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Ethiopia Electric power

FACTS IN BRIEF 2022/23

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*

Overview of ETHIOPIA

Location: - Horn of Africa

Area: - 1.1 million km^2

Land: - 1.0 million km^2 – (90.56%)

Water: - 104,300 km^2 ----- (9.44%)

Population: - 110 Million

Climate:- Tropical monsoon with wide topographic – induced variation

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

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

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 EEP 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 66kV; to contract out such activities to consultants, as required;

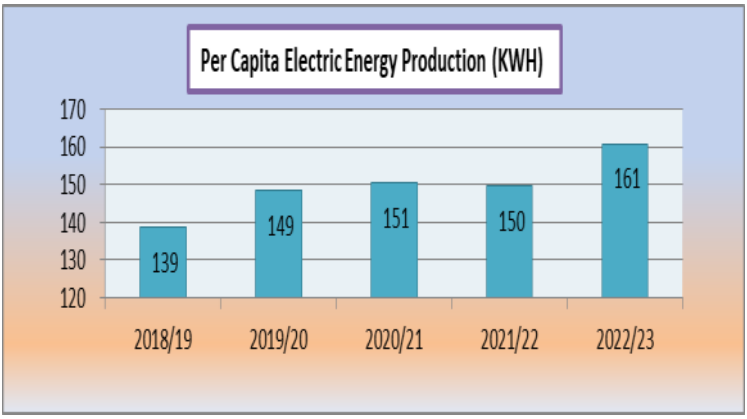
- To undertake construction and upgrading of electricity generation and upgrading transmission and substation of over 66 kV; to contract out such works to contractors as required;
- To administer, operate and maintain electricity generation in the integrated national grid, and transmission lines and 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.

ICS per Capita

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

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

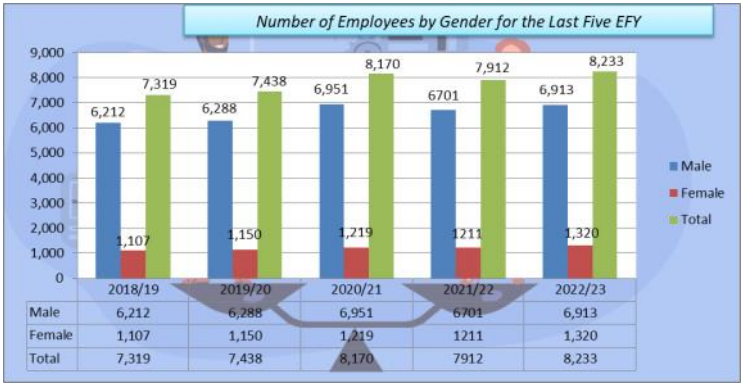
Ethiopia can completely be self-sufficient with domestically produced energy. In this fiscal year, the total production of all electric energy producing facilities is 17,708,307,749 kWh (17,708 GWH) with per capita electric energy production is 161 kWh as compared to previous years increased by around 7%. 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 2015 EFY (Ethiopian Fiscal Year) - the period from July 8, 2022 to July 7, 2023.

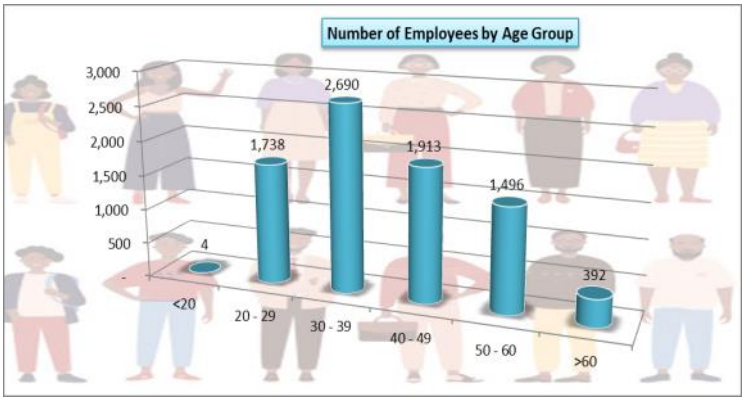
Man Power

At the end of the 2022/23 fiscal year, the total number of employees of Ethiopian Electric Power was 8,233. Among these, 7,268 were permanently employed and the remaining 965 were employed on a contractual basis. The total number of employees in 2015 EFY increased by 4 % as compared with the previous year. Out of those employees around 45 % are in a general service which is civil security, driver, cleaner and others, which is the largest number of employees in the company.

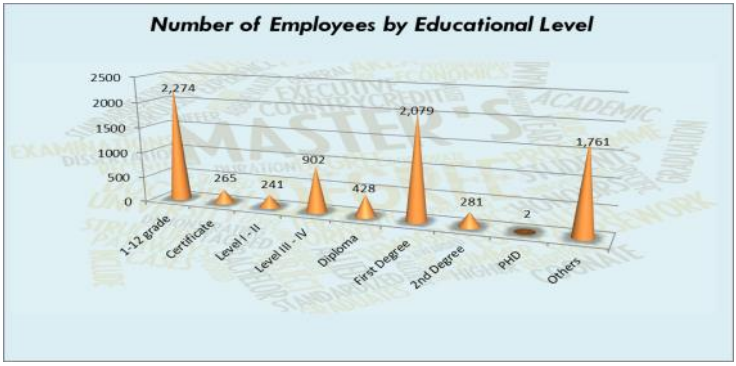


	2018/19	2019/20	2020/21	2021/22	2022/23
Male	6,212	6,288	6,951	6701	6,913
Female	1,107	1,150	1,219	1211	1,320
Total	7,319	7,438	8,170	7912	8,233

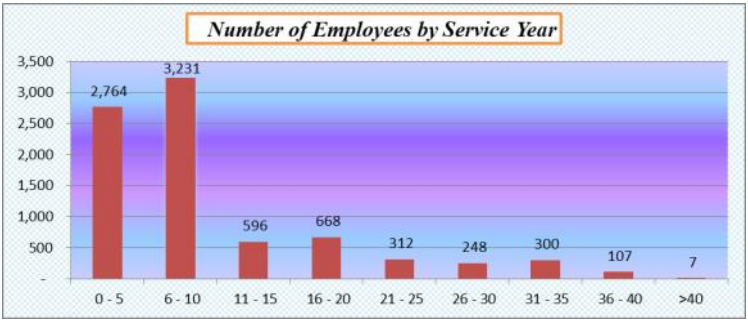
Number of Employees by Age Group as of 2015 EFY



Number of Employees by Educational Level as of 2015 EFY



Number of Employees by Service Year as of 2015 EFY



The above graph and collected data indicated that:

- The number of employees has increased by 4% as compared with the previous year and the total number of employees has shown an increase of around 4.5% in the period of the last five years.
- Most employee service year is below 5 years and the age group is between 25 and 35 years
- The maximum number of employees is semiprofessional which is next to general service.
- Most of the employee's educational background is lower than first degree level.
- Around 85% of employee is permanent and the remaining are on contract

Generation operation

Generation is the production process center of the power industry. Ethiopian Electric Power has got a total generation capacity of 5,256.50 MW from hydro, wind, geothermal and biomass (Waste), with installed capacity of 4,820.30 MW, 404.00 MW, 7.3 MW, and 25.0 MW respectively. Based on installed capacity, the maximum energy source for installed in EEP is a hydropower plant around 91.7 % converge and the other source of energy is wind 7.69 % and remaining raise with geothermal and biomass.

There are 6 diesel power plants with installed capacity of around 99.7 MW are not included due to decommissioning.

The total energy production from all sources of energy was 17,708,307,749 kW (17,708 GWH), which is hydro 96.71%, wind 3.25% and biomass 0.04 % will be shared. The production of energy as compared with previous years is increased by 10.14 % and also peak load is increased by 6%. In this budget year, electricity generated at Gibe III represented 36.78% of the generation sent out followed by Tana Bales with 13.91% and Gibe I and Gibe II with 15.34% and the remaining will be other power plants.

Installed capacity (MW) of ICS as of 2015 EFY (2022/23 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:-

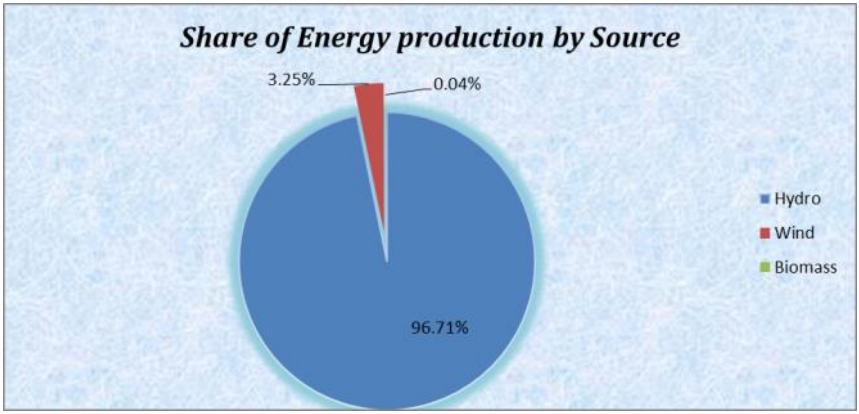
Installed capacity (MW) of ICS as of 2015 EFY (2022/23 G.C.)

No.	*Power Plant*	*Hydro*	*Geo ther-mal*	*Wind*	*Bio-mass*	*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	Abasam-uel	6.6				6.6	2016
19	Rappie Waste				25.00	25	2019
20	Genale Dawa	254				254	2020
21	GRED	750				750	2022
22	Ayisha II Wind			80		80	2022
ICS Total		***4,820.2***	***7.3***	***404***	***25***	***5,256.5***	
Share (%)		***91.7***	***0.14***	***7.69***	***0.48***	***100***	

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

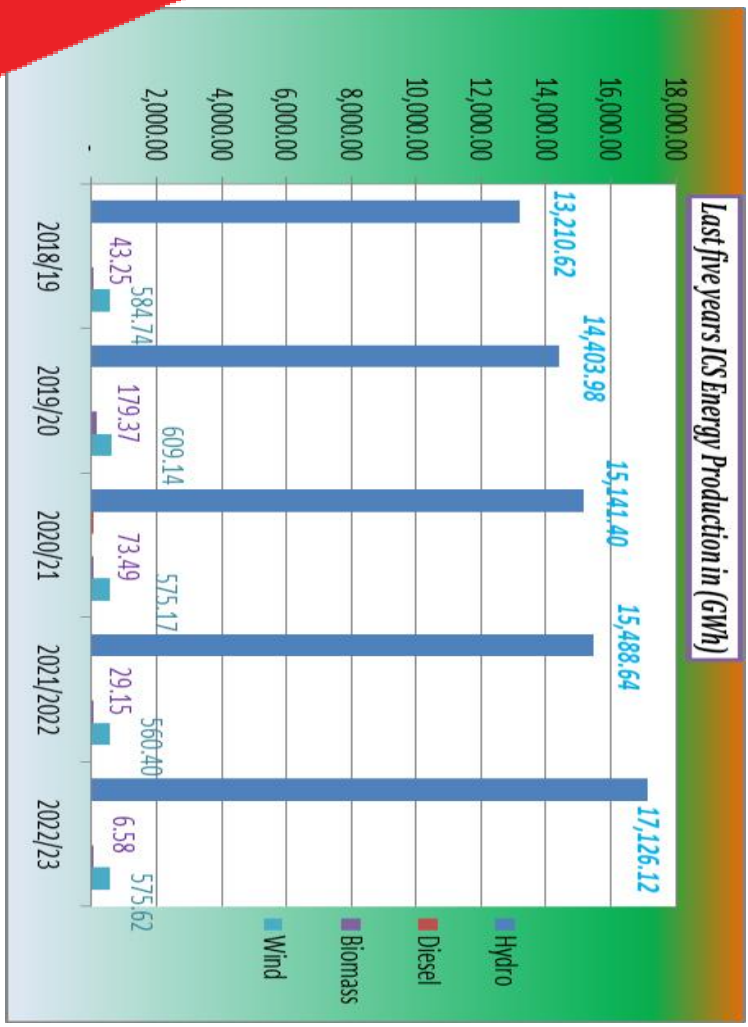
Energy Production in MWh 2015 EFY (2022/23)

Rank	*Name of Power Plant*	*Hydro*	*Wind*	*Biomass*	*Total*	*Share of energy by plant (%)*
1	Gibe-III	6,513,105.00			6,513,105.00	***36.78***
2	Tana Beles	2,463,699.00			2,463,699.00	***13.91***
3	Gilgel Gibe II	1,810,967.00			1,810,967.00	***10.23***
4	Genale Dawa III	1,600,240.68			1,600,240.68	***9.04***
5	Hidase	1,209,072.66			1,209,072.66	***6.83***
6	Gilgel Gibe I	904,074.73			904,074.73	***5.11***
7	Finchaa	665,527.00			665,527.00	***3.76***
8	Tekeze	564,928.15			564,928.15	***3.19***
9	Melka Wakena	418,153.60			418,153.60	***2.36***
10	Adama II		408,626.16		408,626.16	***2.31***
11	Tis Abay II	296,331.95			296,331.95	***1.67***
12	Amerti Neshe	263,637.68			263,637.68	***1.49***
13	Awash III	170,329.00			170,329.00	***0.96***
14	Koka	137,384.78			137,384.78	***0.78***
15	Adama I		132,949.15		132,949.15	***0.75***
16	Awash II	108,664.40			108,664.40	***0.61***
17	Ayesha		34,041.81		34,041.81	***0.19***
18	Reppie			6,575.00	6,575.00	***0.04***
	Total	**17,126,115.63**	**575,617.12**	**6,575.00**	**17,708,307.75**	**100.00**
	Energy share by Source %	96.71	3.25	0.04	100.00	



Last five years ICS Energy Production in (GWh)

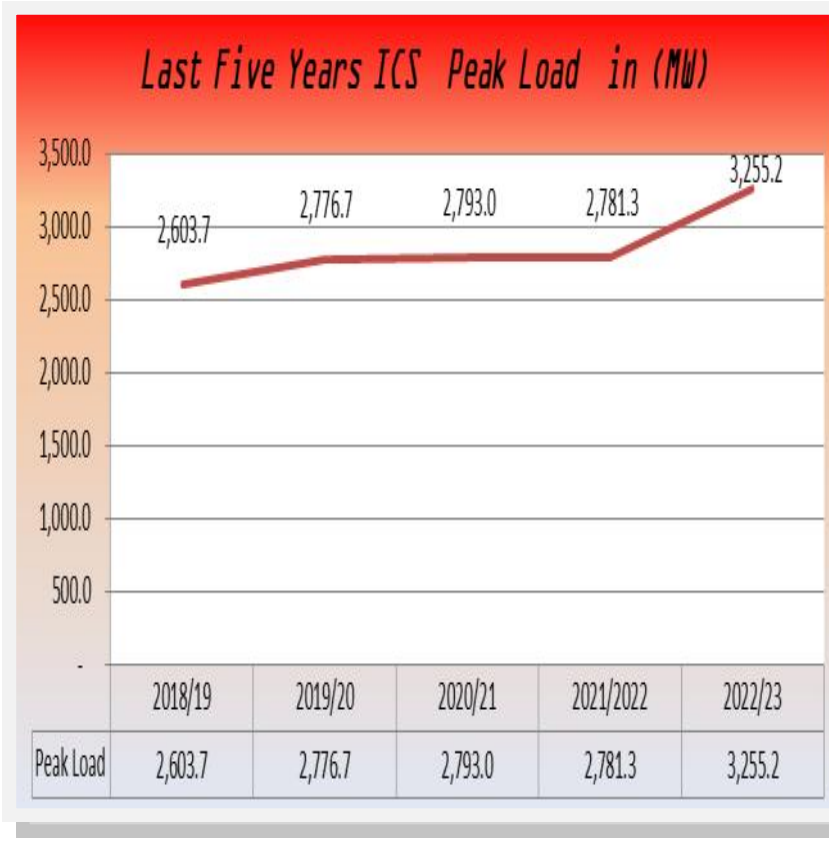
Source of Energy	2018/19	2019/20	2020/21	2021/2022	2022/23
Hydro	13,210.62	14,403.98	15,141.40	15,488.64	17,126.12
Diesel	-	-	0.03	-	-
Biomass	43.25	179.37	73.49	29.15	6.58
Wind	584.74	609.14	575.17	560.40	575.62
Total	13,838.61	15,192.49	15,790.09	16,078.19	17,708.31



Note: In 2015 EFY power generation is increased by 10.14% from the previous year, but the annual growth rate for the last five years of generation production increased 5.2%. In addition to the increment of energy production in this budget year is Genale Dawa III ,GERD power plant two units and tekeze are properly generated. In this budget year 14 hydropower plants, 3 winds and 1 biomass fully and partial generates energy

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 4% for the last five years. This year's peak demand is higher than in previous years. (*) refer to The ICS peak load data is a suppressed peak load and it does not reflect the true value and also 2014 EFY peak load not including **tekeze**.



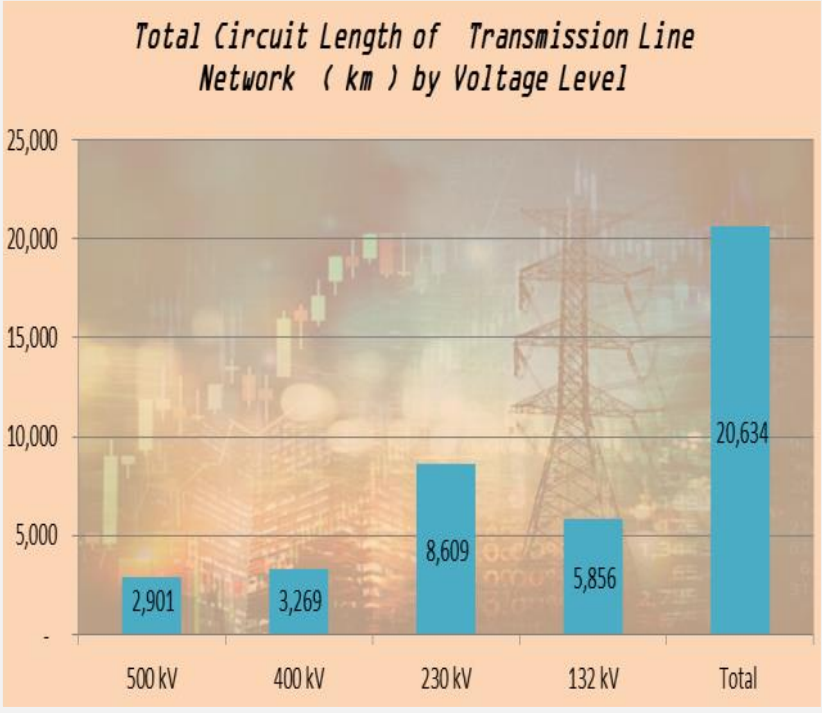
Transmission substation operation

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, 500 kV, 400kV, 230kV and 132kV that extends 15,726.83 km route length and 20,634 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 ***Gedarif*** in Sudan. Kenya HVDC interconnection between ***Wolaita Sodo*** substation (Ethiopia) and ***Suswa*** (Kenya), comprising of a 435 km, +/- 500 kV HVDC bipolar overhead line.

Transmission Line circuit length in kV

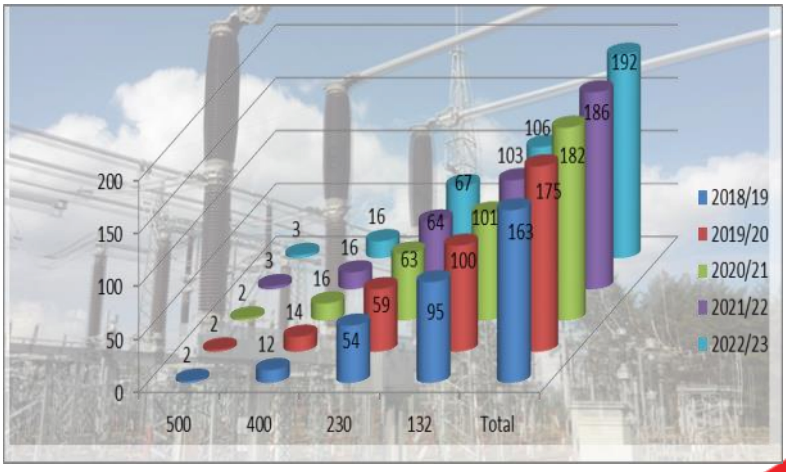
Service Year G.c	500	400	230	132	Total
2018/19	2,476	2,641	8,357	5,407	18,881
2019/20	2,476	2,641	8,383	5,805	19,304
2020/21	2,476	3,255	8,383	5,856	19,969
2021/22	2,901	3,269	8,609	5,856	20,634
2022/23	2,901	3,269	8,609	5,856	20,634



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 substation is 192 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
2018/19	2	12	54	95	163
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



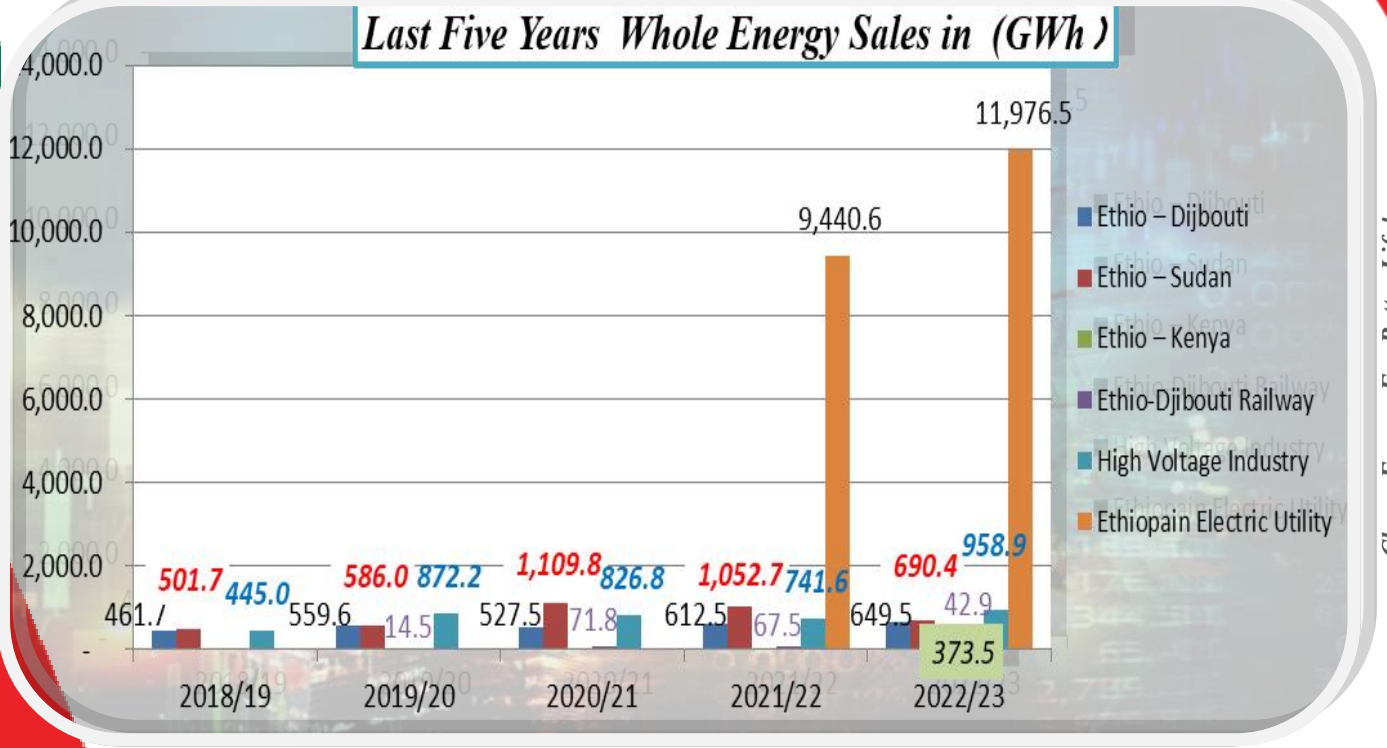
Energy Sales

Ethiopia's electric 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 sale, bulk of electricity for local demand (EEU, High voltage industry greater than 66 kV (HV) and Ethio- Djibouti railway (EDR)) for export (Djibouti, Sudan and Kenya).

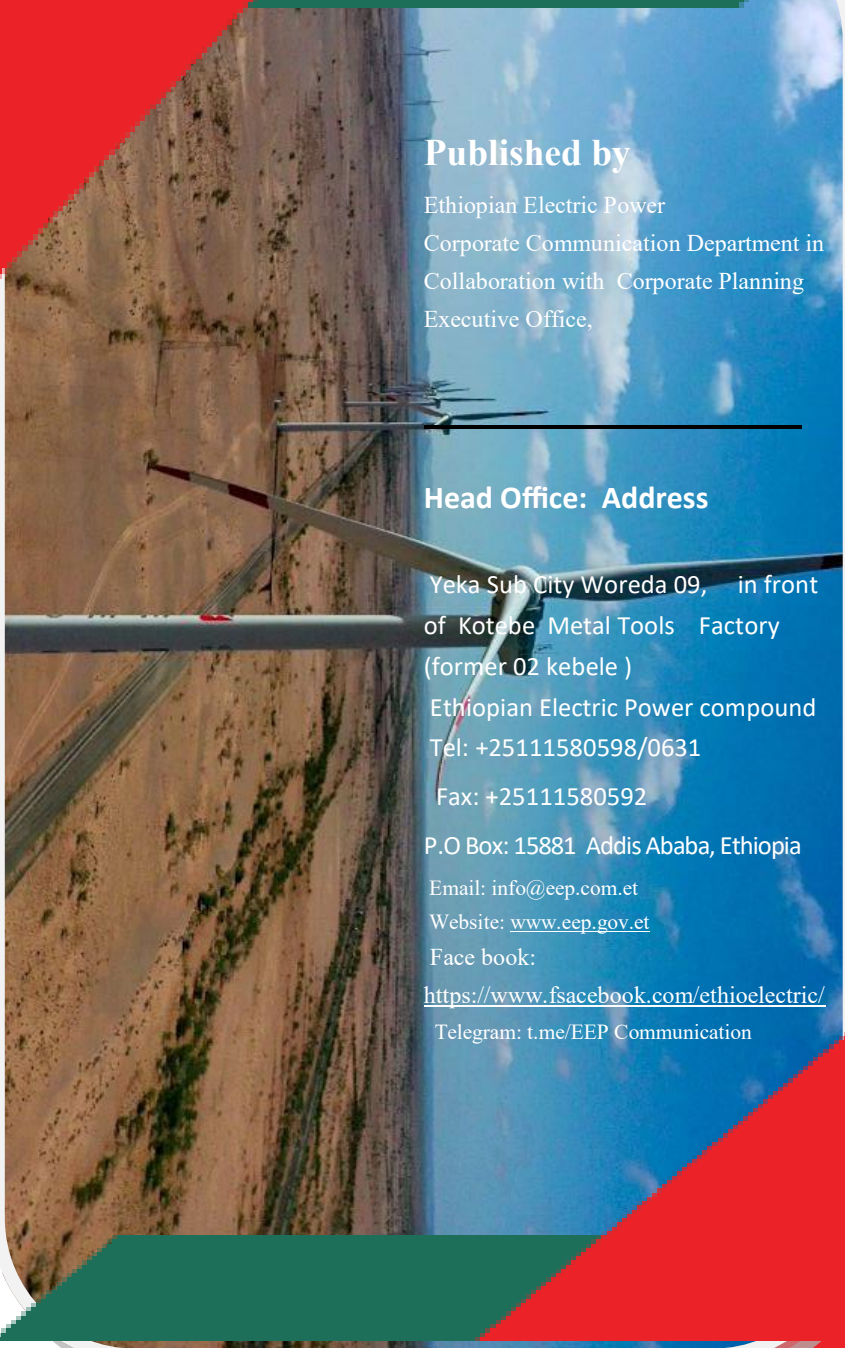
EEU is EEP´s main customer representing over *81.5%* of energy consumption. EEP has 13 HV Customers connected at 132 kV and *6.5%* of total energy consumption. There are six active cement plants that consume 79% of the total HV consumption. The export energy consumption with Sudan, Kenya and Djibouti is around *11.5%.*

	Last Five Years Energy Sales in (Gwh)				
Interconnections	***2018/19***	***2019/20***	***2020/21***	***2021/22***	***2022/23***
Ethio – Djibouti	461.7	559.6	527.5	612.5	649.5
Ethio – Sudan	501.7	586.0	1,109.8	1,052.7	690.2
Ethio – Kenya*					373.5
Ethio-Djibouti Railway **		14.5	71.8	67.5	42.9
High Voltage Industry (HV)	445.0	872.2	826.8	741.6	958.9
Ethiopian Electric Utility (EEU) ***				9,440.6	11,976.5
Total	***1,408.4***	***2,032.2***	***2,535.8***	***11,914.93***	***14,691.61***

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.


Last Five Years Whole Energy Sales in (GWh)
4,000.0
12,000.0
10,000.0
8,000.0
6,000.0
4,000.0
2,000.0
-
461.7
501.7
445.0
559.6
586.0
14.5
872.2
527.5
1,109.8
71.8
826.8
612.5
1,052.7
67.5
741.6
9,440.6
649.5
690.4
42.9
373.5
958.9
11,976.5
2018/19
2019/20
2020/21
2021/22
2022/23
Ethio – Dijbouti
Ethio – Sudan
Ethio – Kenya
Ethio-Djibouti Railway
High Voltage Industry
Ethiopain Electric Utility


ETHIOPIAN ELECTRIC POWER
ETHIOPIAN ELECTRIC POWER
HOLETA 500kV SUBSTATION



Published by

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