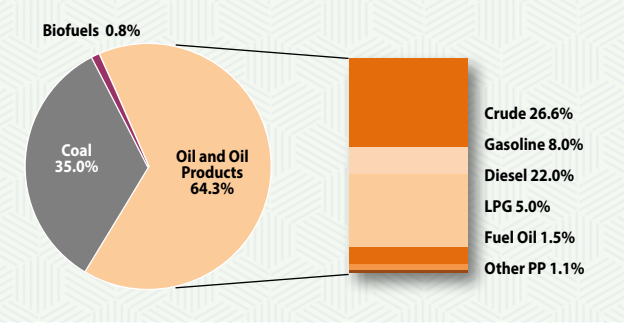


Figure 16. Net Energy Imports, by Fuel Shares (In Percent): 2019

[24] https://www.doe.gov.ph/renewable-energy/bioethanol?q=renewable-energy/Summary-of-Project
[25] https://biothekecologic.com/new-40mwe-biomass-power-plant-in-the-philippines/
[26] 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)

Oil imports stood at 22.1 MTOE, of which 38.0 perccent were crudes and 62.0 percent finished oil products. Due to five (5) month shutdown of Petron's Bataan Refinery, the volume of imported crude oil plunged by 27.0 percent to 8.4 MTOE in 2019 from its previous year's 11.5 MTOE. Bulk (71.9 percent) of the country's crude imports were sourced from the Middle East, while Russia and nearby countries in the Asia-Pacific Region[27] supplied 15.0 percent and 13.1 percent shares, respectively.

Aggregate import volume of finished oil products increased by as much as 12.2 percent to 13.7 MTOE in 2019 from 12.2 MTOE in 2018. This was to ensure adequate supply of oil products to meet domestic demand, particularly in the transport sector, despite the limited operation of Petron's refinery during the year. China, South Korea and Singapore are the major sources of the imported oil products with 41.7 percent, 20.8 percent and 11.5 percent share, respectively. These countries are also the top export markets of finished oil products from the Philippines.

Exports of finished oil products went down by 40.8 percent to 1.0 MTOE in 2019. The decrease is attributable to the reduction in refinery output caused by Petron's maintenance shutdown and higher domestic demand. On the other hand, exports of crude oil from the Galoc field has been declining since 2014 as it posted a further reduction of 6.8 percent in 2019. Similarly, exports of condensate from Malampaya was 1.4 percent lower than its 2018 level of 424.0 kTOE.

As coal-fired power plants required more fuel input to generate electricity, imported coal posted a 5.3 percent hike to reach 14.6 MTOE in 2019 vis-à-vis 13.9 MTOE in 2018. Bulk (95.0 percent) of imported coal was sourced from Indonesia, while Australia, Vietnam and Russia provided the remaining import requirement.

On the other hand, coal exports increased to 5.3 MTOE in 2019, twice as much as its 2.7 MTOE recorded in the previous year, as the strong domestic production allowed for the hike in export volume. China, the country's top export market (96.5 percent share) for locally produced coal, increased its coal requirement to 8.7 MMT or almost twice its 4.5 MMT in 2018. Meanwhile Thailand quadrupled its demand for Philippine coal to 228.6 MT in 2019. Taiwan and India likewise served as export markets during the year.

Ethanol imports went down by 18.3 percent to reach 118.3 kTOE, from its 2018 level of 144.7 kTOE. The downward trend is consistent with the reduction in the volume of imported gasoline for this particular period.

[27] Includes Brunei, Malaysia and Australia

IV ENVIRONMENTAL IMPACT

The upward trends in both energy supply and consumption for 2019 resulted in a 5.4 percent increase in total greenhouse gas (GHG) to reach 130.0 million ton of CO_2 equivalent ($MtCO_2e$) from last year's 123.3 $MtCO_2e$. Higher GHG emission for 2019 is attributable to increased activities in all sectors, except in the industry that recorded a reduction of 5.5 percent. Power generation continues to contribute the biggest share in the total GHG emission at 53.2 percent, as its GHG emission increased by 8.6 percent to 69.2 $MtCO_2e$ *(Table 2)*. On the other hand, the transport sector contributed a share of 27.3 percent to the total, as it registered a 3.5 percent increase in its GHG emission during the year. Other sectors (households, services and agriculture) also registered higher GHG during the same period. Petron's resumption of its refinery activities after a five (5)-month hiatus necessitated an increase in its own use of crude oil that led to the hike in GHG emission from oil refining by as much as 35.8 percent in 2019.

Table 2: GHG Emission, by Sector: 2018 vs 2019

Sector	CO_2 Emission ($MtCO_2e$)		Total NonCO_2 Emission ($MtCO_2e$)		Total GHG Emission ($MtCO_2e$)		Total GHG Emission (% Change)
	2018	2019	2018	2019	2018	2019	2018-2019
Power Generation	63.5	68.9	0.3	0.3	63.8	69.2	8.6
Transport	34.1	35.3	0.2	0.2	34.4	35.5	3.5
Industry	13.9	13.2	0.1	0.1	14.0	13.2	-5.5
Other Sectors*	10.4	11.0	0.1	0.1	10.5	11.0	5.3
Energy**	0.7	1.0	0.0	0.0	0.7	1.0	35.7
Total	**122.7**	**129.4**	**0.6**	**0.7**	**123.3**	**130.0**	**5.4**
% Distribution							**Change in Distribution**
Power Generation	51.7	53.3	44.0	45.6	51.7	53.2	1.5
Transport	27.8	27.3	33.5	33.3	27.9	27.3	-0.5
Industry	11.3	10.2	12.6	11.1	11.3	10.2	-1.2
Other Sectors*	8.5	8.5	9.7	9.7	8.5	8.5	-0.0
Energy**	0.6	0.8	0.2	0.4	0.6	0.8	0.2
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	

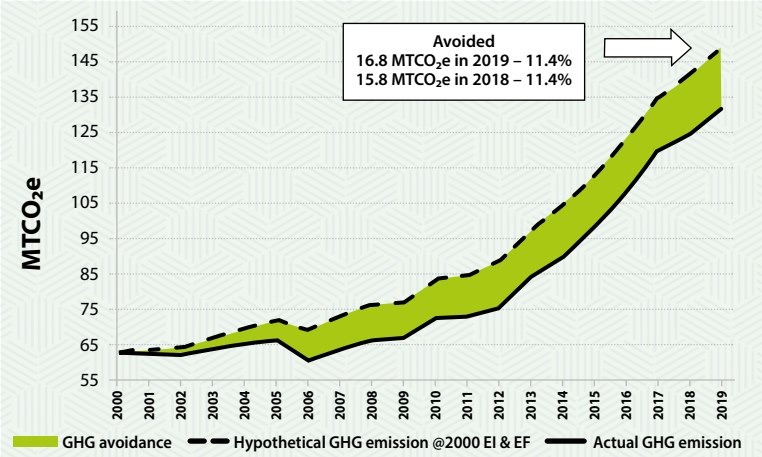
**includes emission from the services, households and agriculture sectors*
***includes losses incurred in oil refining*

Emissions from coal accounted for more than half (52.0 percent) of the total GHG emission in 2019, as it increased by 7.1 percent to 67.7 $MTCO_2e$. On the other hand, oil accounted for 41.4 percent share with 53.9 $MTCO_2e$, or 4.2 percent higher than its year-ago level *(Table 3)*. These increases are attributable to the heightened utilization of coal as fuel in power generation and that of oil in the transport sector.

Table 3: GHG Emission, by Fuel: 2018 vs 2019

Sector	CO_2 Emission ($MtCO_2e$)		Total NonCO_2 Emission ($MtCO_2e$)		Total GHG Emission ($MtCO_2e$)		Total GHG Emission (% Change)
	2018	2019	2018	2019	2018	2019	2018-2019
Oil	51.4	53.6	0.3	0.3	51.7	53.9	4.2
Coal	62.8	67.3	0.3	0.3	63.2	67.7	7.1
Gas	8.4	8.5	0.0	0.0	8.4	8.5	0.7
Total	**122.7**	**129.4**	**0.6**	**0.7**	**123.3**	**130.0**	**5.4**
% Distribution							**Change in Distribution**
Oil	41.9	41.4	46.7	46.5	41.9	41.4	-0.5
Coal	51.2	52.0	52.0	52.3	51.2	52.0	0.8
Gas	6.9	6.6	1.3	1.2	6.8	6.5	-0.3
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	

Figure 17. Actual GHG Emission, Hypothetical GHG Emission and GHG Avoidance: 2000 – 2019



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

Figure 17 and *Table 4* showed the avoidance vis-à-vis mitigation measures in the energy sector. Fuel diversification in power generation through intensified use of RE and natural gas reduced GHG emission by 3.3 percent or 4.8 $MtCO_2e$ from the total hypothetical[28] GHG emission. Demand side measures, such as efficiency in fossil fuels and electricity, as well as biofuel blending further reduced hypothetical GHG emission by 8.1 percent or 11.9 $MtCO_2e$ during the same period. Due to combined supply and demand side mitigation measures, the energy sector has avoided a total of 16.8 $MtCO_2e$ or 11.4 percent of the hypothetical GHG emission reduction in 2019. This level translates to a 5.4 percent increase from 2018's total avoidance of 15.8 $MtCO_2e$.

Table 4. CO_2 Avoidance from the Mitigation Measures (in $ktCO_2e$)

GHG Reduction Measures	2018	Reduction Impact* %	2019	Reduction Impact* %	% Change (2018-2019)
Demand side	11,031.4	7.9	11,935.3	8.1	8.2
Efficiency in Electricity Consumption (EEC)	3,121.0	2.2	3,438.8	2.3	10.2
Efficiency in Fossil Fuel Consumption (EEF)	6,182.4	4.4	6,691.0	4.6	8.2
Biofuel	1,728.1	1.2	1,805.6	1.2	4.5
Supply side					
Fuel Diversification in Power Generation @ 2000 GDP & EF**	4,815.7	3.5	4,818.8	3.3	0.1
Total Avoidance (Demand + Supply - EEC)	**15,847.1**	**11.4**	**16,754.1**	**11.4**	**5.7**
Actual GHG Emission	123,317.7		130,032.8		5.4
Hypothetical GHG Emission (Actual + Total Avoidance)	139,164.8		146,786.9		

**Refers to the percent reduced emission (Total Avoidance / Hypothetical GHG Emission x 100)*
***Includes efficiency in Power Generation and EEC*

[28] Refers to actual GHG emission plus total avoidance; or the level of GHG emission if there were no mitigation measures being adopted

V Energy – Economy and Environmental Indicators[29]

The country settled for the lower limit of its economic target for 2019 with a 6.0 percent expansion in its real gross domestic product (GDP) – the slowest growth since the 3.9 percent posted in 2011. The slowdown was primarily driven by the contraction in public investment as the budget impasse[30] necessitated the adoption of a reenacted budget that stalled major infrastructure projects, and resulted in government underspending for January to April along with the spending ban on new projects before the May election.

By industrial origin, the Services sector remains as the main driver of economic growth, contributing 4.5 percentage points to the GDP growth in 2019, as its 7.5 percent increase in aggregate gross value added (GVA) outpaced that of GDP. This is attributable to the improved performance of domestic trade, particularly retail trading, financial intermediation and business activities that offset the uncertainties around the government's ongoing tax reform program and the external environment. On the other hand, growth in the Industry sector was slower at 4.7 percent despite its 30.2 percent share to of GDP and contributing 1.4 percentage points to GDP growth. The slump in manufacturing and construction output, which make up nearly 90 percent of total industrial output, contributed to the slowdown. Similarly, the AFF sector, which had the least contribution to real GDP at 9.2 percent share posted a sluggish 1.2 percent increase in gross value added (GVA which translates to an almost nil (0.1 percentage points) contribution to economic growth. The AFF sector remained vulnerable to weather-related phenomenon due to the absence of adequate support infrastructure and services, such as the mild El Niño during the first half of 2019, as well as the spread of African swine fever (ASF) in Luzon. Given the tepid performance of the industries, the 17.3 percent increase in investments[31] and the 5.6 percent growth in consumer spending, supplemented by the country's double-digit growth in international trade, further stimulated GDP growth in 2019.

A. Energy Intensity

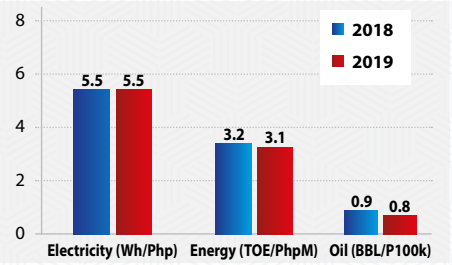


Figure 18. Energy Intensities: 2018 vs 2019

The country's economy-wide energy intensity level reached 3.1 tonnes of oil equivalent per million pesos of real GDP (TOE/MPhp) in 2019, lower by 3.6 percent than the 3.2 TOE/MPhp in 2018. Similarly, oil intensity dropped by 3.1 percent to 0.8 barrel per P100,000 (BBL/Php100,000), while electricity intensity was unchanged at 5.5 watt-hour per peso (Wh/Php) *(Figure 18)*.

[29] GDP figures as based on the PSA National Accounts of the Philippines (NAP), as of April 20, 2020 (rebased 2018)
[30] delayed passage of the 2019 budget over alleged pork barrel or illegal funds https://www.rappler.com/business/249977-gross-domestic-product-philippines-q4-2019
[31] PSA Report on Investments as of 20 February 2020

Despite increased economic activity, end-use economic sectors have implemented energy efficiency and conservation (EE&C) practices owing to the passage of Republic Act 1285, otherwise known as the Energy Efficiency and Conservation Act. This contributed to the decline in their respective energy use per unit of output. The Services sector posted a 1.9 percent reduction in its energy intensity level to 1.3 TOE/MPhp in 2019, as establishments implemented programs for energy efficiency and conservation to attain savings in electricity and other fuels. In the Industry sector, energy use per unit of industrial output went down by 8.0 percent to 0.8 TOE/MPhp as output from manufacturing sub-sectors slowed down during the year. Households' energy intensity likewise dropped by 1.7 percent to 0.9 TOE/MPhp, while the AFF sector's energy per unit of output stood at 0.06 TOE/MPhp, 1.3 percent lower than the previous year.

B. Energy Elasticity

The energy-to-GDP elasticity, which is the percentage change in energy demand for every percentage change in GDP, was reported at 0.4 units in 2019, while oil supply to GDP elasticity likewise registered 0.5 units. These values indicate that increase in the volume of overall energy (and oil) consumed was slower vis-à-vis the hike in economic output during the year. On the other hand, electricity was 1.0 unit elastic vis-à-vis GDP, which means that demand for electricity moves in accordance with the increase in economic output for 2019 *(Figure 19)*.

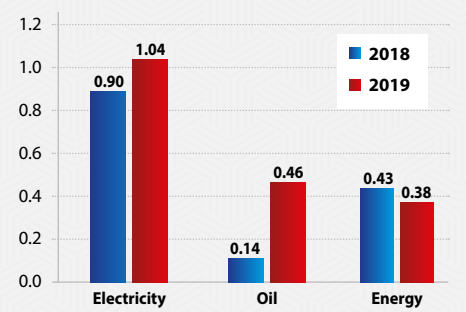


Figure 19. Energy Elasticities: 2018 vs 2019

C. Energy Per Capita

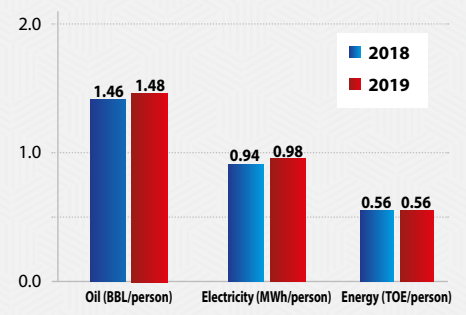


Figure 20. Energy Per Capita, 2018 vs. 2019

Energy per capita level went up by 0.7 percent to 0.56 TOE/person in 2019. Similarly, electricity per capita posted a 4.6 percent growth from the previous year's level to reach 0.98 megawatt-hour (MWh)/person, while oil per capita stood at 1.48 barrel/person, 1.2 percent higher than its 2018 level. The improvements in per capital levels for 2019 are consistent with the government's push to expand energy access, particularly thru intensified electrification programs *(Figure 20)*.

D. GHG Emission

Carbon intensity, or the amount of GHG emission per unit of economic output, declined by 0.6 percent to 0.67 tons of CO_2 equivalent (tCO_2e) per Php100,000, owing to mitigation efforts that involved the promotion and use of renewable energy and other low carbon fuels (Figure 21). Similarly, with fossil fuels' 67.2 percent share in the energy mix, the GHG intensity of the TPES was 2.16 tCO_2e/TOE, 4.8 percent more than its 2018 level of 2.07 tCO_2e/TOE, while GHG emission per TOE of oil consumption was registered at 2.67 tCO_2e in 2019. On the other hand, GHG emission per megawatt-hr (MWh) of electricity generation increased by 2.2 percent to 0.65 tCO_2e in 2019 due to higher share of fossil fuels, particularly coal, to power generation. Lastly, there was a 3.8 percent escalation in the amount of GHG per capita to 1.20 tCO_2e/person from 1.16 tCO_2e/person a year-ago.

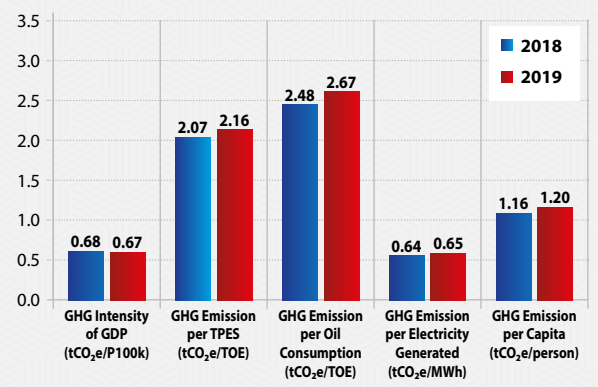


Figure 21. Environmental Emission Indicators: 2018 vs. 2019

2019 Energy Balance Table *In thousand tons of oil equivalent (kTOE)*

	Coal	Natural Gas	Oil & Oil Products	Hydro	Geothermal
Indigenous	7,257.9	3,626.0	522.6	1,997.9	9,192.4
Imports	14,616.0	-	22,097.5	-	-
Exports	(5,287.4)	-	(1,520.4)	-	-
International Marine Bunkers	-	-	(54.0)	-	-
International Civil Aviation	-	-	(1,618.1)	-	-
Stock Change	895.1	-	(126.9)	-	-
Total Primary Energy Supply	**17,481.6**	**3,626.0**	**19,300.7**	**1,997.9**	**9,192.4**
Refinery (Crude Run)	-	-	(407.8)	-	-
Power Generation (Fuel Input)	(15,123.7)	(3,408.8)	(735.7)	(1,997.9)	(9,192.4)
Transmission/Distribution Loss	-	-	-	-	-
Energy Sector Use & Loss	-	(155.7)	(224.3)	-	-
Net Domestic Supply	**2,357.9**	**61.5**	**17,932.9**	**-**	**-**
Statistical Difference	-	-	-	-	-
% Statistical Difference	-	-	-	-	-
Total Final Energy Consumption	**2,357.9**	**61.5**	**18,511.7**	**-**	**-**
Industry	2,217.1	61.5	1,464.5	-	-
Transport	-	-	12,173.1	-	-
Households	-	-	1,312.0	-	-
Services (excluding Transport)	-	-	2,338.8	-	-
Agriculture	-	-	227.6	-	-
Non-Energy Use	140.9	-	995.8	-	-

2018 Energy Balance Table *In thousand tons of oil equivalent (kTOE)*

	Coal	Natural Gas	Oil & Oil Products	Hydro	Geothermal
Indigenous	6,204.5	3,601.1	593.8	2,336.0	8,972.7
Imports	13,881.5	-	23,720.4	-	-
Exports	(2,667.7)	-	(2,204.7)	-	-
International Marine Bunkers	-	-	(82.8)	-	-
International Civil Aviation	-	-	(1,624.7)	-	-
Stock Change	(1,068.9)	-	(408.0)	-	-
Total Primary Energy Supply	**16,349.4**	**3,601.1**	**19,994.0**	**2,336.0**	**8,972.7**
Refinery (Crude Run)	-	-	(631.8)	-	-
Power Generation (Fuel Input)	(13,776.3)	(3,324.0)	(728.4)	(2,336.0)	(8,972.7)
Transmission/Distribution Loss	-	-	-	-	-
Energy Sector Use & Loss	-	(217.7)	(80.2)	-	-
Net Domestic Supply	**2,573.1**	**59.4**	**18,553.6**	**-**	**-**
Statistical Difference	-	-	-	-	-
% Statistical Difference	-	-	-	-	-
Total Final Energy Consumption	**2,573.1**	**59.4**	**18,167.9**	**-**	**-**
Industry	2,410.9	59.4	1,468.8	-	-
Transport	-	-	11,752.7	-	-
Households	-	-	1,254.6	-	-
Services (excluding Transport)	-	-	2,222.5	-	-
Agriculture	-	-	208.0	-	-
Non-Energy Use	162.2	-	1,261.2	-	-

Solar	Wind	Biomass	Biodiesel	Bioethanol	Electricity	Total
107.1	89.6	7,735.7	178.2	169.0	-	30,876.4
-	-	-	-	118.3	-	36,831.8
-	-	-	-	-	-	(6,807.8)
-	-	-	-	-	-	(54.0)
-	-	-	-	-	-	(1,618.1)
-	-	-	9.0	92.7	-	869.9
107.1	**89.6**	**7,735.7**	**187.2**	**379.9**	**-**	**60,098.2**
-	-	-	-	-	-	(407.8)
(107.1)	(89.6)	(404.1)	(8.7)	-	9,117.9	(21,950.2)
-	-	-	-	-	(859.4)	(859.4)
-	-	-	-	-	(767.8)	(1,147.7)
-	**-**	**7,331.6**	**178.4**	**379.9**	**7,490.8**	**35,733.2**
-	**-**	**-**	**-**	**-**	**-**	(578.8)
-	**-**	**-**	**-**	**-**	**-**	(1.6)
-	**-**	**7,331.6**	**178.4**	**379.9**	**7,490.8**	**36,312.0**
-	-	1,207.1	14.5	-	2,424.2	7,389.0
-	-	-	126.8	379.9	9.1	12,689.0
-	-	5,771.9	-	-	2,627.0	9,710.8
-	-	352.6	32.9	-	2,190.5	4,914.9
-	-	-	4.2	-	239.9	471.7
-	-	-	-	-	-	1,136.6
					Self-Sufficiency (%)	**51.4**

Solar	Wind	Biomass	Biodiesel	Bioethanol	Electricity	Total
107.4	99.1	7,724.6	168.1	169.8	-	29,977.2
-	-	-	-	144.7	-	37,746.7
-	-	-	-	-	-	(4,872.4)
-	-	-	-	-	-	(82.8)
-	-	-	-	-	-	(1,624.7)
-	-	-	14.2	35.3	-	(1,427.4)
107.4	**99.1**	**7,724.6**	**182.3**	**349.8**	**-**	**59,716.6**
-	-	-	-	-	-	(631.8)
(107.4)	(99.1)	(429.7)	(8.1)	-	8,578.2	(21,203.5)
-	-	-	-	-	(774.4)	(774.4)
-	-	-	-	-	(700.0)	(998.0)
-	**-**	**7,294.9**	**174.2**	**349.8**	**7,103.8**	**36,108.9**
-	**-**	**-**	**-**	**-**	**-**	385.7
-	**-**	**-**	**-**	**-**	**-**	1.1
-	**-**	**7,294.9**	**174.2**	**349.8**	**7,103.8**	**35,723.1**
-	-	1,198.7	13.4	-	2,372.1	7,523.3
-	-	-	126.6	349.8	9.0	12,238.1
-	-	5,746.1	-	-	2,430.0	9,430.7
-	-	350.2	30.4	-	2,065.0	4,668.1
-	-	-	3.9	-	227.6	439.6
-	-	-	-	-	-	1,423.4
					Self-Sufficiency (%)	**50.2**