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Ethiopia Electric power



FACTS IN BRIEF 2023/24

Clean Energy For Better Life!!

Ethiopian Electric Power

Mission

“To provide reliable and sustainable electric power through innovation, technology, continuous learning, fairness and commitment”

Vision

“To be the power hub of Africa”

Core Values

- ✓ *Customer-centric*
- ✓ *Sustainability*
- ✓ *Reliability*
- ✓ *Empowerment*
- ✓ *Continuous improvement*
- ✓ *Integrity*
- ✓ *Occupational Health and Safety*
- ✓ *Synergy*

1. Overview of the country

Location: - Horn of Africa

Area: - 1.1 million km²

Land: - 1.0 million km² – (90.56%)

Water: - 104,300 km² (9.44%)

Population: - 109,498,000

Climate: - Tropical monsoon with wide
topographic – induced variation

Natural resource: - Gold, platinum, copper,
potash, natural gas, hydro power,
geothermal power, wind power and
solar energy.

Electric Energy Potential: -

Hydro power: - More than 45,000 MW

Wind power: - More than 1,350,000 MW

Geothermal power: - More than 10,000 MW

2. Ethiopian electric power Establishment

The history of electricity in Ethiopia goes back to the late 1880s. The service was started by Emperor Minilik-II through one diesel generator powering up the national palace. The diesel generator was a gift from the government of Germany. The company was formed in 1956 as the Ethiopian Electric Light & Power Authority (EELPA), which bundled all Ethiopian activities around electricity in a single organization. In 1996, EELPA was split into the Ethiopia Electric Authority (EEA), taking over all regulating activities and a company, Ethiopian Electric Power Corporation (EEPCo), bundling all activities from power generation to household delivery. In 2013, EEPCo was again split up into two companies, Ethiopian Electric Utility (EEU) and Ethiopian Electric Power (EEP).

Ethiopian Electric Power is a state-owned enterprise established under the Council of minister's regulation No.302/2013 and its amendment regulation No.381/2016 which mandated to undertake the following activities:

- ✓ To undertake feasibility studies, design and survey of electricity generation in integrated national grid, construction of transmission lines and substation over 66 kV; to contract out such activities to consultants, as required;
- ✓ To undertake construction and upgrading of electricity generation and upgrading transmission and substation of over 66 kV; to contract out such works to contractors as required;

- ✓ To administer, operate and maintain electricity generation in the integrated national grid, and transmission lines and substations of over 66 kV;
- ✓ To sell and purchase bulk electric power on transmission lines above 66 kV;
- ✓ To lease transmission lines above 66kV;
- ✓ To submit electricity tariff proposals with respect to power its sales and implement same upon approval;
- ✓ In line with directives and policy guidelines issued by the Ministry of Finance and Economic Development, to sell and pledge bonds and to negotiate and sign loan agreements with local and international financial sources;
- ✓ To undertake any other related activities necessary for the attainment of its purposes.

3. Electric Supply System

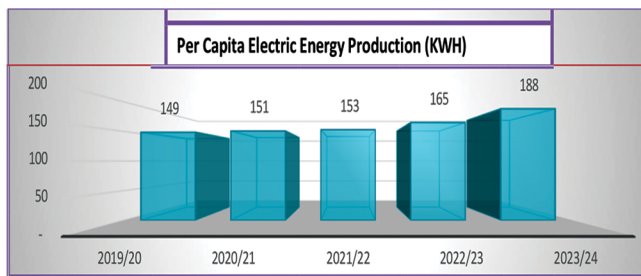
Currently, the company maintains the interconnected system (ICS), which is mainly supplied from hydro power plants and wind farms.

4. ICS per Capita

Electric power consumption per capita (kWh) is the production of power plants and combined heat and power plants with less transmission, distribution, and transformation losses and their own use by heat and power plants, divided by the midyear population.

EEP believes that supporting the country's economic growth by anticipating future energy needs and decarbonizing the economy is a tremendous opportunity to create wealth, generate employment, and improve both the condition of the country and people's health.

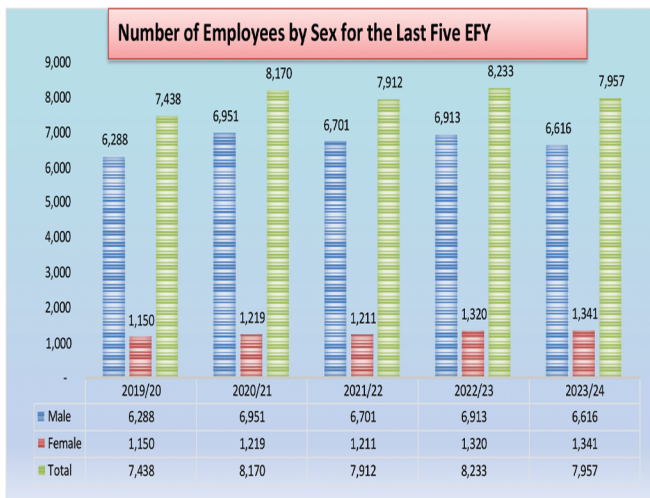
Ethiopia can be completely self-sufficient with domestically produced energy. In the previous fiscal year, the total production of all-electric energy-producing facilities is 20,596,381,268.5 kWh (20,596.3 GWh), with per capita electric energy production of 188 kWh as compared to previous years, which increased by around 14 percent. The increase of electrification in rural areas and the growth of demand in the country brought an average increment in the generation capability and showed the growth trend of the ICS per capita generation.



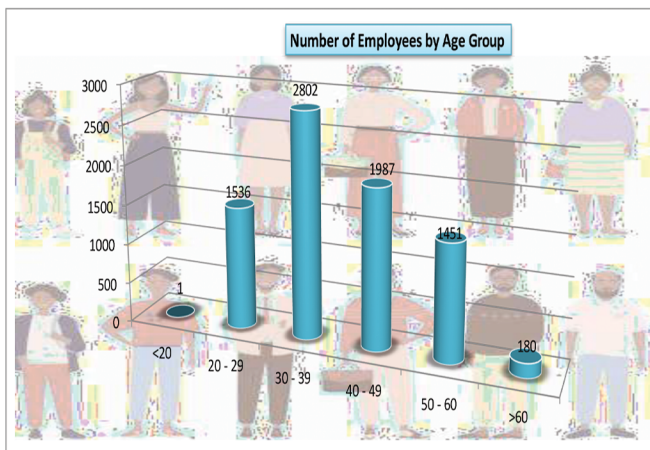
Note: All data contained herein are based on the 2016 EFY (Ethiopian Fiscal Year) - the period from July 8, 2023 to July 7, 2024.

5. Man Power

At the end of the 2016 EFY, the total number of employees of Ethiopian Electric Power was 7,957. Among these 6,616 were permanently and the remaining 1,343 were employed on a contractual basis.

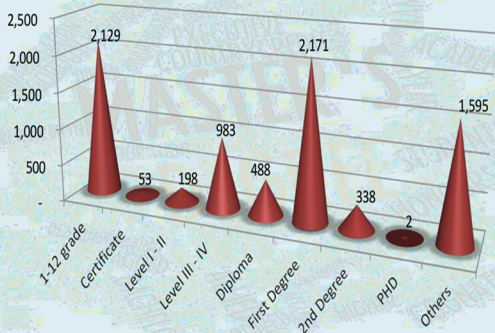


Number of Employees by Age Group as of 2016 EFY



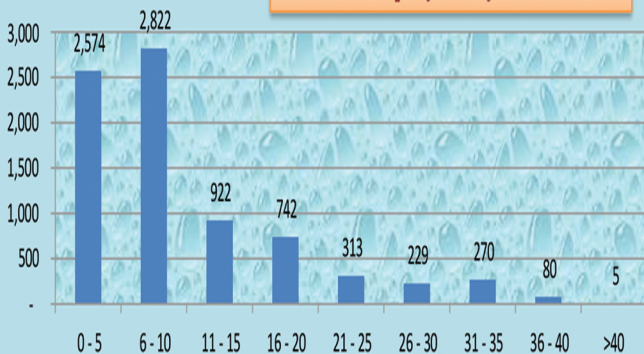
Number of Employees by Educational Level as of 2016 EFY

Number of Employees by Educational Level



Number of Employees by Service Year as of 2016 EFY

Number of Employees by Service Year



From the above graph and collected data as indicated that:

- ✓ The number of employees has decreased by 3.4 percent as compared with the previous year and the total number of employees has shown an increase of around 4.5 percent in the period of the last five years.

- ✓ Most of employee service year is between 6 to 10 years and the most of employee age group is between 30 to 39 years
- ✓ The maximum number of employees is semiprofessional which is next to general service.
- ✓ Around 83 percent of employee is permanent and the other employee is contract and retired contract.

6. Generation operation

Generation is the production process center of the power industry. Ethiopian Electric Power has a total generation capacity of 5,656.5 MW from hydro, wind, geothermal and biomass (Waste), with installed capacities of 5,220.2 MW, 404 MW, 7.3 MW, and 25 MW respectively.

Based on installed capacity, the maximum energy source for installed EEP is a hydropower plant, where around 92.3 percent converges and the other source of energy is wind 7.14 percent and remains with geothermal and biomass.

The diesel power plants are under question due to a lack of proper maintenance and spare parts. There are six diesel power plants with an installed capacity of around 99.7 MW that are not included due to decommissioning.

The total energy production from all sources of energy was 20,596,381,268.5 kWh, (20,596.3 GWh), of which hydro 96.5 percent, wind 3.3 percent, and biomass 0.2 percent will be shared. The production of energy as compared with

previous years has increased by 16.3 percent and the peak load has increased by around 14 percent. In this budget year, electricity generated at Gibe III represented 34.1 percent of the generation sent out, followed by GERD with 16.3 percent and the remaining will be from other power plants.



Installed capacity (MW) of ICS as of 2016 EFY (2023/24 G.C.)

The installed generation capacity specifies the maximum possible Electricity generation that can be produced by the installation and is usually given in megawatts. The sum of all installations gives the total installed generation capacity in Ethiopia. An overview of this can be seen in the table below: -

Installed capacity (MW) of ICS as of 2016 EFY (2023/24 G.C.)

| No. | Power Plant | Hydro | Geo thermal | Wind | Biomass | Total | In-service date (G.C) |
|------------------|-----------------|-----------------|----------------|-------------|-------------|----------------|--------------------------|
| 1 | Koka | 43.2 | | | | 43.2 | 1960 |
| 2 | Tis Abay I | 11.4 | | | | 11.4 | 1964 |
| 3 | Awash II | 32 | | | | 32 | 1966 |
| 4 | Awash III | 32 | | | | 32 | 1971 |
| 5 | Finchaa | 134 | | | | 134 | 1973/2003 |
| 6 | Meleka Wakena | 153 | | | | 153 | 1988 |
| 7 | Aluto Langano | | 7.3 | | | 7.3 | 1999 |
| 8 | Tis Abay II | 73 | | | | 73 | 2001 |
| 9 | Gilgel Gibe I | 184 | | | | 184 | 2004 |
| 10 | Tekeze | 300 | | | | 300 | 2009 |
| 11 | Gilgel Gibe II | 420 | | | | 420 | 2010 |
| 12 | Beles | 460 | | | | 460 | 2010 |
| 13 | Amerti Neshi | 97 | | | | 97 | 2011 |
| 14 | Ashegoda | | | 120 | | 120 | 2012 |
| 15 | Adama I | | | 51 | | 51 | 2012 |
| 16 | Adama II | | | 153 | | 153 | 2014 |
| 17 | Gilgel Gibe III | 1,870 | | | | 1,870 | 2015 |
| 18 | Aba samuel | 6.6 | | | | 6.6 | 2016 |
| 19 | Rappie Waste | | | | 25.00 | 25 | 2019 |
| 20 | Genale Dawa | 254 | | | | 254 | 2020 |
| 21 | GRED | 1,150 | | | | 1,150 | 2022 & 2024 |
| 22 | Ayisha II Wind | | | 80 | | 80 | 2022 |
| ICS Total | | 5,220.30 | 7.3 | 404 | 25 | 5,656.5 | |
| Share (%) | | 92.3 | 0.13 | 7.14 | 0.44 | 100 | |

Installed energy Capacity In Mw 2016 EFY (2023/24) IC (MW)

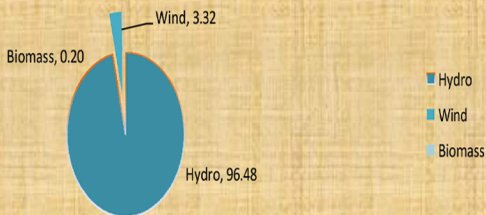


Note: Ethiopian Electric power is installed capacity through 22 power plants which oversee 16 hydro, 1 geothermal, 4 winds and 1 biomass

Energy Production in MWh 2016 EFY (2023/24)

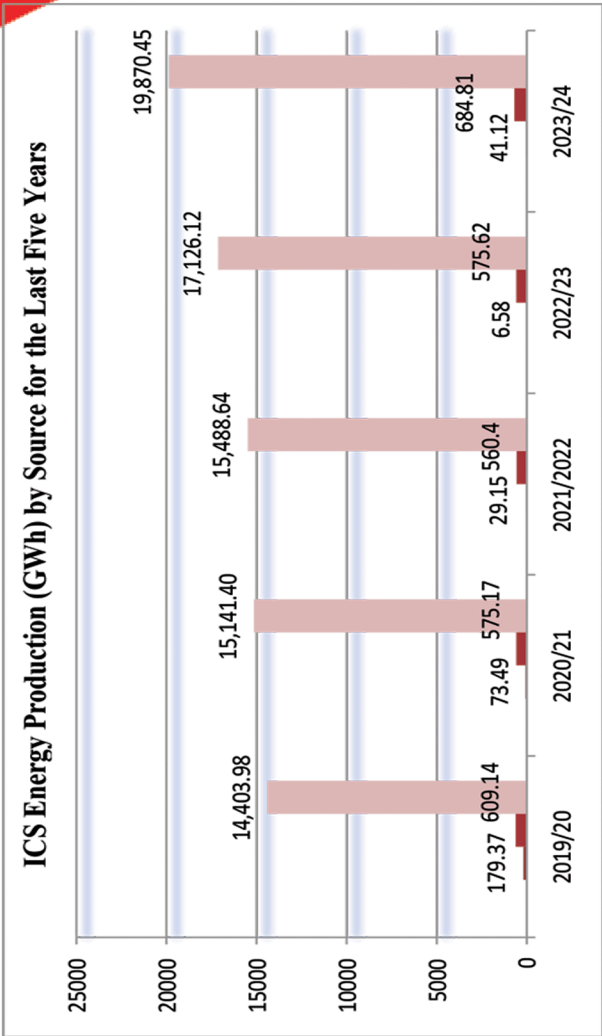
| Rank | Name of Power Plant | Hydro | Wind | Biomass | Total | Share of Energy by the Power Plant (%) |
|---------------------|---------------------|---------------|------------|-----------|---------------|--|
| 1 | Gibe III | 7,026,358.0 | 0 | 0 | 7,026,358.00 | 34.11 |
| 2 | GERD | 3,358,419.8 | 0 | 0 | 3,358,419.80 | 16.31 |
| 3 | Tana Beles | 2,007,514.0 | 0 | 0 | 2,007,514.00 | 9.75 |
| 4 | Genal-Dawa III | 1,950,526.1 | 0 | 0 | 1,950,526.10 | 9.47 |
| 5 | Gelgel Gibe II | 1,793,728.8 | 0 | 0 | 1,793,728.80 | 8.71 |
| 6 | Gelgel Gibe I | 888,660.3 | 0 | 0 | 888,660.30 | 4.31 |
| 7 | Tekeze | 735,703.7 | 0 | 0 | 735,703.70 | 3.57 |
| 8 | Finchaa | 615,293.0 | 0 | 0 | 615,293.00 | 2.99 |
| 9 | Melka Wakena | 603,187.0 | 0 | 0 | 603,187.00 | 2.93 |
| 10 | Adama II | 0 | 395,642.5 | 0 | 395,642.47 | 1.92 |
| 11 | Ameriti Neshe | 281,595.3 | 0 | 0 | 281,595.35 | 1.37 |
| 12 | Tis Abay II | 206,712.1 | 0 | 0 | 206,712.10 | 1.00 |
| 13 | Awash III | 172,392.2 | 0 | 0 | 172,392.20 | 0.84 |
| 14 | Koka | 138,192.8 | 0 | 0 | 138,192.85 | 0.67 |
| 15 | Adama I | 0 | 126,700.3 | 0 | 126,700.31 | 0.62 |
| 16 | Ayisha II | - | 125,562.5 | - | 125,562.53 | 0.61 |
| 17 | Awash II | 92,162.3 | 0 | 0 | 92,162.30 | 0.45 |
| 18 | Reppi | - | 0 | 41,123.8 | 41,123.81 | 0.20 |
| 19 | Ashegoda | - | 36,906.7 | 0 | 36,906.66 | 0.18 |
| Total (MWh) | | 19,870,445.50 | 684,811.96 | 41,123.81 | 20,596,381.27 | 100.00 |
| Share by source (%) | | 96.48 | 3.32 | 0.20 | 100.00 | |

SHARE OF ENERGY PRODUCTION BY SOURCE



Last five years ICS Energy Production in (GWh)

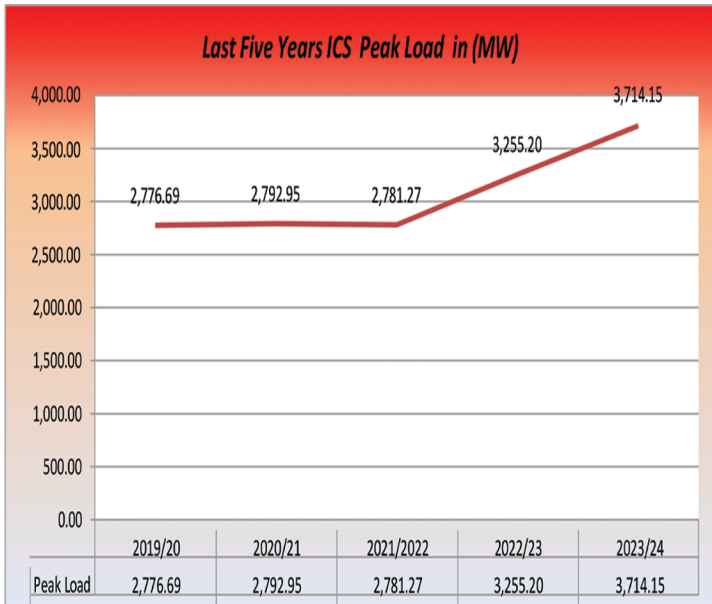
| Source of Energy | 2019/20 | 2020/21 | 2021/2022 | 2022/23 | 2023/24 |
|------------------|-----------|-----------|-----------|-----------|-----------|
| Hydro | 14,403.98 | 15,141.40 | 15,488.64 | 17,126.12 | 19,870.45 |
| Diesel | - | 0.03 | - | - | - |
| Biomass | 179.37 | 73.49 | 29.15 | 6.58 | 41.12 |
| Wind | 609.14 | 575.17 | 560.4 | 575.62 | 684.81 |
| Total | 15,192.49 | 15,790.09 | 16,078.19 | 17,708.31 | 20,596.38 |



Note: In 2016 EFY generation production is increased by 16.3 percent from the previous year, but the annual growth rate for the last five years of generation production increased 8.2 percent. In this budget year 14 hydropower plants, 4 winds and 1 biomass full and partial generated energy.

7. ICS Peak Load

Peak demand is the time when consumer demand for electricity is at its highest. The annual growth rate of peak demand was around 7.8% for the last five years. This year’s peak load increased by 14 percent from previous years.



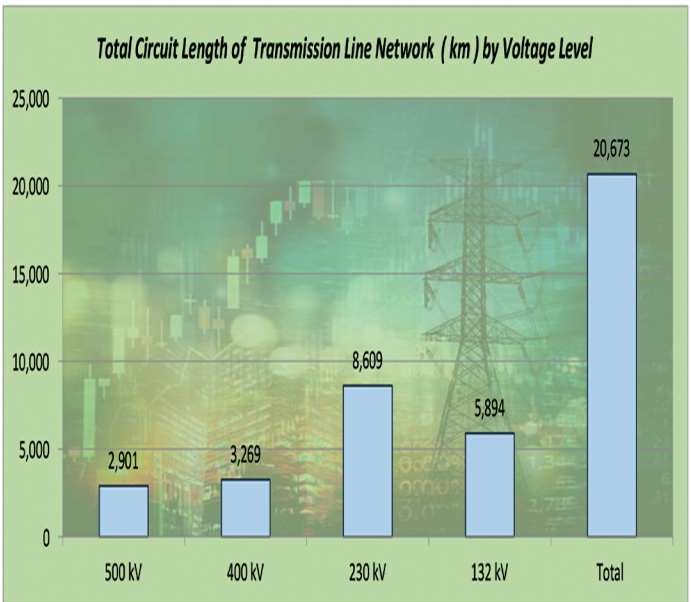
8. Transmission substation operation

Transmission is used to transmit electric power over relatively long distances, usually from a central generating station to main substations. The grid infrastructure is an electric highway that links and carries electric power from power generation .

plants to the load centers through a transmission system with various voltage levels at HVDC, 500kV, 400kV, 230kV and 132kV that extends 15,765.31 km route length and 20,673 km circuit length, and with sub-transmission lines at 66 and 45 kV that are managed by Ethiopian Electric Utility (EEU)EEP is currently regionally interconnected with Djibouti, Sudan and Kenya. Djibouti interconnectors around 296 km 230 kV single circuit line from Hurso substation to Djibouti. Sudan's interconnection comprises around 194 km 230 kV double circuit line from Metema substation in the north-west of Ethiopia to Gedaref in Sudan. Kenya HVDC interconnection between Wolaita Sodo substation (Ethiopia) and Suswa (Kenya), comprising of a 435 km, +/- 500 kV HVDC bipolar overhead line.



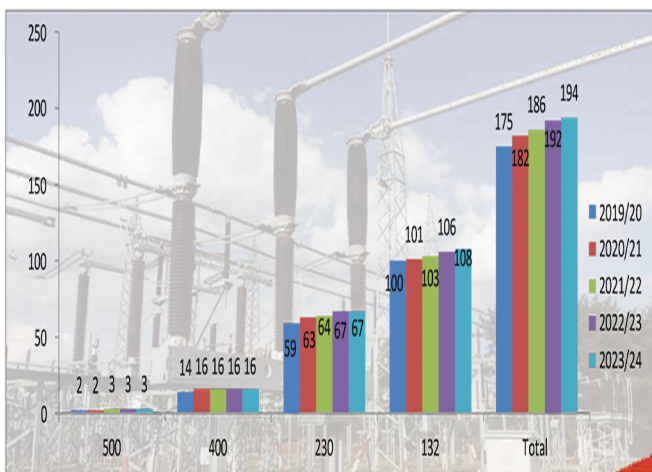
| Service Year G.C | 500 kV | 400 kV | 230 kV | 132 kV | Total |
|------------------|--------|--------|--------|--------|--------|
| 2019/20 | 2,476 | 2,641 | 8,383 | 5,805 | 19,304 |
| 2020/21 | 2,476 | 3,255 | 8,383 | 5,856 | 19,969 |
| 2021/22 | 2,901 | 3,269 | 8,609 | 5,856 | 20,634 |
| 2022/23 | 2,901 | 3,269 | 8,609 | 5,856 | 20,634 |
| 2023/24 | 2,901 | 3,269 | 8,609 | 5,894 | 20,673 |



Substation: - it is a part of an electrical transmission system that transforms voltage from high to low or the reverse. The power stations connected to the transmission grid had a total number of substations is 194 with various voltage levels at 500kV, 400kV, 230kV and 132kV, which is mobile, industry, generation switchyard, traction and transmission substation across the existing system.



| Year (G.C) | Number of substations by voltage level (kV) | | | | |
|------------|---|-----|-----|-----|-------|
| | 500 | 400 | 230 | 132 | Total |
| 2019/20 | 2 | 14 | 59 | 100 | 175 |
| 2020/21 | 2 | 16 | 63 | 101 | 181 |
| 2021/22 | 3 | 16 | 64 | 103 | 186 |
| 2022/23 | 3 | 16 | 67 | 106 | 192 |
| 2023/24 | 3 | 16 | 67 | 108 | 194 |



9. Energy Sales

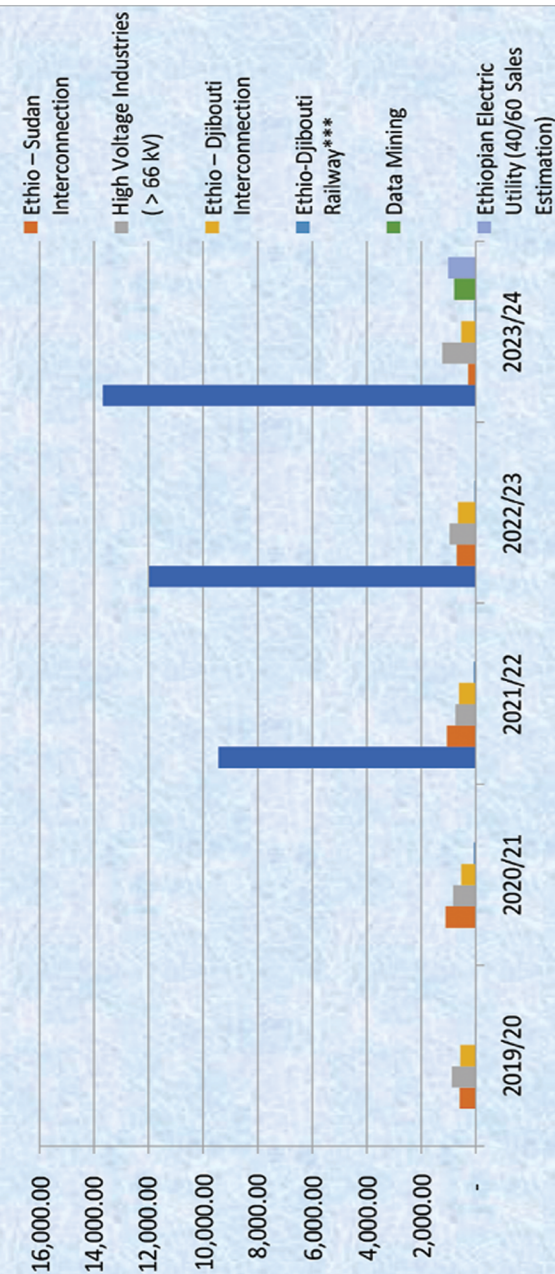
Ethiopia's electricity supply system is managed by the Ethiopian Electric Power (EEP) and the Ethiopian Electric Utility (EEU) which are wholly owned by the Ethiopian Government. EEP is mandated for the generation, transmission and bulk sale of electricity while EEU is mandated for the distribution and retail of electricity to customers nationwide. EEP is sale bulk electricity for local demand (EEU, High voltage industry greater than 66 kV (HV) and Ethio- Djibouti railway (EDR)) for export (Djibouti, Sudan and Kenya).

At the end of the 2016 Ethiopian fiscal year, total energy consumption is 18,536.74 Gwh. From those energy around 90.4 percent local and remaining for export customers. EEU is EEP's main customer that represented 79.24 percent and High voltage customers connected at 132 kV 6.62 percent and data mining 4.3 percent of total energy consumption. The export customer has Sudan, Kenya and Djibouti with energy consumption of 1.47, 2.85 and 5.29 percent respectively.

| No. | Description | Energy Wholesales (GWh) by G.C. | | | | |
|-----|---|---------------------------------|-----------------|------------------|------------------|------------------|
| | | 2019/20 | 2020/21 | 2021/22 | 2022/23 | 2023/24 |
| 1 | Ethiopian Electric Utility ** | - | - | 9,440.61 | 11,978.62 | 13,685.01 |
| 3 | High Voltage Industries (> 66 kV) | 872.21 | 826.77 | 741.61 | 958.94 | 1,226.88 |
| 5 | Ethio-Djibouti Railway*** | 14.47 | 71.78 | 67.54 | 42.85 | 46.26 |
| 4 | Ethion – Djibouti Interconnection | 559.56 | 527.45 | 612.47 | 649.47 | 527.80 |
| 2 | Ethio – Sudan Interconnection | 585.99 | 1,109.77 | 1,052.70 | 690.17 | 271.64 |
| 6 | Ethio-Kenya* | | | | 373.51 | 980.10 |
| 7 | Data Mining | - | - | - | - | 796.29 |
| 8 | Ethiopian Electric Utility (40/60 Sales Estimation) # | - | - | - | - | 1,002.77 |
| | Total | 2,032.23 | 2,535.77 | 11,914.93 | 14,693.55 | 18,536.74 |

Notes: (**) refer to from Hamle up to Tekemt /2014 EFY are not included for EEU others Energy sales (out of Addis Abeba region). (***) refer to for 2019/20 G.C. Ethio-Djibouti Railway data is only for 6 months. (*) refer to starting from November 2022 G.c for Ethio- Kenya. Data mining customer starting from December 2023 G.c and also (#) refers to Ethiopian Electric Utility included 40/60 Sales Estimation and metering problem.

Wholesales Energy in GWh for the Last Five EFY





Published by

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