

Mapping of Energy Institutions and Initiatives in Ethiopia



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1. Introduction

Sustainable energy risen to one of the Sustainable Development Goals (SDGs) in 2015 as well as the historic climate change commitments made at the COP 21. The African energy sector is experiencing an influx of new initiatives and actors committed to the expressed common goal of supporting the continent in reaching a sustainable energy future¹. Ethiopia is a remarkable example in this drive towards a sustainable energy future. The country has recorded impressive rates of economic growth in recent years and one of the key prerequisites for sustaining this growth is the continued investment in energy infrastructure²

The country has abundant renewable energy resources and has a potential to generate over 60,000 megawatts (MW) of electric power from hydroelectric, wind, solar and geothermal sources³. Given its massive clean energy reserves, Ethiopia can become a cornerstone of the regional power market and of the East Africa Power Pool (EAPP)⁴. Large scale expansion of generation capacity is also driven by the GoE's objective to become a power export hub in East Africa, while also scaling-up its domestic power supply. Together with domestic network expansion, in the coming years, exports to Sudan, Djibouti, and Kenya could boost the country's export revenue potential, estimated to be as much as US\$500 million, per annum, by the end of the decade. By 2020, Ethiopia could achieve as much revenue from power export as it does from domestic sources. This dollar denominated revenue could be used for continued cross-subsidies for domestic consumers⁵. Currently Ethiopia earns about 80 million dollars of revenue annually by selling about 100 MW of energy to Sudan and 80 MW of energy to Djibouti⁶.

Cross-border interconnections between the east Africa countries under EAPP reduce fuel costs, while improving the security of energy supply in the system, enabling countries to optimize domestic energy sources and compensate for potential seasonal variability or fuel shortages. Regional interconnections could mitigate ongoing natural supply problems in Egypt or inadequate distribution systems in Ethiopia⁷.

There is an increasing trend in terms of investment and number of energy initiatives. Even though Ethiopia has crafted an ambitious energy sector development policy and plan, challenges of access to energy remain. Over half of the population is located geographically close to the electricity grid, but actual interconnection rates are just 25%, and per capita domestic electricity consumption is less than 100 kWh per year. Moreover, traditional biomass for household cooking also accounts for 89% of total domestic energy consumption⁸. This trend needs to be reversed since Ethiopia will continue

¹ EUEI PDF, *Mapping of Energy Initiatives and Programs in Africa*, (no. May, 2016).

² A.G Fallis, 'National Energy Map for India: Technology Vision 2030', *Journal of Chemical Information and Modeling*, Vol. 53, no. 9, 2013, pp. 1689–1699.

³ US Foreign Commercial Service, 'Ethiopia Energy', 2017, pp. 5–9.

⁴ Details on the Map of EAPP are attached in the Annex

⁵ World Bank Group, *Ethiopia Electrification Program (ELEAP) Program-For-Results Information Document (PID) Concept Stage Report No. PIDC0100191*, (2017).

⁶ Xinhua, 'Ethiopia plans to increase energy export to Kenya', 2017.

⁷ IHA, *Better hydro in an interconnected world: International Hydropower Association*, (no. May, 2017).

⁸ USAID, 'Investment Brief for the Energy Sector in Ethiopia'.

to use up unsustainable levels of natural resources (with its expanding population) unless the country explores new ways of generating energy (not just electricity) and new means of using energy resources.

A new Energy Law, Proclamation 810/2013, further reinforces the government's stated commitment to sustainable development practices as outlined in its Climate Resilient Green Economy Strategy⁹. The CRGE Strategy has given significant attention to the imperative of expanding electricity generation from renewable sources of energy for domestic and regional markets; and leapfrogging to modern and energy-efficient technologies in transport, industrial sectors and buildings. Ethiopia plans to become a middle-income country by 2025, a plan that entails significant investment in energy infrastructure. Major investment projects have been initiated under the Ethiopian Growth and Transformation Plan in phase one (GTP-I; 2011-2015) and phase two (GTP-II; 2016-2020).

These renewable energy projects will contribute to achieve Ethiopia's green growth targets while also earning foreign exchange through electricity exports. The involvement of the private sector is being stepped up. In the energy sector, diversified renewable sources of energy such as geothermal, wind and solar, will form an increasing share of overall capacity while decreasing household dependence on inefficient biomass energy consumption at the same time. Leapfrogging to energy efficient technologies became the main focus in the transport sector and in the growing industry sector¹⁰.

The Government of Ethiopia has determined that private sector investment is critical to achieve these aggressive power generation targets, but acknowledges that it lacks sufficient experience with Independent Power Producers (IPPs). The Government of Ethiopia also faces other major challenges in expanding the country's energy system, including the need to rehabilitate an aged distribution system with high losses and ensure more efficient operation and maintenance of the expanded system. It must also become a creditworthy purchaser of electricity from IPPs, address foreign exchange constraints, reform tariffs to allow for full-cost recovery, and deliver more power to the majority of the population who are living off-grid¹¹.

This report is commissioned by CDKN and is based on the previous works of the Ministry of Water, Irrigation and Electricity. It aims to identify national and regional energy investments, initiatives and actors. It also outlines the policy and institutional framework on energy.

⁹ USAID, 'Investment Brief for the Energy Sector in Ethiopia'.

¹⁰ Africa Development Bank, *Federal Democratic Republic of Ethiopia Country Strategy Paper*, (AFRICAN DEVELOPMENT BANK GROUP, 2016).

¹¹ USAID, *Ethiopia Energy Sector Overview*, (no. March 2016, 2017).

2. Energy Policy and Strategy

Rationale

Ethiopia's energy policy was formulated with a number of key rationales in mind: i) develop and utilize the country's energy resources in line with the country's overall development strategy; ii) assist other economic sectors to meet their development objectives by putting in place a clearly defined energy policy; iii) ensure reliable and secure energy supplies to cushion the economy from external and internal disruptions of supply as well as price fluctuations; iv) ascertain what energy technologies and equipment are appropriate for and compatible with the country's economic development needs; and v) raise the efficiency of the energy sector and develop the necessary institutional and manpower capabilities to undertake energy development programs¹².

The policy document aims to address household energy problems by promoting agro-forestry, increasing the efficiency with which biomass fuels are utilized, and facilitating the shift to greater use of modern fuels. Furthermore, the policy paper states that the country will rely mainly on hydropower to increase its electricity supply but it also mentions developing Ethiopia's geothermal, solar, wind and other renewable energy resources where appropriate. In addition, it aims to further explore and develop oil and gas reserves as well as to encourage energy conservation in industry, transport and other major energy-consuming sectors, to ensure that energy development is socially just, and economically and environmentally sustainable¹³. Different legal frameworks have also been adopted along with the energy policy including the Electricity Proclamation 86/1997; the Investment Proclamation 280/2002 and its amendment Proclamation 375/2003; the Electricity Operations Regulations 49/1999 and others. Key national development policies also influence the energy sector including: the Rural Development Policy and Strategy; Environmental Policy; Science and Technology Policy; the investment Proclamation; and the Water Resources Management Policy¹⁴.

Table 1: Ethiopian Energy Policies and Policy Target

	Title	Year	Policy Target
1	Growth and Transformation Plan II (GTP II) 2016-2020	2016	Bioenergy, Geothermal, Solar, Hydropower, Wind
2	National Energy Policy 2013	2013	Multiple RE Sources
3	Climate Resilience and Green Economy	2012	Hydropower, Multiple RE Sources
4	Scaling-Up Renewable Energy Program	2012	Hydropower, Multiple RE Sources,
5	Growth and Transformation Plan (GTP I) 2011-2015	2011	Multiple RE Sources
6	National Biogas Program (NBP)	2007	Bioenergy
7	The Rural Electrification Fund	2003	Multiple RE Sources

¹² MWIE, 'Energy Policy of Ethiopia', *Country Report IEEJ*, no. July, 2011, pp. 1–36.

¹³ Dereje Derbew, 'Ethiopia's Renewable Energy Power Potential and Development Opportunities', *Africa Clean Energy Corridor Initiative*, 2013, pp. 1–33.

¹⁴ Derbew, 'Ethiopia's Renewable Energy Power Potential and Development Opportunities'.

8	Ethiopian Rural Energy Development and Promotion Centre (EREDPC)	2002	Multiple RE Sources
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Objectives:¹⁵

- Giving priority to renewable energy development and CRGE strategy.
- Considering Hydropower as the backbone of the country's electricity generation.
- Promoting and enhancing the development of other renewable energy (RE) sources.
- Increasing RE mix thereby improving energy security and reliability of energy supply.
- Becoming a regional hub for renewable energy.
- Enhancing global cooperation to exchange knowledge and technologies.
- Strengthening cross border energy trade.
- Increasing access to affordable and adequate modern energy.
- Promoting efficient, clean, and appropriate energy technologies.
- Improving the energy efficiency of systems and operations.
- Strengthening energy sector governance and building a strong energy institution.
- Ensuring capacity building and technology transfer.
- Strengthening energy sector financing.
- Exploring for natural gas and other hydrocarbon fuels.
- Encouraging Public-Private Partnership in energy generation.

The strategy formulated to develop the energy sector includes¹⁶.

- the Electric Power Generation Construction Program,
- Electricity Transmission Lines Construction Program,
- Power Distribution and Expansion Program,
- Universal Electrification Access Program (grid-based),
- Off-grid Rural Electrification Program,
- National Energy Regulatory System for Electricity and Energy Efficiency,
- Alternative Energy Development and Promotion Program
- Overall capacity building of institutions and stakeholders that have a stake in the energy sector's development, effectiveness and efficiency.

In addition new technological innovations will be utilized to ensure that the energy sub-sector do not emit additional carbon-dioxide. To promote and sustain rural alternative energy development activities, efforts will be made to enhance the capacity and knowledge in this regard of regions, producers and consumers. The distribution of wood saving materials and technologies throughout the country will be continued¹⁷.

¹⁵ Azeb Asnake, 'Ethiopian Energy Sector Investment Opportunities', in 'Ethiopian Energy Sector Investment Opportunities', *UK-ETHIOPIA TRADE & INVESTMENT FORUM, October 21st 2015 Azeb*, (LONDON, UK, 2015).

¹⁶ Derbew, 'Ethiopia's Renewable Energy Power Potential and Development Opportunities'.

¹⁷ IMF, *The Federal Democratic Republic of Ethiopia : Poverty Reduction Strategy Paper : GTP I*, (no. 11, 2011).

3. Ethiopian Energy Potentials

Ethiopia has a vast renewable and non-renewable energy resource - from Hydropower, Solar, Wind, Geothermal, Wood, Agricultural waste, Natural gas, Coal and Oil shale¹⁸. Each energy source with its potential and exploited performance as of 2015 is shown in the table below.

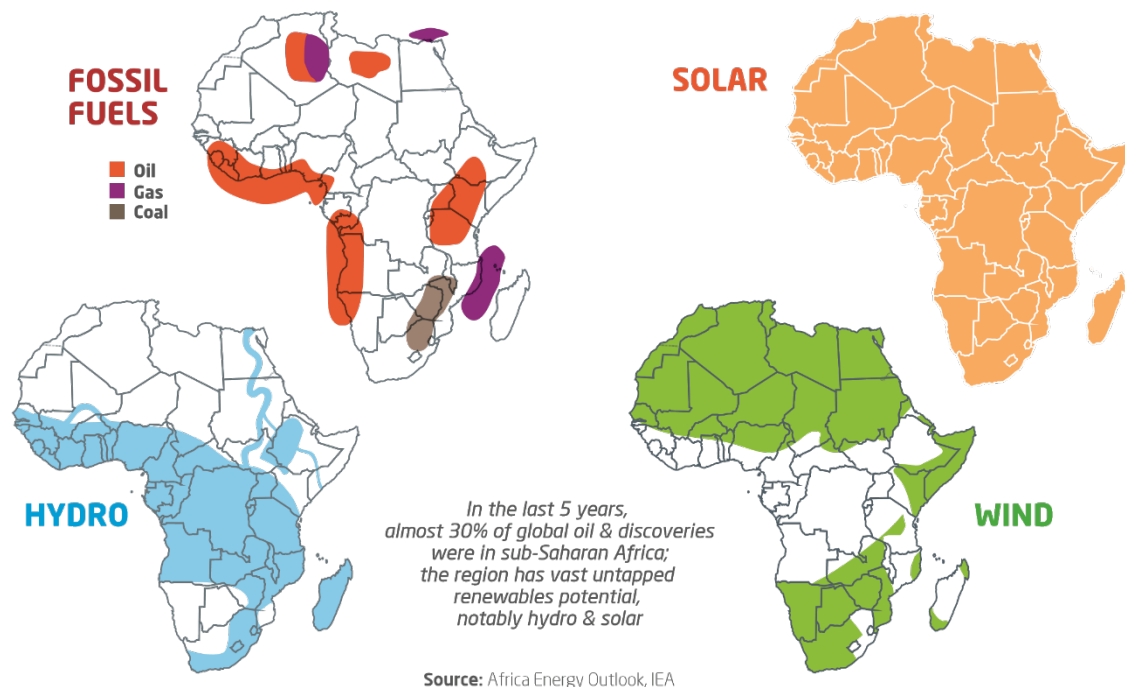


Figure 1: Graphical illustration on Africa and Ethiopia energy potential¹⁹

Table 2: Ethiopia Energy Potentials²⁰.

Resource	Unit	Exploitable Reserve	Exploited in 2015
Hydropower	MW	45,000	<5%
Solar	kWh/m ² /Day	5.5	<1%
Wind	GW	1,350	<1%
Geothermal	MW	7000	<1%
Wood	Million tons	1120	50%
Agricultural waste	Million tons	15-20	30%
Natural gas	Billion m ³	113	0%
Coal	Million tons	300	0%
Oil shale	Million tons	253	0%

The Ethiopian energy policy and CRGE strategy give due emphasis to the renewable energy resource potential which includes power from hydro, wind, solar and geothermal²¹.

¹⁸ Asnake, 'Ethiopian Energy Sector Investment Opportunities'.

¹⁹ RES4MED, 'Renewable energy solutions for the Mediterranean', 2015.

²⁰ Asnake, 'Ethiopian Energy Sector Investment Opportunities'.

²¹ Asnake, 'Ethiopian Energy Sector Investment Opportunities'.

Hydro: significant hydropower resources are distributed in nine major river basins and their tributaries. It is estimated that these could generate an economically affordable energy of about 260 TWH. However, less than 5 % of the potential has been exploited so far.

Wind: has total wind energy resource reserve of 3,030 Giga Watt and the potential exploitable quantity of is 1,350 Giga Watt. For technical and economic reasons appropriate wind regions for grid-based electricity generation are those with wind density of 300W/m², (wind speed 6.5 m/s) and above. Ayisha in the Eastern part of the country has good potential with an average wind speed exceeding 8 m/s. currently three wind farms have completed and connected to the grid, namely: Ashegoda, Adama I and Adama II with 324 MW total installed capacity. The table below²² shows Wind energy potential by region and the details of Wind Farm Site Selected in Ethiopia are listed in the annex²³.

Table 3: Wind Energy Potential Installed Capacity by Region

Country/state	Area (1,000 km ²)	Potential installed capacity (GW)
Amhara	155.0	59
Tigray	50.2	78
Afar	94.1	52
SNNP	109.9	26
Gembela	24.6	0
Oromiya	320.0	75
Benshagul	49.5	0
Somali	300.3	1,060
Ethiopia	1,103.6	1,350

Solar: According to the revised Master Plan, average solar energy potential for the country is 5.5 KWh/m²/day, with the highest radiation recorded in the northern part of the country in Tigray and the Afar regions. This resource also lends itself to be developed in a modular way to address the energy needs of communities that live far from the grid. The table below show the priority investment in solar power development in short-term.

Table 4: Recommended sites for short-term Solar PV power Development²⁴

No.	Name	Capacity (MW)	Area (km ²)	Regions
	Debre Berhan Pv	10	0.39	Amhara
	Metehara pv power	50	1.6	Oromiya
	Dera solar energy Pv	60	1.59	Oromiya
	Total	120	3.58	

Geothermal: The best prospective areas are distributed along the Ethiopian Rift valley system which runs for more than 1000 km from the Afar depression, at Red Sea to the Turkana depression

²² Derbew, 'Ethiopia's Renewable Energy Power Potential and Development Opportunities'.

²³ Derbew, 'Ethiopia's Renewable Energy Power Potential and Development Opportunities'.

²⁴ Derbew, 'Ethiopia's Renewable Energy Power Potential and Development Opportunities'.

southwards (NE-SW to N-S direction). A total of 16 geothermal resource areas have been identified by various studies. These resource zones are all located within the rift valley system (Aluto Langan, Tullu Moya Tendaho, Danakil Depression)²⁵

²⁵ Asnake, 'Ethiopian Energy Sector Investment Opportunities'.

4. Major Institutions in the Ethiopian Energy Sector

Ministry of Water, Irrigation and Electricity (MOWIE) – plans, leads, coordinates, and monitors overall energy development. It is also responsible for capacity building in the sector, research, development and dissemination of renewable energy technologies and improved energy technologies USAID, ‘Investment Brief for the Energy Sector in Ethiopia’, *Power Africa*, 2015, pp. 1–4.. Under MOWIE there are a number of supervised institutions that are directly related to the energy sector. These are: National Strategic Petroleum Reserve Administration, Ethiopian Electric Power (EEP), Ethiopian Electric Utility (EEU) and Ethiopian Energy Authority (EEA).

Other institutions that play a key role in the energy sector in Ethiopia include the Ministry of Finance and Economic Cooperation (MoFEC) in charge of public finances, the Ministry of Trade which is involved in the petroleum pricing system as well as providing different tax incentives including Tax-free importation of capital goods, Tax holidays and Money repatriation for private sectors involved in importing off-grid solar technologies, the Ministry of Mines (MoM) in charge of upstream hydrocarbon and geothermal resources exploration, and Ministry of Environment, Forest and Climate Change (MoEFCC) - Regulatory policy and decision making, environmental, climate related operations climate change mitigation. Moreover different non-states actors have worked with the ministry in the expansion of energy accessibility at national and regional level. Some of the non state actors have listed in the table below with area of intervention and energy sub sector they are actively intervened.

Table 5: state and non-state actors in the Ethiopian energy sector ²⁶

Actor	Activity									Energy Related Activity
	Financing	Consultation	Facilitation	Implementation	Promotion	Technical Assistance	Policy Development	Capacity development	Networking	
World Bank										All except
UNDP										1,6
UNEP										1,3,6
African										5
EU Energy										
GIZ										1,4,6
SNV										1,8
1. Improved Stoves 2. Bio-Ethanol 3. Wind 4. Micro Hydro 5. Mega Hydro 6. Solar PV System 7. Geothermal 8. Domestic Biogas 10. Waste Energy										

²⁶ Zereay Tessema, Brijesh Mainali, and Semida Silveira, ‘Mainstreaming and sector-wide approaches to sustainable energy access in Ethiopia’, *Energy Strategy Reviews*, Vol. 2, no. 3–4, 2014, pp. 313–322.

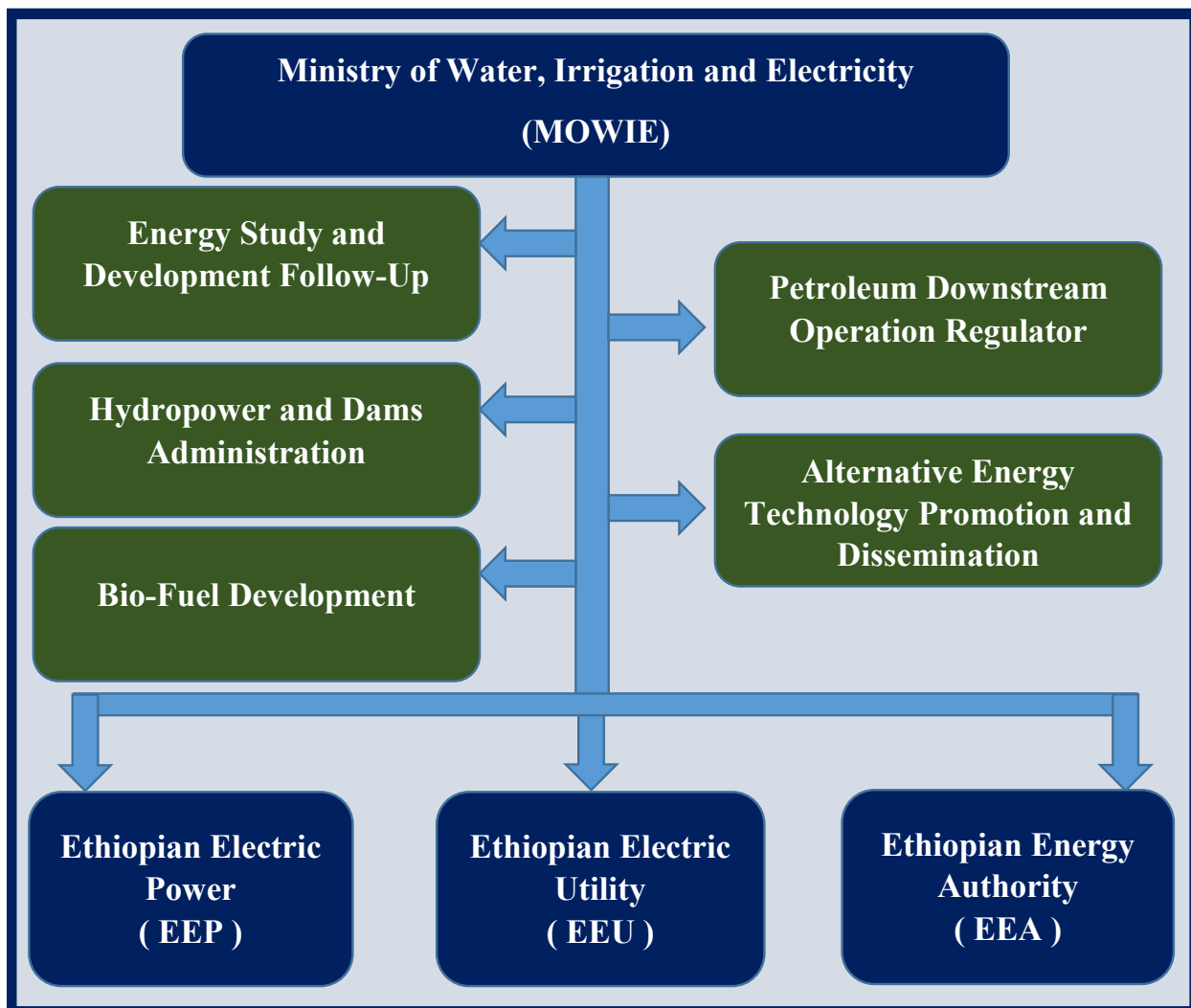


Figure 2 Institutional structure of MoWE ²⁷

Ethiopian Electric Power (EEP): is responsible for generation and transmission. EEP is the sole provider of bulk electricity to users, mainly to the Ethiopian Electric Utility (EEU), direct industrial customers, and exports to neighboring countries. Djibouti and Sudan are connected to Ethiopia by a high-voltage power line. A 400 MW energy purchase agreement has been signed between Kenya and Ethiopia, and a 500 kilovolt (kV) HVDC line between the two countries is under construction. EEP operates and maintains more than 12 hydro-power plants and three wind power plants in different parts of the country with installed capacity of more than 4,290 MW, including the Gibe III plant (1,870 MW). There are two major hydro-power projects under construction, the Grand Ethiopian Renaissance Dam (6,000 MW) and Genale-Dawa 3 (254 MW). EEP have 20 Power plants with a mix

²⁷ Asnake, 'Ethiopian Energy Sector Investment Opportunities'.

of renewable power from Hydro, , geothermal, wind and from diesel generator, the details of power plants connected to national grid are summarized in the table below. EEP operates and maintains all high-voltage transmission lines across the country, which covers more than 9,000 km with varying voltage levels ranging from 66kV to 500kV; and more than 90 sub-stations. Large-scale transmission line expansion is planned to extend the system and cover the whole country, including cross border power lines²⁸. The table below show existing Power Plants of Ethiopia from hydro, geothermal , wind and diesel with their installed capacity in MW to national Grid²⁹

Table 6: Existing Power Plants Installed Capacity in MW to national Grid

	Power Plant	Hydro	Diesel	Geo thermal	Wind	Total
1	Koka	43	-	-	-	43
2	Awash II	32	-	-	-	32
3	Awash III	32	-	-	-	32
4	Finchaa	134	-	-	-	134
5	Meleka Wakena	153	-	-	-	153
6	Tis Aby I	11	-	-	-	11
7	Tis Abay II	73	-	-	-	73
8	Gilgel Gibe	184	-	-	-	184
9	Aluttu Langanano	-	-	7	-	7
10	Kaliti	-	14	-	-	14
11	Dire Dawa	-	38	-	-	38
12	Awash 7 killo	-	35	-	-	35
13	Tekeze	300	-	-	-	300
14	Gilgel gibe II	420	-	-	-	420
15	Beles	460	-	-	-	460
16	Fincha Amerti Neshi	97	-	-	-	97
17	Ashegoda	-	-	-	120	120
18	Adama I	-	-	-	51	51
19	Adama II				153	153
20	Gibe III	1870				1870
	Total	3810	87	7	324	4228

Ethiopian Electric Utility (EEU): owns, operates and manages the electricity distribution networks across Ethiopia. EEU is presently serving app. 2.3 million customers and is expected to reach 7 million new customers by 2019/20. EEU is responsible for maintaining, upgrading and modernizing distribution networks to ensure that there is adequate distribution network capacity available to meet the needs of its existing customers as well as prospective customers. EEU is also responsible for enhancing the electricity access coverage from 55% to 90% in the next five years in addition to

²⁸ Ministry of Foreign Affairs of Denmark, *Accelerating Wind Power Generation in Ethiopia, Thematic Program Document*.

²⁹ MWIE, 'Ethiopian power sector: The renewable future', no. March, 2017.

operating and managing sub transmission (45 and 66 KV) and sub-stations. The trans-border connection of power such as to East Africa countries is also within the remit of EEU³⁰.

Ethiopian Energy Authority (EEA): was established in 2013, as a regulatory agency for the energy sector. It is mandated to issue licenses for generation, transfer, distribution, and sales, as well as the import and export of electricity in Ethiopia. As per the provision of the relevant proclamation, the agency is also responsible for issuing permits for private sector actors and reviewing tariff proposals in relation to the national grid³¹. Ethiopia's first Independent Power Purchase (IPP) geothermal projects at *Corbetti* and *Tulu Moyo* are under selection process of the tender to be granted.

Ethiopian Rural Energy Development and Promotion Centre (EREDPC) – with the mandate to carry out national energy resources studies, data collection and analysis, rural energy policy formulation, technology research and development and to promote appropriate renewable energy technologies in rural areas; the Centre also serves as the Executive arm of the Rural Electrification Fund (REF). To assess and implement projects under the REF the EREDPC has established a core team as the Rural Electrification Executive Secretariat REES. The REES being responsible for project appraisal shall also provide advisory services, capacity building, and training to Regional Energy Bureaus and cooperatives.

Rural Electrification Fund (REF) - to enable the private and cooperative engagement in rural electrification activities through loan based finance and technical support. Among other REF shall also prepare an off-grid rural electrification master plan which shall be updated annually and conduct feasibility studies to identify suitable RE projects, which will be implemented by the private sector (which includes NGOs, CBOs, co-operatives, municipalities/local governments and other entities). The resources available to the REF are used to subsidize 85 % of the cost of rural electrification projects. Renewable energy sources are entitled to a higher subsidy of 95 %. Most of the projects that receive assistance, however, are based on electricity generation with diesel generators.

Rural Electrification Fund still has limited capacities and/or experiences with extensively deploy mini-grids. The activities carried out by the Rural Electrification Fund so far is about 45,365 solar home systems are electrified including with the ongoing project and electrified about 545 rural health posts and about 370 elementary schools and training centers. The projects under the fund will have social, economic and environmental benefits by improving lighting services, reducing costs, improving health, education and safety for off-grid rural households while reducing GHG emissions³².

³⁰ Ministry of Foreign Affairs of Denmark, *Accelerating Wind Power Generation in Ethiopia, Thematic Program Document*.

³¹ Ministry of Foreign Affairs of Denmark, *Accelerating Wind Power Generation in Ethiopia, Thematic Program Document*.

³² MWIE, 'Rural Electrification in Ethiopia', 2016, pp. 25–28.

5. Private Sector Participation in Energy Sector Development

The Government of Ethiopia is in the process of reviewing its 1960 commercial code in an effort to facilitate investment and ease of operations. Areas of focus include clarifying regulations for potential investors, standardizing appropriate accounting practices to more accurately assess tax and other operating liabilities, increasing protection for shareholders and provisions for bankruptcy filings as well as modernization of trade and registration processes. Further, the revised Investment Code of 1996 and the Investment Proclamation provide incentives for development related investments, and have gradually removed most of the sector specific restrictions on investment. However, Ethiopia's investment code still prohibits foreign investment in banking, insurance, and financial services. The remaining state owned sectors include telecommunications, power transmission and distribution, and postal services with the exception of courier services USAID, 'Investment Brief for the Energy Sector in Ethiopia'..

Although the power sector is led by the public utility, the 1998 investment code (No 116/1998) has been formulated to promote private sector participation in the power generation business. Given the present laws and regulations, the foreign private sector can participate in hydropower generation (Independent Power Producers, IPPs). They can also invest in: electrical equipment manufacturing (transformer, cable, wire); off grid rural electrification using mini-grid systems based on: solar, small-hydro, hybrid systems; equipment and appliance manufacturing and supply including Hydro, solar and wind generator components, transmission & distribution components (transformers, cables, accessories, poles and towers, meters, etc), solar home systems, heating systems, etc. It also invites private sector involvement in construction of dams, biogas digesters, solar PV panels, solar lanterns, water heaters, and efficient cook stove manufacturing and distribution in all regions of the country³³³⁴.

Traditionally, EEP has owned and operated all power plants in Ethiopia. With an IPP contract, the roles will be changed to purchaser of electricity at an agreed price and conditions from IPPs'. IPPs address foreign exchange constraints, reform tariffs to allow for full-cost recovery and deliver more power to the majority of the population living off-grid and at the same time transfer substantial construction and operating risks to the IPPs. Good preparation and transparent procedures for IPPs can substantially reduce the electricity price for the benefit of all stakeholders. Well-designed and well-prepared auctions will attract bidders, increase competition and lower the electricity price. Many details can influence the success of an auction and much can be achieved with a good auction design. An auction will result in a long-term power purchase agreement (PPA). The agreement will

³³ MWIE, 'Ethiopian power sector: The renewable future'.

³⁴ Derbew, 'Ethiopia's Renewable Energy Power Potential and Development Opportunities'.

guarantee the winner the sale of electricity for a defined price for a long-term period, e.g. for the next 15-20 years^{35 363738} .

Ethiopia Electric Power (EEP) is developing procurement processes to select contractors and is awarding projects using a competitive bidding process. Under the Global Procurement Initiative (GPI), Crown Agents International, a U.S. based firm, is developing a procurement manual for EEP using a U.S. Trade and Development Agency (USTDA) grant. Power Africa has been assisting EEP with development of IPP tender documents and the legal and regulatory IPP framework. Ethiopia is drafting its feed-in tariff bill, which should offer independent power producers the option to sell renewable energy power to the national grid at specified rates. Engineering Procurement Contracts (EPC) are still considered as an unsolicited contract when companies are providing turnkey solutions and bring the finance. Most EEP projects are tendered. There is a Work on progress for advancing negotiations towards financial closure for Ethiopia's first Independent Power Purchase (IPP) geothermal projects at Corbetti and Tulu Moye that will generate up to 1,000 MW. And auction for 100 MW Metehara solar project has done, Initial response from more than 60 companies and bid evaluation in progress³⁹.

³⁵ Ministry of Foreign Affairs of Denmark, *Accelerating Wind Power Generation in Ethiopia, Thematic Program Document*.

³⁶ USAID, *Ethiopia Energy Sector Overview*.

³⁷ Derbew, 'Ethiopia's Renewable Energy Power Potential and Development Opportunities'.

³⁸ USAID, 'Power Africa in Ethiopia', no. September 2016, 2016, p. 2.

³⁹ MWIE, 'Ethiopian power sector: The renewable future'.

6. Energy Programs and Initiatives

6.1. International and Regional Energy Initiatives

Under this section different international and continental level energy initiatives that includes Ethiopia in the targeted countries will be pointed out. The summary of each initiative will include implementing agencies, African partners, donors participated, and energy sector selected for intervention as well as the main objectives and activities are discussed below.⁴⁰

6.1.1. Sustainable Energy for All (Africa Hub)⁴¹

The Sustainable Energy for All (SE4All) Africa Hub is a partnership of African institutions working to coordinate and facilitate the implementation of the SE4All Initiative in Africa and the achievement of its 2030 objectives. The SE4All Africa Hub provides technical assistance to African countries in the fields of energy access, renewable energy and energy efficiency. It promotes policy advocacy and networking.

Implementing Agencies: Hosted by the AfDB together with the African Union Commission, the New Partnership for Africa's Development (NEPAD) Agency and UNDP.

African Partners Involved: African Union Commission, NEPAD Planning and Coordination Agency, ECOWAS Centre for Renewable Energy and Energy Efficiency (ECREEE) and RECs

Donors Involved: African Development Bank, UNDP, and France

Countries Targeted: Pan-African mandate. Country-level processes: 44 African countries joined initiative including **Ethiopia**.

Area of Energy: Renewables, Non-Renewables Electricity, Heating and Cooling, Energy Efficiency and Cooking Energy

Objectives:

- To coordinate and facilitate the implementation of the SE4ALL initiative on the African continent in keeping with the resolution of the Conference of Energy Ministers of Africa in November 2012. The Hub will promote African ownership, inclusiveness and a comprehensive approach to the Initiative's implementation.

Activities

- Coordination and facilitation of the implementation of the SE4All initiative in Africa;
- Development and provision of guidance to African countries on SE4All country action processes - Rapid assessments / gap analysis⁴²,

⁴⁰ EUEI PDF, *Mapping of Energy Initiatives and Programs in Africa*.

⁴¹ Visit the SE4ALL official page and country profile for details on the project at <https://www.se4all-africa.org/se4all-in-africa/country-data/ethiopia/>

⁴² Rapid Gap Analysis of Ethiopia energy sector can be found in this link

- Support to the development of country-level Action Agendas and Investment Prospectuses
- Support to countries with the mobilization of resources towards the implementation of their SE4All AAs and IPs

6.1.2. Africa Renewable Energy Access Program (AFREA I & II) – ESMAP⁴³

ESMAP provides analytical and advisory services to low-income and middle-income countries to increase their know-how and institutional capacity to achieve environmentally sustainable energy solutions for poverty reduction and economic growth. Supporting several activities in countries around the world, ESMAP is an integral part of the Energy and Extractives Global Practice of the World Bank.

Implementing Agencies: AFREA is managed by the World Bank’s Africa Energy Unit and is a funding window of the World Bank’s ESMAP program.

African Partners Involved: Na

Donors Involved: World Bank Energy Sector Management Assistance Program (ESMAP) and its donors (Australia, Austria, Denmark, Finland, France, Germany, Iceland, Lithuania, the Netherlands, Norway, Sweden, and the United Kingdom, as well as the World Bank)

Countries Targeted: Benin, Burkina Faso, Congo, DR, **Ethiopia**, Kenya, Liberia, Madagascar, Mali, Mozambique, Nigeria, Rwanda, Senegal, South Sudan, Tanzania, Uganda, Zambia

Area of Energy: Electricity system, Grid-connected generation, Mini-grids and Stand-alone Off-grid

Objectives:

- To Promote increased access to energy, with an emphasis on renewable energy and energy efficiency (Energy Access);
- To Create an enabling environment for regional cooperation and private sector participation in energy generation, transmission and distribution (Capacity Building); and
- To Complement and support AFTEG’s “Energy-Driven Development” vision of poverty reduction, green and inclusive growth, paying special attention to Gender and Fragile and Post Conflict Countries

Activities

- Analytical and advisory activities
- Institution and capacity building
- Recipient-executed technical assistance

[https://www.se4all-africa.org/fileadmin/uploads/se4all/Documents/Country_RAGAs/MWH - Updated-Rapid_Gap_Analysis.pdf](https://www.se4all-africa.org/fileadmin/uploads/se4all/Documents/Country_RAGAs/MWH_-_Updated-Rapid_Gap_Analysis.pdf)

⁴³ ESMAP official Page <http://www.esmap.org>

- Bank-executed technical assistance
- Investment grants

6.1.3. Global Alliance for Clean Cook-stoves

The Global Alliance for Clean Cook stoves is a public-private partnership hosted by the UN Foundation to save lives, improve livelihoods, empower women, and protect the environment by creating a thriving global market for clean and efficient household cooking solutions. The Alliance's 100 by '20 goal calls for 100 million households to adopt clean and efficient cook stoves and fuels by 2020⁴⁴.

Implementing Agencies: Hosted by the UN Foundation. Over 1,400 partners are part of the Global Alliance

African Partners Involved: Diverse set of over 1,400 private sector, public and civil society partners.

Donors involved: Multiple bilateral and multilateral donors including the governments of Canada, Finland, Germany, The Netherlands, Norway, Sweden, United Kingdom, United States, and the World Bank; Corporates including Shell, Dow Corning Corporation, Deutsche Bank, CEMEx, Johnson & Johnson, and Morgan Stanley; Foundation and civil society donors such as GIZ, SNV, Caterpillar Foundation, Shell Foundation, Barr Foundation, Osprey Foundation, and the OPEC Fund for International Development.

Countries Targeted: Focus countries: Ghana, Kenya, Nigeria, Uganda (4 additional countries outside of Africa) and Partner countries: Burkina Faso, Central African Republic, Côte d'Ivoire, Democratic Republic of the Congo, **Ethiopia**, Ghana, Kenya, Lesotho,

Area of Energy: Renewables, Non-Renewables Heating and Cooling, Energy Efficiency and Cooking Energy

Objectives

- To create a thriving global market for clean and efficient household cooking solutions in order to save lives, improve livelihoods, empower women, and protect the environment.
- The Alliance's 100 by '20 goal calls for 100 million households to adopt clean and efficient cook stoves and fuels by 2020.

Activities

- Strengthen the supply of clean and efficient cook stoves and fuels
- Enhance demand for clean and efficient cook stoves and fuels
- Enable markets for clean and efficient cook stoves and fuels

⁴⁴ Official Pages of the project <http://cleancookstoves.org>

Progress reports (Ethiopia Market Assessment Report⁴⁵ and Research report on Ethanol: Towards a viable alternative for domestic cooking in Ethiopia⁴⁶)

6.1.4. Power Africa⁴⁷⁴⁸

Power Africa is a multi-partner initiative which launched in 2013. Power Africa's aims to increase electricity access in sub-Saharan Africa by adding more than 30,000 megawatts of cleaner, efficient electricity generation capacity and 60 million new home and business connections. Power Africa works with African governments and private sector partners to remove barriers that hinder sustainable energy development in sub-Saharan Africa and to unlock the substantial wind, solar, hydropower, natural gas, biomass, and geothermal resources on the continent.

Implementing Agencies: USAID, Departments of State, Treasury, Commerce, Energy, Export-Import Bank, Overseas Private Investment Corporation, U.S. Trade and Development Agency, Millennium Challenge Corporation, U.S. African Development Foundation

African Partners Involved: African Union (NEPAD), African Development Bank, Governments of Angola, Botswana, Cote d'Ivoire Democratic Republic of Congo, **Ethiopia**, Ghana, Guinea, Kenya, Lesotho, Liberia, Malawi, Mozambique, Nigeria, Rwanda, Senegal, Sierra Leone, South Africa, Swaziland, Tanzania, Uganda, and Zambia.

Donors Involved: US as the main donor (12 government agencies involved), with partnerships with African Development Bank, World Bank, Governments of Sweden, Norway, UK, European Commission, SE4All, IRENA, NEPAD

Countries Targeted: Focus countries that signed Memoranda of Understandings with Power Africa: **Ethiopia**, Ghana, Kenya, Liberia, Nigeria, and Tanzania

Area of Energy: Electricity system, Grid-connected generation, Mini-grids and Stand-alone off-grid

Objectives

- To add 60 million new households and business connections across sub-Saharan Africa, including grid and off-grid - Add 30 GW of cleaner, more efficient electricity generation

Activities

- Transaction assistance (early-stage support for project preparation activities and late-stage assistance to advance power transactions to financial close and beyond)
- Finance
- Technical assistance for policy/regulatory design and reform

⁴⁵ The document can be accessed in the following link

<http://cleancookstoves.org/binary-data/RESOURCE/file/000/000/160-1.pdf>

⁴⁶ The document can be accessed in the following link

<http://cleancookstoves.org/binary-data/RESOURCE/file/000/000/386-1.pdf>

⁴⁷ Official Page of Power Africa <https://www.usaid.gov/powerafrica>

⁴⁸ Official Page of Power Africa in Ethiopia <https://www.usaid.gov/powerafrica/ethiopia>

- Capacity Building: Technical Assistance to support institutional strengthening, technical and regulatory skill development, and project development and management activities
- Legal Assistance to strengthen governments' expertise and negotiation capacity for structuring, financing and closing power transactions

Progress in Ethiopia⁴⁹

Assisting with the development of new laws and regulations that will facilitate private-sector led independent power project (IPP) investments in geothermal, solar, wind, hydro, and biomass projects. The project assisting the Ministry of Finance and Economic Cooperation in setting up an IPP unit at MoWIE, Assisting with negotiations and bring to financial closure the Government of Ethiopia's initial landmark independent power project for the Corbetti and Tulu Moye geothermal projects that will generate up to 1,000 MW. Assisting Ethiopia Electric Utility on reducing commercial losses in the distribution network to below 10 percent and developing a plan to reduce distribution losses and assist with introduction of "smart grid technology

6.1.5. Biofuels Program for Household and Transport Energy Use⁵⁰

The United Nations Economic Commission for Africa (ECA) in partnership with the African Union Commission (AUC) and the NEPAD Policy and Coordinating Agency (NPCA) are implementing a project which explores and promotes modern biofuels development in Africa, particularly providing policy and regulatory support.

Implementing Agencies: United Nations Economic Commission for Africa (UNECA), African Union Commission (AUC) and the NEPAD Policy and Coordinating Agency, (NPCA) / IRENA

African Partners Involved: ECA Institute for Economic Development and Planning (IDEP), AUC African Energy Commission (AFREC), Regional Economic Communities (RECs), SE4ALL Regional Hub at the AfDB, government ministries or departments in charge of energy, local project developers (or private sector) and NGOs

Donors Involved: IRENA, United Nations Economic Commission for Africa (UNECA)

Countries Targeted: Signatories to the African Clean Energy Corridor (ACEC): Angola, Botswana, Burundi, the Democratic Republic of Congo, Djibouti, Egypt, **Ethiopia**, Kenya, Lesotho, Malawi, Mozambique, Namibia, Rwanda, South Africa, Sudan, Swaziland, Uganda, the United Republic of Tanzania, Zambia, and Zimbabwe

Area Of Energy: Electricity system, Grid-connected generation, Mini-grids and Stand-alone off-grid

Objectives

⁴⁹ US Foreign Commercial Service, 'Ethiopia Energy'.

⁵⁰ Biofuels Program for Household and Transport Energy Use official page

<https://www.unece.org/publications/strengthening-capacity-african-countries-promote-use-renewable-energy>

The overall objective of the project is to build the capacity of targeted countries to promote the production and usage of biofuels in order to achieve sustainable development and poverty reduction.

- To promote modern biofuels development in Africa, particularly providing policy and regulatory support
- To harmonize financial, institutional and policy frameworks for the promotion of biofuels
- To enhance capacity to formulate and implement gender sensitive policies and programs on biofuel development
- To improve capacity, particularly project developers, to package biofuels projects for investment

Activities

The main activities of the project are following:⁵¹

- Case studies on the experience of enabling policies and regulatory reforms that facilitates for the adoption of the biofuels technologies.
- Regional workshops based on case studies to share the lessons learned, and link these lessons to local context and experience;
- Guidelines and training materials and training manuals, model agreements and standards for creating a harmonized enabling environment for up-take of biofuels in Africa.
- Training workshops on: (a) policy and regulations (formulation); (b) establishing the national systems of innovation (linking R&D to industrial policy); (c) biofuels standards or standardization; (d) biofuels project development; and contract negotiation (financing).
- Providing specific and demand-driven technical assistance to identified countries on how they can develop and modernize the biofuel sector in order to generate modern electricity, heat energy, and/or transport fuels.

6.1.6. Energizing Development (EnDev)⁵²⁵³

EnDev promotes sustainable access to modern energy services that meet the needs of the poor - long lasting, affordable, and appreciated by users. EnDev works in 25 countries in Africa, Asia and Latin America. Since 2005, EnDev has taken a leading role at promoting access to Sustainable Energy for All⁵⁴. EnDev 1 was from May 2005 - December 2009 and EnDev 2 is from October 2009 - April 2019

Implementing Agencies: GIZ (lead) in cooperation with Netherlands Enterprise Agency (RVO)

⁵¹ Implementing Biofuels Program for Household and Transport Energy Use

<https://www.uneca.org/sites/default/files/PublicationFiles/implementing-biofuels-programme-for-household-and-transport-energy-use.pdf>

⁵² UNDESA, 'A Survey of International Activities in Rural Energy Access and Electrification', no. May, 2014.

⁵³ Kat Harrison, Andrew Scott, and Ryan Hogarth, *Accelerating access to electricity in Africa with off-grid solar-Off-grid country briefing: Ethiopia*, (no. January, 2016).

⁵⁴ Official Page of the initiative <https://endev.info>

African Partners Involved: EnDev has a number of partners in each country where it is active. Typical ministries it cooperates with are the local Ministry of Environment, Ministry of Agriculture and Ministry of Energy. Other partners are businesses and business associations, NGOs, research institutes.

Donors Involved: Australia, Germany, the Netherlands, Norway, Switzerland, UK; Contributions from EU and Ireland

Countries Targeted: Benin, Burkina Faso, Burundi, **Ethiopia**, Ghana, Kenya, Liberia, Madagascar, Malawi, Mali, Mozambique, Rwanda, Senegal, Tanzania, Uganda

Area Of Energy: Electricity system, Mini-grids and Stand-alone off-grid

Objectives

- to achieve sustainable access to energy for minimum 18 million people worldwide by 2019

Activities

- To promote sustainable access to modern energy services for households, social institutions and small to medium-sized enterprises in developing countries in Africa, Asia and Latin America.
- To support the development and dissemination of solar home systems, Pico PV, hydro mini-grids, biogas, and improved cook stoves.
- To Support grid improvement and grid connection.
- To Project interventions include developing markets for energy products and services; this includes targeted awareness campaigns, assisting entrepreneurs with energy-related businesses as well as transferring knowledge regarding technology and business skills, technical assistance and capacity building.
- To provides financial support to energy-related businesses to kick-start markets or buy down capital investments, but generally not for operational costs.
- A wide variety of project types and approaches can be found in the various recipient countries.

Progress Made in Ethiopia⁵⁵

- Promote solar systems, hydro power and improved cook stoves (ICS)
- Increase Access to electricity to 360,000 people
- Increase Access to modern cooking energy to 748,000 people
- Increase Access to modern energy services to 534 social institutions and 2,900 SMEs

⁵⁵ More information of the projects intervention in Ethiopia can be accessed with the link <https://endev.info/content/Ethiopia>

6.1.7. Energy Africa Campaign⁵⁶

Africa can have access to affordable, reliable, sustainable and modern energy by 2030. With this framework the Energy Africa campaign have planned to accomplish in overcome financial hurdles and the series of market failures that are preventing firms from raising capital by testing new approaches and reaching the poorest, overcome the policy and regulatory barriers to household energy access. The campaign drawing African countries into the compact to accelerate clean energy access, raise awareness to encourage others to work with the project as partners, make the most from developments in research and innovation and position this campaign within broader global efforts to ensure access to affordable, reliable and sustainable energy for all

Implementing Agencies: A campaign that brings together wide set of initiatives and programs to provide a political push in one narrow area. So, to be confirmed through each compact (which will list all the partners), but at a regional level likely to include institutional partners like the AfDB, the African Union and the African Progress Panel, bilateral initiatives like Power Africa or partners with a focus on a particularly area, like Shell Foundation on innovation, Africa Enterprise Challenge Fund on finance to businesses

African Partners Involved: 14 African countries including governments of **Ethiopia**, Kenya, Sierra Leone, Nigeria, Malawi, Rwanda, Somalia, Senegal, Mozambique that have signed agreement with UK, African Union

Donors Involved: DFID and leveraged support from a range of other donors in each country

Countries Targeted: Zimbabwe, Sierra Leone, Ghana, Tanzania, **Ethiopia**, Kenya, Nigeria, Malawi, Rwanda, Somalia, Senegal, Mozambique, Uganda, Zambia

Area of Energy: Stand-alone off-grid

Objectives

- To help Africa to achieve universal energy access by 2030 by accelerating the private sector led expansion of the household solar market

Activities

- Set out actions needed by governmental and development partners through Compact Agreements with 14 African governments to unleash the PayGo solar household market
- the policy & regulation reform and the support to businesses commit who will do what by when and track actions.
- Tackle the policy and regulatory barriers to household energy access to accelerate a market based approach to clean energy access;

⁵⁶ Energy Africa Campaign official Page <https://www.gov.uk/government/news/energy-africa-campaign>

- Address the financial hurdles and market failures that are preventing firms from raising capital by co-investing in innovative approaches to energy access that are commercially viable and target poor consumers
- Raise awareness to encourage others to work with us as partners in this area;

6.1.8. Geothermal Risk Mitigation Facility⁵⁷

The African Union Commission (AUC) on the one side and the German Federal Ministry for Economic Cooperation and Development (BMZ) and the EU-Africa Infrastructure Trust Fund (EU ITF) via KfW Entwicklungsbank (KfW) on the other side established the Geothermal Risk Mitigation Facility (GRMF) to fund geothermal development in Eastern Africa. In addition, the UK Department for International Development (DFID) is making a contribution to the GRMF. The GRMF was launched in April 2012 and is implemented in a series of application rounds. The program co-finances surface studies and drilling program aimed at developing geothermal energy projects – being a largely untapped indigenous and renewable energy resource.

Implementing Agencies: KfW

African Partners Involved: African Union Commission (AUC)

Donors Involved: German Federal Ministry of Economic Cooperation and Development (BMZ), EU-Africa Infrastructure Trust Fund (European Commission and 12 member states), DFID

Countries Targeted: First application phase: **Ethiopia**, Kenya, Rwanda, Tanzania, Uganda; from second and third round: as for the first round, plus Burundi, Comoros, Djibouti, Democratic Republic of Congo, Eritrea, Zambia

Area of Energy: Electricity system and Grid-connected generation

Objectives

- To Encourage public and private investors as well as PPP to develop geothermal prospects for power generation in Eastern Africa

Activities

- Grant program designed to reduce the risk of geothermal exploratory test drilling and facilitate private and public investment
- Grants provided for surface studies and drilling exploration
- Focus on de-risking as high upfront cost & risks of geothermal are mitigated by grants

In Ethiopia GRMF finance Surface studies for: Dofan, Fantale and Tuu-Moye, as well as Drilling projects for: Corbetti and Fantale

6.1.9. Lighting Africa

⁵⁷ Geothermal Risk Mitigation Facility (GRMF) <http://www.grmf-eastafrika.org>

Lighting Africa has already enabled 20.5 million people across Africa to meet their basic electricity needs (lighting and mobile phone charging) through quality-verified off-grid solar products, since running its first pilot projects in Ghana and Kenya in 2009. Lighting Africa aim to reach 250 million more people by 2030⁵⁸.

Implementing agencies: World Bank's Africa Energy Unit, IFC.

African Partners Involved: not specified

Donors Involved: Denmark, Italy, the Netherlands, and USA. Lighting Africa receives funding under AFREA, which is funded by the World Bank Energy Sector, Management Assistance Program (ESMAP) and its donors (Australia, Austria, Denmark, Finland, France, Germany, Iceland, Lithuania, the Netherlands, Norway, Sweden, and the United Kingdom, as well as the World Bank)

Countries Targeted: Originally piloted in Ghana and Kenya using an IFC-GEF grant, Lighting Africa remains a collaborative undertaking between IFC and the World Bank's Africa Energy Unit and focuses on Sub-Saharan Africa. It is current active in Burkina Faso, the Democratic Republic of Congo, **Ethiopia**, Kenya, Liberia, Mali, Nigeria, Senegal, South Sudan, Tanzania and Uganda

Area of Energy: Stand-alone off-grid

Objectives

- To accelerate the development of commercial off-grid lighting markets in Sub-Saharan Africa, eliminate barriers for the private sector

Activities

- Market Intelligence: publication of market research
- Quality Assurance: development of a series of Quality Standards and testing methods (now operated by Lighting Global)
- Access to Finance: facilitates and leverages financial products to help provide capital for distributors and consumers
- Consumer Education: development of consumer education materials and consumer education campaigns in partnership with manufacturers and distributors.
- Business Development Support: advisory services for players in this sector on best business practices, corporate governance and risk management
- Lighting Africa currently is focused on designing and implementing IDA-funded activities to stimulate and transform the market for quality assured PV-lighting products in sub-Saharan African countries.

Progress Made in Ethiopia⁵⁹ between July 2014 - June 2016

⁵⁸ Lighting Africa Official page <https://www.lightingafrica.org>

⁵⁹ Reaching Out to Rural Areas <https://www.lightingafrica.org/country/ethiopia/>

- Provide business support to a range of private sector companies entering the sector. These services include providing basic business and technical training to retailers and MFIs entering the solar energy lending space.
- The Government of Ethiopia established a financing facility in 2013, with Lighting Africa's support and US\$20 million in financing from the World Bank.
- Over 300,000 solar lighting products meeting Lighting Global Quality Standards were imported during the first 18 months this facility was in operation, providing roughly 1 million Ethiopians with access to modern energy services. As of March 2016, 779,514 quality-verified solar lanterns have been imported using funds from this facility. Following this initial success, the World Bank decided to double its funding to \$40 million in May 2016.

6.1.10. Renewable Energy Performance Platform (REPP)⁶⁰

REPP supports small to medium-sized renewable energy projects (below 25 MW) throughout sub-Saharan Africa. A wide range of renewable energy technologies are eligible for support, including wind, solar photovoltaic (PV), geothermal, waste to energy (landfill gas and thermal waste to energy), run-of-river hydropower, biomass and biogas. The REPP has initial funding of £48 million from the United Kingdom's Department of Energy and Climate Change through the International Climate Fund.

Implementing Agencies: UNEP, European Investment Bank, Frankfurt School-UNEP Collaboration Center

African Partners Involved: not specified

Donors Involved: EU-Africa Infrastructure Trust Fund (EU plus 12 member states), Norwegian Agency for Development Cooperation (NORAD)

Countries Targeted: Sierra Leone, Liberia, Burkina Faso, Ghana, Nigeria, **Ethiopia**, Uganda, Kenya, Tanzania and Mozambique

Area of Energy: Electricity system, Grid-connected generation, Mini-grids and Stand-alone off-grid

Objectives

- To overcome barriers for small/medium scale renewable energy projects relating to perceived risks, technologies and regulations across SSA
- reduce cost of capital for funding projects

Activities

- Facilitate the delivery of existing risk mitigation instruments
- Assist in identifying appropriate lending facilities
- Provide results-based financial support in order to facilitate the realization of viable projects.

⁶⁰ Renewable Energy Performance Platform (REPP) official page <https://www.repp-africa.org>

6.1.11. Renewable Energy Solutions for Africa (RES4Africa)⁶¹

RES4Africa is a leading platform for public-private dialogue in the Sub-Saharan African renewable energy context. It is a network of key international energy stakeholders (utilities, industries, agencies, technical service providers and top academia) engaged in promoting clean tech solutions in the Sub-Saharan African continent. RES4Africa initially target the Eastern African Region focusing on Ethiopia, Kenya, Rwanda, Tanzania and Uganda. RES4Africa is at the moment a spin-off project of RES4Med association (www.res4med.org). RES4Africa encourages the set-up of partnership formulas to provide decision makers with private sector perspectives to stimulate investment opportunities along the entire supply chain through networking activities.

Implementing Agencies: RES4MED

African Partners Involved: Na

Donors Involved: Na

Countries Targeted: Kenya, Mozambique, **Ethiopia**, Uganda, Tanzania, South Africa, Senegal, Ghana, Nigeria

Area of Energy: Electricity system, Grid-connected generation, Mini-grids and Stand-alone off-grid

Objectives

- To Creation of a business-friendly environment is a pre-requisite for RES/EE deployment
- To Upgrading and expansion of power infrastructures to meet new energy requirements
- To Appropriate business models and financing tools for sustainable projects both large scale and distributed generation and for EE applications
- To RES/EE deployment creates a local manufacturing and services industry. This requires private sector's involvement along the whole value chain to generate employment
- To An enabling environment requires the creation of skilled workforce and institutional capacity

Activities

- Advanced Training Course Scholarship to some selected stakeholders from African Countries
- Study on integration of renewable energy in the electricity grids
- Guidelines for regulatory framework for infrastructures development
- Renewable Energy Outlook / Country assessment
- Technical summer schools for junior engineers/technicians – Locally (including internships programs) (mini-grids, geothermal, DG, storage solutions, etc.)
- MOU cooperation agreement

⁶¹ Renewable Energy Solutions for Africa official page www.res4africa.org

6.1.12. Strategic Climate Fund - Scaling Up Renewable Energy Program (SREP)

SREP is funded by the Strategic Climate Fund (SCF), one of the two Climate Investment Funds (CIF). SREP aims to scale up the deployment of renewable energy solutions and expand renewable markets in the world's poorest countries⁶².

Implementing Agencies: AfDB, World Bank, International Finance Corporation

African Partners Involved: not specified

Donors Involved: Australia, Denmark, Japan, Korea, Netherlands, Norway, Spain, Sweden, Switzerland, UK, US.

Countries Targeted: SREP pilot country investment plans endorsed in Africa and potential countries: Benin, **Ethiopia**, Kenya, Lesotho, Madagascar, Sierra Leone, Tanzania, Zambia, Ghana, Liberia, Malawi, Mali, Rwanda, Uganda

Area of Energy: Electricity system, Mini-grids and Stand-alone off-grid

Objectives

- To Scale-up the deployment of renewable energy solutions in the world's poorest countries to increase energy access and economic opportunities.
- To demonstrate the economic, social and environmental viability of low carbon development pathways in the energy sector in low-income countries
- To help low-income countries use new economic opportunities to increase energy access through renewable energy use.

Activities

- Channeled through multilateral development banks (MDBs), SREP financing aims to pilot and demonstrate the economic, social, and environmental viability of low carbon development pathways building off of national policies and existing energy initiatives.
- SREP provides a menu of financing options to accommodate different needs of client countries and program interventions, including grants, equity, concessional loans, and guarantees.

6.1.13. Sustainable Energy Fund for Africa (SEFA)⁶³

SEFA was established in 2011 at the African Development Bank, it is a multi-donor trust fund administered by the African Development Bank anchored in a commitment of USD 60 million by the

⁶² SREP official page <https://www.climateinvestmentfunds.org/fund/scaling-renewable-energy-program>

⁶³ Sustainable Energy Fund for Africa official page <https://www.afdb.org/en/topics-and-sectors/initiatives-partnerships/sustainable-energy-fund-for-africa/>

Governments of Denmark and the United States to support small- and medium-scale Renewable Energy (RE) and Energy Efficiency (EE) projects in Africa. SEFA is founded on the premise that reliable, clean and affordable energy can contribute to strong African economies and can have a positive impact in creating employment opportunities across the continent. SEFA is also aligned with the Sustainable Energy for All Initiative (SE4ALL) to support preparatory, sector planning and capacity-building activities arising out the AfDB-hosted SE4All Africa Hub. This includes support to High-Impact Opportunities (HIO) for Green Mini-Grids, as an area of strong complementarity with the Bank's business in the grid-connected space.

Implementing Agencies: African Development Bank

African Partners Involved: ECOWAS Centre for Renewable Energy and Energy Efficiency (ECREEE)

Donors Involved: Denmark, United Kingdom, USA, African Development Bank

Countries Targeted: Burkina Faso, **Ethiopia**, Cameroon, Chad, Union of Comoros, Djibouti, Madagascar, Mali, Mauritius, Nigeria, Tanzania, Uganda, Morocco, Guinea-Bissau and Mozambique. Multination Operations

Area of Energy: Grid-connected generation, Mini-grids and Stand-alone off-grid

Objectives

- Unlock private investments in sustainable energy by addressing challenges like initial development costs, lack of start-up capital, limited know-how of project financing and an inadequate enabling environment.

Activities

- Project preparation grants to bring medium-scale RE generation and EE project to bankability
- Equity investments (via African Renewable Energy Fund) to bridge the financing gap for small- and medium-scale RE generation projects
- Enabling environment grant for creating and improving the environment for private investment in on-grid and mini-grid projects
- SEFA also implements global and country-specific activities of DFID's Green Minigrid (GMG) program.

6.2. National Energy Projects

In the following section projects and initiatives operated at national level are summarized. Most of the project are working with the MoWIE as partners as well as implementers. These projects are active projects and for simplicity they are listed with sub-sections by projects donors including world bank, Africa development bank, European Union, china, INBAR and SNV. This countries and

intergovernmental organizations have long time partners' in Ethiopian energy sectors. The projects summarize briefly including main partners' and project descriptions.⁶⁴

6.2.1. Projects funded by World Bank⁶⁵

6.2.1.1. Ethiopia Clean Cooking Energy Program⁶⁶

The Ethiopia Clean Cooking Energy Program is a nationwide program for Ethiopia that targets poor and vulnerable households, who rely primarily on wood fuels for cooking. National statistics show that 85% of cooking fuel currently used in Ethiopia is either collected or purchased. The purpose of the project is to provide improved energy access to such households, with associated benefits for poverty alleviation, while simultaneously reducing greenhouse gas emissions from the exploitation of non-renewable biomass resources and from fossil fuels.

Table 7: Ethiopia Clean Cooking Energy Program Project at a Glance

Project ID	P153425
Country	Ethiopia
Region	Africa
Status	Active
Approval Date	May 27, 2016
Closing Date	N/A
Total Project Cost**	US\$ 8.11 million
Commitment Amount	US\$ 0.00 million
Team Leader	Rahul Kitchlu

Sectors

- Renewable Energy Biomass 25%
- Renewable Energy Geothermal 25%
- Renewable Energy Solar 25%
- Renewable Energy Wind 25%

6.2.1.2. Ethiopia Off-Grid Renewable Energy Program⁶⁷

The Ethiopia Off-Grid Renewable Energy Program is a nation-wide program for Ethiopia that targets the large segment of the population without access to electricity for basic uses. Due to poor grid coverage and the dispersed nature of settlements in rural areas, only 14% of the population are

⁶⁴ MWIE, 'Scaling Up Renewable Energy Program:Ethiopia Investment Plan', *Project Appraisal*, no. January, 2012, pp. 1–89.

⁶⁵ More information on World Bank energy Projects in Ethiopia (last accessed on august 2017) http://www.worldbank.org/en/country/ethiopia/projects/all?qterm=energy&lang_exact=English&os=20

⁶⁶ More information on ET Clean Cooking Energy Program (last accessed on august 2017) <http://projects.worldbank.org/P153425?lang=en>

⁶⁷ More information on Ethiopia Off-Grid Renewable Energy Program <http://projects.worldbank.org/P153864?lang=en>

connected to the electricity grid. Meanwhile, more than 12 million rural households rely on sources other than the electricity grid for energy for lighting, with the majority utilizing kerosene lamps. The project promotes scaling-up of the uptake of off-grid renewable energy technologies to provide electricity for lighting and other domestic, commercial, or institutional energy needs for households and other users either not connected to the grid, or not served by the grid due to acute shortage of electricity in the grid.

Table 8: Ethiopia Off-Grid Renewable Energy Program Project at a Glance

Project ID	P153864
Country	Ethiopia
Region	Africa
Status	Active
Approval Date	May 27, 2016
Closing Date	N/A
Total Project Cost**	US\$ 6.00 million
Commitment Amount	US\$ 0.00 million
Team Leader	Rahul Kitchlu

Sectors

- Renewable Energy Biomass 25%
- Renewable Energy Geothermal 25%
- Renewable Energy Solar 25%
- Renewable Energy Wind 25%

6.2.1.3. Ethiopia Electricity Network Reinforcement and Expansion Project (ENREP) additional financing ⁶⁸

ENREP consists of four components. The first component, Reinforcement and expansion of electricity network supports grid upgrade and extension to improve the overall service delivery of the Ethiopian electricity network.

The second component, Access scale-up (US 50 million dollars equivalent from IDA and US 20 million dollars from Government of Ethiopia (GoE)). This component includes: (a) intensification of connections to households and villages in areas already covered by the grid; (b) extension of the distribution network in selected areas; and (c) enhancement of connectivity in newly connected areas.

The third component, Market development for renewable energy and energy efficient products (US 40 million dollars equivalent from IDA and US 10 million dollars equity contribution from beneficiaries) leverages the market-based approach developed under the umbrella of the lighting

⁶⁸ More information on Ethiopia Electricity Network Reinforcement and Expansion Project (ENREP) <http://projects.worldbank.org/P155563?lang=en>

Africa program to support the spread of off-grid renewable energy systems among households residing in areas far removed from the grid, or those in areas under the grid who cannot afford a connection.

The fourth component, Modernization support (US 10 million dollars equivalent from IDA) provides support to the modernization of the electricity sector initiated by the GoE, which ultimately led to the unbundling of Ethiopian electric power corporation (EEPCo).

The proposed additional financing will finance: (a) expanded investments in on-grid electrification; (b) scale-up of credit facilities for the financing of stand-alone, renewable energy systems and energy efficient products; and (c) additional technical assistance in support of sector modernization.

Table 9: Ethiopia Electricity Network Reinforcement and Expansion Project at a Glance

Project ID	P155563
Country	<u>Ethiopia</u>
Region	<u>Africa</u>
Status	Active
Approval Date	May 27, 2016
Closing Date	N/A
Total Project Cost**	US\$ 248.00 million
Commitment Amount	US\$ 200.00 million
Team Leader	Rahul Kitchlu, Karen Bazex

Sectors

- Renewable Energy Biomass 3%
- Renewable Energy Geothermal 3%
- Public Administration - Energy and Extractives 10%
- Energy Transmission and Distribution 78%
- Renewable Energy Solar 3%
- Renewable Energy Wind 3%

6.2.1.4. Ethiopia Geothermal Sector Development Project⁶⁹

The development objective of the Geothermal Sector Development Project (GSDP) is to develop geothermal resources in Ethiopia. There are four components to the project, the first component being Aluto geothermal site development.

This component will finance goods, including drilling consumables and associated materials; services, including drilling contractors, the supervision engineer, reservoir engineering, and management; drilling and testing of about 22 wells; and design and construction of a steam-gathering system connecting the producing and injection wells.

⁶⁹ More information on Ethiopia Geothermal Sector Development Project <http://projects.worldbank.org/P133613?lang=en>

The second component is the Alalobad geothermal site development. This component will finance goods, including drilling consumables and associated materials; services, including drilling contractors and the supervision engineer; and drilling and testing of about four wells. Financing from International Development Association, or IDA will be used for production drilling and testing activities, in order to establish the economic viability of the geothermal resources and finalize a feasibility study of the Alalobad geothermal site.

The third component is the drilling rigs, associated accessories, and spare parts. This component will finance goods, in particular two full-size modern diesel electric drilling rigs with all associated equipment, accessories for directional drilling and both overpressure and under-pressure drilling, and a complete inventory of spare parts.

Finally, the fourth component is the legal, institutional, and regulatory framework development. It cover Private Sector Development, Public Sector Management and Environment and Natural Resource Management

Table 10: Ethiopia Geothermal Sector Development Project at a Glance

Project ID	P133613
Country	Ethiopia
Region	Africa
Status	Active
Approval Date	May 29, 2014
Closing Date	June 30, 2020
Total Project Cost**	US\$ 218.50 million
Commitment Amount	US\$ 178.50 million
Team Leader	Raihan Elahi, Rahul Kitchlu, Kenta Usui

Sectors

- Renewable Energy Biomass 25%
- Renewable Energy Geothermal 25%
- Renewable Energy Solar 25%
- Renewable Energy Wind 25%

6.2.1.5. Ethiopia Climate Innovation Center⁷⁰

World Bank–supported business hub, the Ethiopia Climate Innovation Center (ECIC), was launched in 2014 to support pioneering clean technology enterprises that address climate change while creating jobs and improving livelihoods. First of its kind in the country, the center will help over 3.1 million Ethiopians increase resilience to climate change and is expected to create more than 12,000 jobs in the next ten years. The Ethiopia CIC is part of infoDev’s Climate Technology Program (CTP),

⁷⁰ More information on Ethiopia Climate Innovation Center
<http://projects.worldbank.org/P130142?lang=en>

which is currently implementing a global network of innovation centers across seven other countries. The Ethiopia CIC is supported by the government of Norway, UKAid and the World Bank. It is managed by a consortium led by the Horn of Africa Regional Environment Center (HoAREC) , a regional institution hosted by Addis Ababa University (AAU) and other public and private sector partners.

Table 11: Ethiopia Climate Innovation Center Project at a Glance

Project ID	P130142
Country	Ethiopia
Region	Africa
Status	Active
Approval Date	November 22, 2013
Closing Date	April 30, 2018
Total Project Cost**	US\$ 5.00 million
Commitment Amount	US\$ 0.00 million
Team Leader	Jaime Andres Uribe Frias

Sectors

- Renewable Energy Biomass 25%
- Renewable Energy Geothermal 25%
- Renewable Energy Solar 25%
- Renewable Energy Wind 25%

6.2.2. Projects funded by Africa Development Bank

6.2.2.1. Djibouti-Ethiopia Power Interconnection: Hydro-Powering East Africa⁷¹

The development objective of the project was to improve electricity access in Ethiopia and Djibouti at affordable prices through regional cooperation in power trade. The AfDB has been an active partner in implementing the connection by providing USD 95 million for the project. The 283-km Ethiopia-Djibouti transmission line was officially inaugurated in October 2011. The 230-kV line, enabling Djibouti to import up to 60 MW of electricity, is estimated to be earning Ethiopia at least USD 1.5 million per month, and has eased Djibouti's reliance on fossil-fuel power plants and generators.

The project also provided short-term employment for about 1,190 people in Ethiopia and 460 in Djibouti. Also, it generated opportunities for jobs and transfer of skills to sub-contractors in Djibouti and Ethiopia. In Djibouti, import of the low-cost hydropower would help to suppress the costly thermal generation resulting in cost savings through reduced oil import. The interconnection also enables the two systems to support each other during emergencies.

⁷¹ More information on Djibouti-Ethiopia Power Interconnection: Hydro-Powering East Africa <https://www.afdb.org/en/news-and-events/djibouti-ethiopia-power-interconnection-hydro-powering-east-africa-12279/>

ADF 11 has invested a loan of USD 42.89 million for Ethiopia and loan/grant of USD 54.79 million to co-finance the project with the Ethiopian Electric Power Corporation (EEPCo) and the Ministry of Economy, Finance and Planning Electricité de Djibouti (EdD).

6.2.2.2. Ethiopia-Kenya Power Interconnection: The Power of Regional Interconnection⁷²

Ethiopia-Kenya Power Interconnection is 1,068 km of high voltage direct current (HVDC) electricity highway between Ethiopia and Kenya, with a power transfer capacity of up to 2,000 MW. Developing regional interconnections and operating as a Power Pool Strategic partnerships among stakeholders, with significant contribution for regional economic cooperation and stability. Co-financing from AfDB (USD 338 million), World Bank (USD 684 million), Agence Française de Développement (USD 118 million), Government of Kenya (USD 88 million) and Government of Ethiopia (USD 32 million). The ADF is expected to play a crucial role with a proposed loan of UA 150 million to Ethiopia and UA 75 million to Kenya.

6.2.2.3. Assela Wind Farm – Scaling-Up Renewable Energy Program (SREP)⁷³

The objective of the wind farm project will be: -To further investigate the areas identified in the wind map -To asses and evaluate available wind potential sites suitable for grid connected power generation -Gaining high quality wind data from the proposed site and assessing that data in a pre-feasibility study process -Conducting a full feasibility study, Environmental and Social Impact Assessment and conceptual design for the site and make it ready for construction of a wind farm project in that location The overall objective of the project is to determine if the project is viable and feasible from the technical, economic, environmental and social perspectives. It will be used for the hiring of a consultancy firm to perform a detailed technical feasibility study and to carry out a detailed Environmental and Social Impact Assessment, detailed Resettlement Action Plan and preparation of bidding document for construction of wind power plant including the installation of 4 wind masts for wind assessment.

Table 12: Assela Wind Farm – Scaling-Up Renewable Energy Program Project at a Glance

Finance source	Amount
Government	USD 194,727
Co-financier	USD 1,103,452
Delta	USD 1
Total	USD 1,298,180

⁷² More information on Ethiopia-Kenya Power Interconnection: The Power of Regional Interconnection <https://www.afdb.org/en/news-and-events/ethiopia-kenya-power-interconnection-phases-i-and-ii-the-power-of-regional-interconnection-12277/>

⁷³ More information on Assela Wind Farm – Scaling-Up Renewable Energy Program (SREP)

⁷³ More information on Mekele-Dalol & Semera Afdera Power Supply for Industrial Development And Access Scale-Up <https://www.afdb.org/en/projects-and-operations/project-portfolio/p-et-fa0-011/> <https://www.afdb.org/en/projects-and-operations/project-portfolio/p-et-fe0-002/>

*6.2.2.4. Mekele-Dalol & Semera-Afdera Power Supply for Industrial Development And Access Scale-Up*⁷⁴

The Mekele-Dalol and Semera-Afdera Power Transmission Supply for Industrial Development and Access Scale-up Project aims at improving the socio-economic development and livelihoods in Tigray and Afar states through increased access to affordable and sustainable electricity supply and improved service delivery. The project helps to ensure electricity generated from the power plants is transported to remotely located load centers. It will also solve the prevailing power shortages due to inability of existing diesel power plants to satisfy rapidly growing demand in the local potash and salt industries. The African Development Bank (AfDB) has approved 104 million USD loan for a project that will sustainably extend power to industries in Tigray and Afar regional states.

6.2.3. Projects funded by European Union⁷⁵

The EU has been supporting Ethiopia's energy sector for many years, The country's Sustainable Energy for All (SE4ALL) National Action Plan was financed under one such technical assistance. The adoption of the 11th European Development Fund (EDF) National Indicative Program (NIP) for Ethiopia, which features energy as a focal sector of the EU's development aid to Ethiopia, has marked a further step towards reinforced cooperation.

Access to modern, safe and sustainable energy services, renewable production and energy efficiency were selected as specific objectives to focus on over the 2014-2020 period. Two projects are now started implementation.

- One aims at disseminating 35,000 biogas digesters throughout the country and implemented by the Dutch NGO SNV.
- The other one consists in scaling up GIZ's Energizing Development (EnDev) program; it supports the development of a market for improved cook stoves (ICS), high quality solar home systems (SHS) and pico-size photovoltaic devices as well as the promotion of briquettes and the implementation of off grid micro hydropower projects.

*6.2.3.1. Ethiopia Biogas Dissemination Scale-Up Program (NBPE+)*⁷⁶

The Biogas Dissemination Scale-Up Program (NBPE+) is a public-private partnership at federal, regional and district level funded by the European Union and the Government of Ethiopia. SNV is the overall program manager and also provides technical assistance to the implementation. The Ministry of Water, Irrigation and Electricity (MoWIE) executes the program on behalf of the Government of Ethiopia.

⁷⁵ More information on EU energy Projects in Ethiopia (last updated on 11/05/2016 and last accessed august 2017) https://eeas.europa.eu/delegations/ethiopia/1187/eu-projects-ethiopia_en

⁷⁶ The Biogas Dissemination Scale-Up Program (NBPE+)

<http://www.snv.org/project/biogas-dissemination-scale-program-nbpe>

The overall objective of NBPE+ is to improve the living standards of farmers and their families, in the Ethiopian regions of Afar, Amhara, Benishangul-Gumuz, Gambela, Oromia, SNPPR, Somali and Tigray while reducing the over-exploitation of biomass and greenhouse gas emissions. By developing a viable bio-digester sector, the program also aims to contribute to economic and business development as well as creating socio-economic and environmental benefits, through a sustainable energy mix.

The specific objectives of the program are:

- To provide 180,000 people with biogas as clean energy (mainly used for cooking) and bio-slurry as high value fertilizer (in total, 36,000 bio-digesters);
- To improve the affordability of bio-digesters and provide a pro-poor orientation towards female headed and disadvantaged families;
- To expedite sector capacity development for a sustainable domestic bio-digester sector and engage of partners to fill the capacity gap;
- To further develop existing and create new types of bio-digesters, appliances and accessories for both domestic and productive purposes;
- To further develop the institutional and policy framework for the biogas sector in the country.

The Biogas Dissemination Scale-Up Program builds on the achievements of the National Biogas Program of Ethiopia (NBPE) which has been implemented since 2009 in four regions funded by the governments of the Netherlands and Ethiopia. NBPE is part the Africa Biogas Partnership Program, with Hivos as fund manager and SNV providing technical assistance. By the end of 2016 NBPE had supported the installation of over 15,000 bio-digesters. NBPE+ was launched in May 2017 with an implementation period of over five years. Biogas Dissemination Scale-Up Program (NBPE+). NBPE+ is funded by the European Union and the Government of Ethiopia. SNV will be the overall program manager on behalf of the EU fund and will provide technical assistance on the implementation. The Ministry of Water, Irrigation and Electricity (MoWIE) executes the program on behalf of the Government of Ethiopia. The total funding of the program from EU is EUR 20.85 million, while the Government of Ethiopia contributes EUR 2 million.

6.2.4. Projects funded by Government of China

6.2.4.1. Eastern Africa Power Integration Program

The development objective of the Regional Eastern Africa Power Pool Project First Adaptable Program Loan (APL1) for Africa is to increase the volume and reduce the cost of electricity supply in Kenya; and to provide revenues to Ethiopia through the export of electricity from Ethiopia to Kenya. There are two components to the project. The first component is construction of a High Voltage Direct Current (HVDC) transmission interconnection between Ethiopia and Kenya. This component includes four sub components:

1) transmission line. This sub-component will finance the construction of about 1,045 km of bipolar 500 kV HVDC overhead transmission line to interconnect the electricity network of Ethiopia, at the Wolayta/Sodo substation, with the Kenya network, at the Suswa substation.

2) converter substations. This sub-component will finance the engineering design, construction, and commissioning of one converter substation on each end one in Ethiopia and one in Kenya - of the transmission line to be constructed under first component of the project, and provision of goods required for such construction and for the maintenance and surveillance of the transmission network, including an helicopter for each country.

3) Environmental and social management. This subcomponent will implement the environmental and social management plans, as defined in the ESIA's, the resettlement policy framework in Ethiopia, and the RAPS. Financing will be made available by the project implementing entities.

4) System reinforcement. The sub-component includes reinforcements in Kenya of the substations and other parts of the network necessary to integrate regional interconnections, while managing the increased demand in Kenya at the commissioning time of the interconnection for reliable operation of the Kenyan grid. The second component is project management and capacity

Table 13: Eastern Africa Power Integration Program Project at a Glance

Project ID	P126579
Country	Africa
Region	Africa
Status	Active
Approval Date	July 12, 2012
Closing Date	June 30, 2019
Total Project Cost**	US\$ 1262.50 million
Commitment Amount	US\$ 684.00 million
Team Leader	Jianping Zhao, Rahmoune Essalhi, Rahul Kitchlu

Sectors

- Central Government (Central Agencies) 1%
- Energy Transmission and Distribution 93%
- Other Energy and Extractives 6%

6.2.5. Projects funded by INBAR

6.2.5.1. Indo-Africa South-South Program⁷⁷

This project builds on a previous IFAD-funded project “Mainstreaming Pro-Poor Livelihoods and Addressing Environmental Degradation with Bamboo in Eastern & Southern Africa’ that was

⁷⁷ Indo-Africa South-South Program

implemented between 2010 and 2013. While the project's first phase enabled the identification of important resources and development of demonstration sites, the second phase builds on established knowledge to mainstream bamboo as a source of income along the entire value chain from growing, processing and distribution. Due to the availability of crucial local knowledge in bamboo development, the second phase also focuses on the establishment of important partnerships with local stakeholders to enhance and consolidate beneficiary countries.

6.2.5.2. Dutch-Sino-East Africa Program⁷⁸

This program builds on Chinese and Dutch expertise in bamboo value chain development, product design, marketing and standardization to help East Africa unlock the vast potential of its indigenous bamboo resources while contributing to green economic growth, international trade and investment between Europe, China and East Africa. The expected results will contribute to poverty reduction, green economic growth and climate change mitigation and adaptation through the development and improvement of industrial bamboo value chains in East Africa.

6.2.6. Projects funded by SNV

6.2.6.1. Innovations against Poverty (IAP)⁷⁹

Innovations against Poverty (IAP) challenges the private sector to develop innovative products, services and business models that can contribute to the fight against poverty and climate change, with a specific focus on the inclusion and empowerment of women and youth. IAP provides non-reimbursable funding to companies that engage the urban and rural low income population as innovators, entrepreneurs, producers, consumers, or distributors. Companies can apply for funding from IAP through open calls. There will be two rounds of calls in 2017. IAP is funded by Sida (Swedish International Development Agency) and managed by SNV in partnership with BoP Innovation Center and Inclusive Business Sweden.

IAP provides selected companies with financial support ranging from €50.000 to €200.000, as a non-reimbursable risk capital for up to a maximum of 49% of the total required investment. In addition to financial support, IAP offers companies advice in developing and rolling out their business models that engage low income groups and deliver a commercial return. Business development and innovation support will be available to further develop the business idea and practices during group workshops and individual coaching. Besides, specialized support will be available through local associated consultants (to be financed by the investee) and through the online platform.

<http://www.inbar.int/project/south-south-knowledge-transfer-strategies-for-scaling-up-pro-poor-bamboo-livelihoods-income-generation-and-employment-creation-and-environmental-management-in-africa/>

⁷⁸ Dutch-Sino-East Africa Program

<http://www.inbar.int/project/dutch-sino-east-africa-bamboo-development-project/>

⁷⁹ Innovations against Poverty (IAP)

<http://www.snv.org/project/innovations-against-poverty-iap>

6.3. Growth and Transformation Plan

Ethiopia's Growth and Transformation Plan (GTP) outlines a 15 year plan with three 5-year phases to transform from a developing country to a lower-middle income country by 2025⁸⁰. The GoE has embarked on a structural transformation of the economy and society. GoE has completed its first phase of the Growth and Transformation Plan (GTP-I) (2010/11–2014/15), which set a long-term goal for Ethiopia to become a middle-income country by 2025, with a growth rate of at least 11.2 percent per year during the plan period. During 2011-15, Ethiopia grew at a rate of 10 percent.

A second phase of the GTP (GTP-II) is under implementation for the period 2015-2020. The GTP-II puts a strong emphasis on structural transformation, industrialization, urbanization, and export promotion. Massive public infrastructure investment has been at the center of the country's economic strategy. Ethiopia was able to achieve a substantial expansion of energy, road, railway, and telecom infrastructure, financed by domestic and external public borrowing. In addition, public investments in basic service provision, such as education and health, have contributed to poverty reduction as did the introduction of rural safety nets. GTP II continues to commit that women and youth benefit from and participate in overall economic, political and decision making processes in Ethiopia.⁸¹

Under GTP I (2010-2015), hydro power projects were constructed to increase the installed generation capacity from 2,000 MW to 10,000 MW. Currently the country has approximately 4,290 MW of installed generation capacity. GTP II (2015-2020) aims to increase generation capacity by more than 10,000 MW to over 17,000 MW. Approximately 90% of the installed generation capacity is from hydropower while the remaining 8% and 1% is from wind and thermal sources respectively. The hydro dominated systems has been severely affected by drought, and the Government of Ethiopia under GTP is now diversifying the generation mix with other sources such as solar, wind and geothermal that will result in a more climate-resilient power system⁸².

6.3.1. Implementation strategy of the energy sector under GTP

The key implementation strategy in GTP-I was capacity building in energy development and management. This would allow the national electricity company to undergo radical reform such that the national institutional capacity to generate power, construct the infrastructure and efficiently and effectively manage the power and infrastructure could show fundamental improvement. Other implementing strategies that were planned to be employed are strengthening organizational implementation, capacity (the electric power company go through a complete restructuring process), increasing development of electric power generation and access to services, strengthening regulation of electricity providers so as to ensure a reliable service, expanding alternative renewable energy

⁸⁰ US Foreign Commercial Service, 'Ethiopia Energy'.

⁸¹ World Bank Group, *Ethiopia Electrification Program (ELEAP) Program-For-Results Information Document (PID) Concept Stage Report No. PIDC0100191*.

⁸² US Foreign Commercial Service, 'Ethiopia Energy'.

production, increasing emergency oil reserves and ensuring protection of natural resources, and enhancing community development⁸³.

In GTP-II, the implementation strategies give priority focus to the generation of sufficient power for both domestic consumption and export. The Universal Electricity Access Program started in GTP-I was continued to be further implemented. In this regard, a decentralized off-grid solar energy supply will be promoted. Since the role of government in the generation, transmission and distribution of electric power is vital, the preparation and implementation of projects that expand energy generation capacity will be given the utmost emphasis. The prevailing power supply interruption problem is planned to be addressed fully by upgrading and expanding power transmission and distribution lines. Efforts will be made to provide the required energy for the development of industrial, agricultural and service sectors so as to position Ethiopia among the lower middle income countries by 2025.

The strategy focuses on increasing the share of the local content in the construction of energy projects to over 50%, intended to enhance the research and innovation capacity required for development and realization of technological improvements. Electricity generation potentials of the country are prioritized in order of importance as follows: i) Hydroelectric power generation, ii) Geothermal energy, iii) Wind Power and iv) Solar energy. In addition to these potentials, biomass energy sources and diesel generators will be used as standby sources of energy. In relation to alternative energy development, one of the major strategic directions concerns enabling the general public to benefit from modern energy by strengthening the capacity of stakeholders including training to actors involved in the value chain of renewable energy supply chain on how to use and maintain the new technology and related technical know how.

The country still relies heavily on bioenergy resources to meet energy demands. However, development of other renewable resources, principally geothermal and wind is now growing rapidly, and these are expected to supply a growing share of the energy demand in the future⁸⁴. The second strategy focuses on expanding this renewable energy sources which are clean and carbon-free including hydropower, wind energy, geothermal energy and solar energy sources to fulfil the energy demand of the country. Focus will be given to generating adequate power to support the rapid economic and social transformation of the country and for export. The generated energy will also be made accessible to rural and urban areas while giving utmost consideration for power saving.

Thermal energy demand in the residential sector (for cooking and baking food) is responsible for 90% of the total energy consumed in Ethiopia. This energy is mostly derived from solid biomass fuels (up to 95%) with the remaining coming from kerosene and electricity. Heavy reliance on solid biomass fuels has led to deforestation and forest degradation, emission of greenhouse gases and health impacts due to emission of air pollutants during cooking⁸⁵. The third strategic direction is to expand improved biomass energy efficient technology and thereby reduce fuel wood consumption,

⁸³ IMF, *The Federal Democratic Republic of Ethiopia : Poverty Reduction Strategy Paper : GTP I*.

⁸⁴ MWIE, 'Federal Demeocratic Republic of Ethiopia: Updated Rapid Assessment and Gap Analysis on Sustainable Energy for All', no. December, 2013.

⁸⁵ MWIE, 'Federal Demeocratic Republic of Ethiopia: Updated Rapid Assessment and Gap Analysis on Sustainable Energy for All'.

reduce deforestation and protect against desertification. These interventions will also reducing health problems resulting from indoor pollution from biomass burning⁸⁶. The fourth strategic focus is to use wind energy for electric light services and wind water pumping technologies in an effort to transform in to labor saving technology as well as increasing resource productivity with ultimate objective of socio-economic development.

With regard to biofuel development, the major focus areas in the plan's period are: collecting and organizing data on biofuel innovations to produce sufficient biofuel for domestic consumption and export through private sector and community participation for increasing the use of biofuel in the transport sector. To this end the plan proposes to coordinate the formulation of guidelines for setting standards for biofuel technology and implementation, conduct a wide range of activities to use the financial resources to be generated by reducing carbon emission, create awareness on the benefits to be generated from biofuel development as well as strengthen monitoring and support activities.

In addition, it is planned to enable the private sector participate in power generating activities and narrow the gap in the areas of technology, finance and project administration by giving focus on identifying possible domestic and international sources of finance and utilize it efficiently and create favorable conditions for the private sector to participate in the energy sector as the policy permits. The implementation strategies also focus on capacity building, technical support and monitoring, providing incentives and support by expanding market and promotion. In the area of expanding the knowledge and information on alternative energy, the strategy also given emphasis on creating network with research institutions and universities to adopt biofuel technologies and to create and expand periodic monitoring and support.⁸⁷

6.3.2. GTP-I Implementation

Performance indicators for the energy sector under GTP-I: In order to support the efforts to accelerate rapid and sustainable growth, it was planned to increase the power generating capacity of the country from 2000MW in 2009/10 to 8000MW by the end of the plan period. In terms of delivery, total electricity generating capacity reached 4,180MW by 2014/15 and the average performance of all power projects stood at 52%. The Grand Ethiopian Renaissance Dam (GERD) (6000 MW), Gilgel Gibe III HEPP (1870 MW) and wind power projects were the projects initiated during GTPI. Fincha Amertinesh hydroelectric power project, Ashegoda and Adama I wind power projects are some of the projects that have become operational during the GTPI period. Besides, among the on-going power projects, the GERD Project and Genale III (254 MW) have been completed 40% and 65%, respectively. On the other hand, problems of service delivery, delay in rehabilitation of old lines, and lengthy institutional reforms are some of the problems observed in the power sector that have been identified as strategic problem and given a priority as part of GTPII.

During GTPI implementation period, the total length of power transmission line increased from 11,440 km in 2009/10 to 16,018 km (against the target of 17,000 KM) in 2014/15. The additional

⁸⁶ M. G. Mengistu, B. Simane, G. Eshete, and T. S. Workneh, 'A review on biogas technology and its contributions to sustainable rural livelihood in Ethiopia', *Renewable and Sustainable Energy Reviews*, Vol. 48, 2015, pp. 306–316.

⁸⁷ FDRE, *Federal Democratic Republic of Ethiopia Growth and Transformation Plan II (GTP II) (2015/16-2019/20)*, National Planning Commission, (Vol. I, no. Gtp II, 2016).

newly constructed transmission line was 4,578 km. During the plan period, 40,929km power distribution lines were constructed (against the target of 132,000Km). Consequently, the total length of power distribution lines has increased from 126,038km in 2009/10 to 166,967 km by 2014/15. As a result, electricity service coverage increased from 41% in 2009/10 to 60% in 2014/15.

Connections to households have not kept pace with the rapid network expansion. GTP-I included clear sector targets, most notably that of doubling the number of household electricity connections from the current 2 million to 4 million connections. However, currently, only 2.4 million customers had been connected in 2014/15⁸⁸.

During the GTP period, 8.875 million biomass stoves were distributed (against the target of 9.415 million), a total of 11,618 biogas plants have been constructed (against target of 26,000 biogas plants) and 2.032million solar technologies have been distributed (against target of 3.16 million).

The volume of petroleum imports has been growing rapidly (8% annually and higher) over the past ten years and has reached 2 million tons (US\$1.1 billion) in 2011 and different energy strategy has been developed to reverse importing with home developed energy⁸⁹.With respect to biofuel land information, it was planned to identify 23 million hectares of land for Biofuel development. Thus, 16.6 million hectares of land is partly planted and being planted with biodiesel seeds such as Jatrofa and caster, etc. Regarding the construction of blending facilities at fuel stations and the supply of biofuel products, eight facilities were planned to be constructed and four facilities (50% of planned) have been constructed.

Ethiopia have produced ethanol from sugarcane byproduct in sugar factories. And starting from 2009, Ethiopia has been blending ethanol with benzene with five percent ethanol content and later with 10 percent. As a result, 77.38 million liter of ethanol was produced and earned 51.8million USD. About 41million USD has been saved as a result of import substitution, through the production of 50.6 million liters of ethanol and blending it with Benzene, the hard currency was used to importing extra Benzene if this practice was not materialized⁹⁰. In table below shows ethanol yearly production trends from the two sugar factories in Ethiopia⁹².

Table 14: Trends of Ethanol production in Ethiopia in liters

Year	Ethanol produced (liters)		
	Fincha sugar factory	Metehara Sugar Factory	Total
1998/99	1,907,000	-	1,907,000
1999/00	720,000	-	720,000
2000/01	1,790,571	-	1,790,571
2001/02	209,444	-	209,444

⁸⁸ World Bank Group, *Ethiopia Electrification Program (ELEAP) Program-For-Results Information Document (PID) Concept Stage Report No. PIDC0100191*.

⁸⁹ MWIE, 'Federal Demeocratic Republic of Ethiopia: Updated Rapid Assessment and Gap Analysis on Sustainable Energy for All'.

⁹⁰ FDRE, *Federal Democratic Republic of Ethiopia Growth and Transformation Plan II (GTP II) (2015/16-2019/20)*, National Planning Commission.

⁹¹ ENA, 'Ethiopia Blends 59.6 Million Liters Ethanol with Benzene in 5 Years, 2015', 2015.

⁹² Kiros Berhane and A, 'BIOETHANOL PRODUCTION FROM WASTE PAPER', no. June, 2016.

2002/03	894,624	-	894,624
2003/04	911,431	-	911,431
2004/05	1,636,047	-	1,636,047
2005/06	6,847,816	-	6,847,816
2006/07	6,066,860	-	6,066,860
2007/08	5,330,337	-	5,330,337
2008/09	5,878,516	-	5,878,516
2009/10	7,116,585	-	7,116,585
2010/11	7,127,895	6,373,775	13,501,670
2011/12	6,794,000	7,658,000	14,452,000
2012/13	7,620,500	7,063,000	14,683,500
2013/14	11,678,000	7,767,000	19,445,000
2014/15	10,999,000	8,806,000	19,805,000

Ethiopian Mineral, Petroleum and Bio-fuel Corporation which is in charge of the activity, is under construction of two of the three additional ethanol production plants along with the new sugar factories and planned to start in 2017 budget year. The factories will help generate ethanol from waste products obtained in the process of producing sugar to be blended with petroleum, the plants would help cut foreign currency spending. Besides, the fuel consumption of Ethiopia is growing from 10-15 percent annually. The new ethanol production plants along with the existing plants installed around Fincha and Metehara sugar factories will reduce benzene import by 10 percent⁹³. Ethiopia has several sugar factories currently under construction which are run and administered by Sugar Development Agency⁹⁴.

6.3.3. GTP-II Plan

The following are the major energy targets in the growth and transformation plan phase two (GTP-II) Ministry of Foreign Affairs of Denmark, *Accelerating Wind Power Generation in Ethiopia, Thematic Program Document*, (no. October, 2016).

- Increase the power generating capacity of the country from 4,180MW in 2014/15 to 17,208MW by 2019/20; of which, 13,817MW is planned to be generated from hydropower, 1224MW from wind power, 300MW from solar power, 577MW from geothermal power, 509MW from reserve fuel (gas turbine), 50MW from wastes, 474MW from ethanol and 257MW from biomass.
- Increase the energy production capacity of the country from 9,515.27GWH in 2014/15 to 63,207GWH by 2019/20.
- Increase electricity coverage from 60% in 2014/15 to 90% in 2019/20.
- Increase the number of consumers from 2.31million in 2014/15 to 6.955million by 2019/20.
- Increase the total length of power transmission lines from 16,018km in 2014/15 to 21,728km by the end of 2019/20; out of which, to increase the high voltage 500kv gridline to 1,240km, the 400kv gridline from 1,397km in 2014/15 to 2,137km by 2019/20, the 230kv/132kv and

⁹³ ENA, 'Ethiopia to Begin Construction of Ethanol Production Plants, 2017', Ethiopian News Agency, 2017.

⁹⁴ Berhane and A, 'BIOETHANOL PRODUCTION FROM WASTE PAPER'.

66kv gridline from 13,383km in 2014/15 to 18,351km by 2019/20. By so doing, the current power interruption and power loss problems will be mitigated significantly.

- Increase per capita energy consumption from 86KWH in 2014/15 to 1,269KWH by the end of 2019/20.
- Reduce power loss from 23% in 2014/15 to 11% by the end of 2019/20 by rehabilitate an aged distribution system with high losses, ensure more efficient operation and maintenance of the expanded system⁹⁵.
- The power companies' institutional capacity will also be enhanced significantly.
- Distribute 11.45 million improved biogas stoves, 31,400 improved biogas technology, 20,000 household biofuel stoves and biofuel blending technologies during GTP II.
- With regard to solar energy technology, it is planned to distribute 3,600,000 solar lanterns, 400,000 household solar PVs, 3600 institutional solar PVs, 500 solar thermals⁹⁶ and 3,600 solar cookers⁹⁷ are also integral parts of the targets to be achieved by 2019/20.
- Distribute 300 wind powered water pumps, develop 135 mini hydropower stations and conduct 33 Research and Development works on alternative energy development.
- Cover 500,327 hectares of land with biofuel plantation and produce 1,375.23 million liters of bioethanol and 450.3million liters of biodiesel. In addition, 5 bioethanol and 16 biodiesel blending facilities are planned to be installed to produce a blend of 64.4million liters bioethanol. Training programs related to biofuel development are planned to be offered to 706 experts engaged in the field.
- As a result, by planting '**Jatrofa**' and consuming ethanol, 49.8 – 65.9 tons of carbon gas and 60 tons of carbon gas per hectare are planned to be reduced, respectively.

The Following tables from table 8-12 outlines in details the GTP II and upcoming GTP III power generation and distribution plan taking 2020 and 2025 as plans year of completion and 2015 as a baseline year for program.

Table 15: GTP - II Hydro Power Upcoming Projects^{98 99}

No.	Project	Installed Capacity	Energy (GWh)	Indicative Cost (MUSD)	Planned Year of Completion
1	Geba I & II	372	1709	572	2020
2	Genale Dawa VI	256	1532	588	2020
3	Werabesa + Halele	422	1973	886	2020
4	Yeda 1 + Yeda 2	280	1089	540	2020
5	Gibe IV	2000	6200	2000	2020
6	Tams	1700	5760	4214	2020
7	Upper Dabus	326	1460	628	2020

⁹⁵ USAID, *Ethiopia Energy Sector Overview*.

⁹⁶ **Solar thermal** is a device for harnessing solar energy to generate thermal energy or electrical energy for use in industry, and in the residential and commercial sectors.

⁹⁷ **Solar cooker** is a device which uses the energy of direct sunlight to heat, cook or pasteurize drink.

⁹⁸ Asnake, 'Ethiopian Energy Sector Investment Opportunities'.

⁹⁹ MWIE, 'Ethiopian power sector: The renewable future'.

8	Wabi Shebele	88	691	1100	2020
9	Karadobi	1600	7857	2576	2021
10	Beko Abo	935	6632	1260	2022
11	Upper Mendaya	1700	8582	2436	2023
12	Birbir River	467	2724	1231	2023
13	Baro 1 + Baro 2 + Genji	859	3524	1794	2024
14	Genale V	100	575	298	2025
	Total	11,105	50,308	20,123	

Table 16: GTP - II Wind Power Upcoming Projects¹⁰⁰¹⁰¹

No.	Project	Installed Capacity (MW)	Energy (GWh)	Indicative Cost (MUSD)	Planned Year of Completion
1	Iteya I	200	613	380	2016
2	Iteya II	200	312	420	2016
3	Dila	100	306	210	2018
4	Iteya III	200	613	380	2017
5	Assela	100	307	190	2018
6	Debire Birihan	100	613	380	2017
7	Ayisha I & II	420	1577	760	2017
8	Sululta	100	306	210	2019
9	Mega Maji	100	306	210	2019
	Total	1,520	4,955	3,140	

Table 17: GTP - II Solar and Geothermal Power Upcoming Projects¹⁰²

No.	Project	Installed Capacity (MW)	Energy (GWh)	Indicative Cost (MUSD)	Planned Year of Completion
1	Solar Power in three Different Sites	100	175	180	2016
2		100	175	180	2016
3		100	175	180	2016
Geothermal Power					
1	Corbetti	1000	7096	4000	2017 - 2022
2	Aluto Langano II	70	552	280	2018
3	Aluto Langano III	100	788	364	2017
4	Tendaho	100	788	364	2016
	Total	1,570	9749	5,548	

¹⁰⁰ Asnake, 'Ethiopian Energy Sector Investment Opportunities'.

¹⁰¹ MWIE, 'Ethiopian power sector: The renewable future'.

¹⁰² Asnake, 'Ethiopian Energy Sector Investment Opportunities'.

Table 18: Alternative Energy Development plan (2015-2020)¹⁰³¹⁰⁴

No	Type, systems	Target 2020 in number
1	Biomass energy	
1.1	Improved fuel saving cook stoves	11.45 million
1.2	Biodiesel stoves, biodiesel processing technologies	20,000
1.3	Biogas	31,400
2	Solar energy	
2.1	Solar home systems	400,000
2.2	Institutional solar systems	3,600
2.3	Solar lanterns	3,600,000
2.4	Solar water heaters	5,000
2.5	Solar cookers	3,600
2.6	Solar mini grids	250
2.7	Solar water pumps	50
2.8	Solar technician training	1,500
3	Wind water pumps	300
4	Micro hydropower systems	105
5	Alternative energy studies	33

Table 19: Summary of Energy sector GTP-II targets on-grid and off-grid (2016-2020)¹⁰⁵

Indicator	Unit	Baseline (2015)	GTP-II (by 2020)
Electricity service coverage (towns/villages)	Percent	60	90
Installed power generating capacity	MW	4,180	17,347
Length of power transmission system	Km	16,018	21,728
Number of customers connected to grid power	Number	2,310,000	6,955,000
Annual per capita electricity consumption	kWh	86	1,269
Improved cook stoves and biogas plants	Number	8.9 million stoves and 11,618 biogas plants	11.45 million (including 31,400 improved biogas, 20,000 households biofuel stoves)
Solar lanterns	Number	2 million	3.6 million
Household solar systems	Number	40,000	400,000

¹⁰³ MWIE, 'Ethiopian power sector: The renewable future'.

¹⁰⁴ MWIE, 'Rural Electrification in Ethiopia'.

¹⁰⁵ World Bank Group, *Ethiopia Electrification Program (ELEAP) Program-For-Results Information Document (PID) Concept Stage Report No. PIDC0100191*.

7. Conclusion and Way Forward

Ethiopia is endowed with vast renewable energy potential in hydro, solar, wind, and geothermal power and investing significantly in energy infrastructure over the past decade using public-financed and public-executed approaches. The energy generation capacity (mostly hydropower) has already reached 4,256 megawatts (MW) and it is one of the world's cleanest energy producers with 97 percent of its energy generated through hydropower.

Ethiopia has also improved energy coverage through the grid, which is high with 60 percent of towns and villages covered. However, the sector has the second highest energy deficit, in terms of household connections, in SSA with an on-grid access rate of 15 percent and an off-grid access rate of 10 percent. Limited access to reliable energy hinders firm performance and growth and in efforts of electrifying millions of remote households as well as energy access to the ever grown industries that starts to be followed the industrialization policy remains challenge.

Structural reforms should be continued as a focus point to ensure the long-term technical and financial sustainability of the sector, Ethiopia need to materialize the planed private sector participation in the power generation segment (as independent power producers (IPPs)) and to bring on board private sector capital and sustainable financing structures, augment technical know-how, and to help improve the implementation speed of the energy sector.

Acronyms

ACEC	African Clean Energy Corridor
AFDB	African Development Bank
AFREA	African Renewable Energy Access Program
AFREC	AUC Africa Energy Commission
CDKN	Climate and Development Knowledge Network
COOP	Cooperazione Internazionale
Cop21	United Nations Climate Change Conference
CREG	Climate Resilient Green Economy Strategy
DFID	Department For International Development
EAPP	Eastern Africa Power Pool
EC	European Commission
ECOWAS	Economic Commission For West African States
ECREEE	Renewable Energy And Energy Efficiency
EEA	Ethiopian Energy Authority
EEPCo	Ethiopian Electric Power Corporation
EEU	Ethiopian Electric Utility
EIB	European Investment Bank
EPI	European Photovoltaic Industry
EPP	Energy Power Partners
EREDPC	Ethiopia Rural Energy Development And Promotion Centre
ESMAP	Energy Sector Management Assistance Program
FSS	Fuel Saving Stoves
GEF	Global Environmental Facility
GERD	Grand Ethiopian Renaissance Dam
GHG	Green House Gas
GMG	Green Mini-Grids Africa Facility
GoE	Government Of Ethiopia
GPI	Global Procurement Initiatives
GTP	Growth And Transformation Plan
HDVC	High-Voltage, Direct Current
HEPP	African Institute for Economic Development and Planning
HoA	Horn Of Africa
HoA-REC & N	Horn Of Africa Regional Environment Center And Network
IFC	International Financial Corporations
IPP	Independent Power Producers
IRENA	International Renewable Energy Agency
KfW	Kreditanstalt Fuer Wiederaufbau
MoFEC	Ministry Of Finance And Economic Cooperation
MoWIE	Ministry Of Water, Irrigation And Energy (MOWIE)
NEPAD	African Union's New Partnership For Africa's Development
NORAD	Norwegian Agency For Development Cooperation (NORAD)
NPCA	NEPAD Policy And Coordinating Agency

PPA	Power Purchase Agreement
Pv	Solar Photovoltaic
RE	Renewable Energy
REB	Rural Electrification Board
REC	Renewable Energy Certificates
REES	Rural Electrification Executive Secretariat
REF	Rural Electrification Fund
RES4MED	Renewable energy solution for the Mediterranean
RVO	Netherlands Enterprise Agency
SDG	Sustainable Development Goal
SE4ALL	Sustainable Energy For All
SNV	Netherlands Development Organization
TWH	Terawatt-hour
UNDP	United Nation Development Program
USAID	U.S. Agency For International Development (USAID),
USTDA	U.S. Trade And Development Agency
WB	World Bank

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Annex 1 - Wind Farm Site Selected in Ethiopia¹⁰⁶

Table 20: Wind Farm Site Selected in Ethiopia

Name of site	Capacity (MW)	Area (km ²)	Grading in preliminary selection	Region
Diche Oto wind farm	50	100	78	Afar
Ch'ach'a wind farm	100	56	86	Amhara
Gondar West wind farm	50	49	82	Amhara
Debre Markos East wind farm	200	143	87	Amhara
Gondar North wind farm	100	65	80	Amhara
Bahir Dar wind farm	50	80	82	Amhara
Dangla wind farm	200	170	67	Amhara
Dabat wind farm	100	61	56	Amhara
Phase I wind farm in Weldiya	100	43	70	Amhara
Dire Dawa wind farm	50	40	91	Dire
Nazret wind farm	300	254	100	Oromiya
Sheno wind farm	100	56	88	Oromiya
Phase I wind farm in Iteya	100	66	95	Oromiya
Sulalta wind farm	100	60	92	Oromiya
Sendafa North wind farm	100	70	88	Oromiya
Sendafa South wind farm	100	70	88	Oromiya
Phase II wind farm in Iteya	100	70	95	Oromiya
Phase I wind farm in Bolo	100	60	90	Oromiya
Assela wind farm	50	71	93	Oromiya
Phase II wind farm in Bolo	500	300	90	Oromiya
Hula wind farm	300	220	64	Oromiya
Debre Markos West wind farm	200	150	87	Oromiya
Ambo wind farm	200	130	72	Oromiya
Babile wind farm	200	130	56	Oromiya
Imdibir wind farm	50	47	90	SNNP
Dilla East wind farm	300	268	96	SNNP
Soddo wind farm	200	160	84	SNNP
Bu'i East wind farm	100	80	83	SNNP
Jacho wind farm	600	330	73	SNNP
Dilla West wind farm	300	230	96	SNNP
Aysha wind farm	100	60	83	Somali
Mek'ele South wind farm	100	77	85	Tigray
Mek'ele North wind farm	200	185	85	Tigray

¹⁰⁶ Derbew, 'Ethiopia's Renewable Energy Power Potential and Development Opportunities'.

Annex 2 - Africa Electric Interconnection Map¹⁰⁷

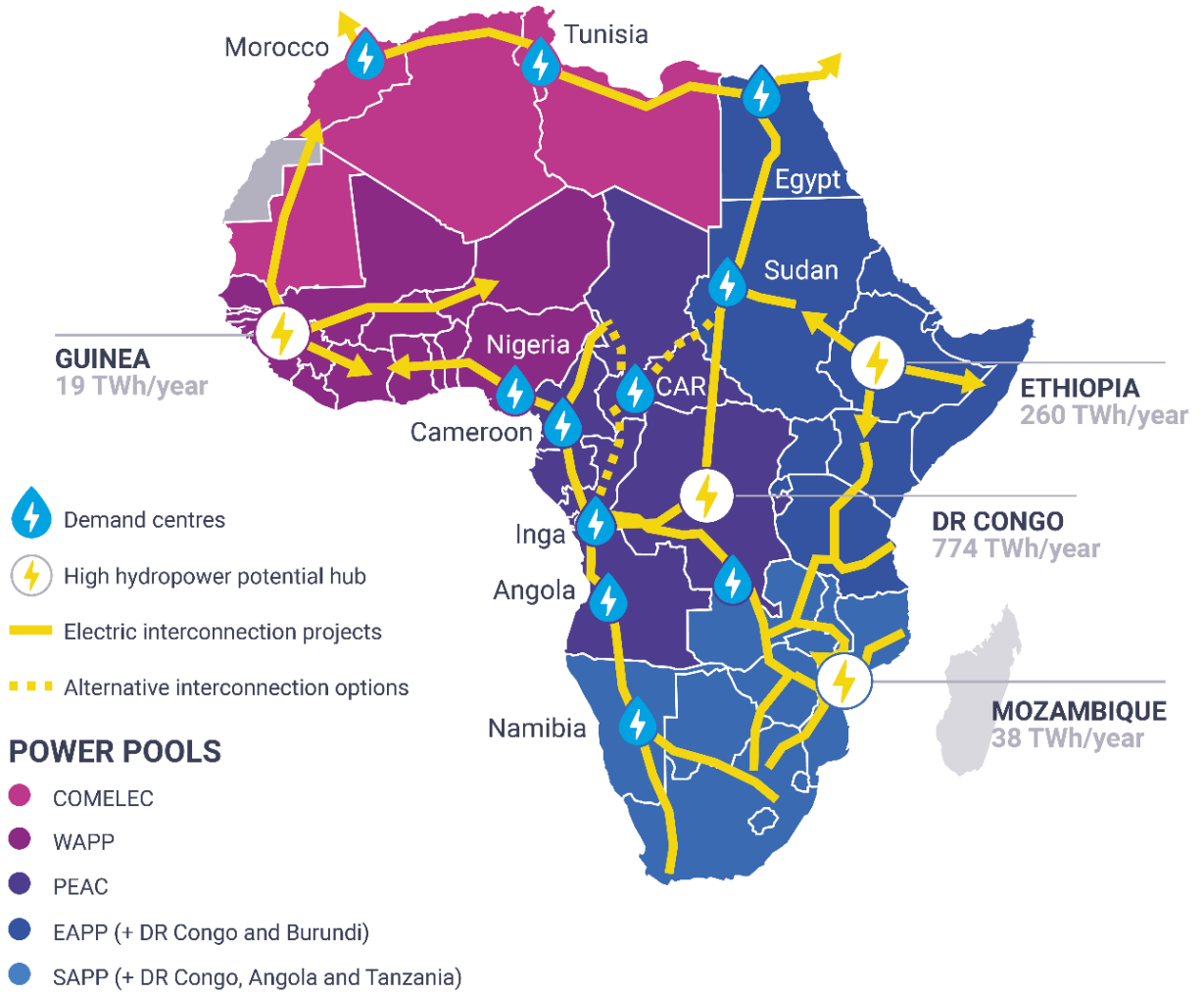


Figure 3: Africa Electric Interconnection Map

¹⁰⁷ IHA, *Better hydro in an interconnected world: International Hydropower Association.*

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