

India-Ethiopia : Prospects of Energy Cooperation



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Abstract - Life cannot exist without energy. Every movement needs energy. The modern civilization depends on use of energy effectively. It plays an important role in socio-cultural and economic development. So there is a global search and cooperation of energy. In this process, India-Ethiopia energy cooperation is an important issue in recent time. Ethiopia has huge amount of water, wind, solar and geothermal energy potentials. However, regardless of its enormous potentials the energy system is very much dependent on conventional fossil fuels and biomass. Only about 32% of the Ethiopian population has access to electricity. The rural people access only 8 present electricity. The Government of Ethiopia, under its latest Growth and Transformation Plan (GTP) envisions transitioning from a developing country to a middle income country by 2025. Ethiopia's ability to achieve this ambitious goal in such key sectors such as agriculture and industry is significantly constrained by current challenges in the energy sector. Therefore, there is huge demand of energy in these areas. India has expertise in Hydroelectricity, Geothermal, wind and solar energy. Several Indian companies gave the satisfactory performance in this field. Indian companies can cooperate to Ethiopia by sharing its experiences and providing technology in energy sector. So that Ethiopia can achieve its goal of 2025. India and Ethiopia having a good Cultural and Political relations for a long time. These countries can take the benefit of their good relations in energy sector. So there are large prospects of Indian energy cooperation in Ethiopia.

Keywords - Energy, metabolism, Civilization, Conventional Biomass, Pico-hydropower.

Introduction

Life cannot survive without energy. Life is made up of cells. Every cell creates energy to survive. Almost all the animals and plants require energy for their metabolism, breathing and movements. Each and every movement needs energy. Energy is the backbone of civilization. The modern civilization is completely depending on use of energy. It plays an important role in socio-cultural and economic development. So there is a global search and cooperation in the field of energy. In this process

India-Ethiopia energy co-operation is an important concern in contemporary world. By 2025, the Ethiopian government, with the adoption of the latest growth and transformation plan (GTP), had developed a vision to transform itself to a middle income country from a developing country. The constraints in the energy sector had proved to be a hindrance in the achievement of the goals in the agricultural and energy sector. Therefore, there is huge demand of energy in these areas. To fulfill the Ethiopian energy demand, India can provide a helping hand in this area. India has expertise and

experience in the harness of Hydroelectricity, Geothermal, wind and solar energy. Several Indian companies have given a satisfactory performance in this field. Indian companies can cooperate with Ethiopia by sharing its experiences and by providing technology useful in energy sector. This can help Ethiopia achieve its goal by 2025.

Ethiopian Energy profile

The second most populous country in Africa is Ethiopia. It is considered among the group of the least developed countries on the planet. The level of populace living underneath poverty line is almost 34%. In terms of access to modern energy, it has the lowest rates. Ethiopia has huge potential in the areas of solar, wind and water energy. There is huge dependence of Ethiopia on the conventional biomass and fossil fuel, apart from having huge energy potentials. The percentage of population having access to electricity is 32%. The population living in the rural areas had access to 8 % electricity. Bio-mass forms the main source of energy in Ethiopia. Waste and biomass constitute the main sources of energy in Ethiopia. It is followed by hydropower (1.6%), and oil (5.7%). The energy consumption in Ethiopia is around 40,000 G GWH. Domestic appliances constitute 92%, transport 4% and industry 3%. Bio energy covers bulk of energy supply in the Ethiopia.

Ethiopia has the potential to be capable in renewable sources of energy. Such sources include solar, geothermal, wind and hydro energies. But the fact is that a very small portion of the energy is actually utilized. There is a tremendous increase in demand in energy due to fast economic growth in Ethiopia. The energy demand is expected to rise to 10-14% every year till 2037.

Hydropower

The potential of Ethiopian hydropower is estimated to be 45,000 MW. After Congo, it occupies the second highest place in Africa. Fortunately, the terrain in

Ethiopia is well suited for the hydropower projects. There are mainly ten river basins—there are international rivers like Wabi Shebelle, Ganale – Dawa, Omo and Blue Nile. There are many other streams, which descend from the mountains. There is an adequate catchment area, which had sufficient rainfall. It is for the same reason that Ethiopia is considered “Water Tower of Eastern Africa”. It won't be an overestimate if it is said that Blue Nile contributes 86% of all the water contributed by Ethiopia. The study which was conducted by Ministry of Water Resources (MoWR) shows that there is water flow of 122 billion cubic meters from the major river basin in Ethiopia. Notwithstanding the mountains and encompassing scene in the western and southern regions of Ethiopia, there are many hydro resources, which are fit to generate hydro-electric power of different capacities, which range from very small to large hydro-electricity plants. In the remote areas, the small scale hydro resources are more suitable for the rural areas. They are additionally not associated with the national lattice. The potential for such plans is 100 MW hydropower. There is distribution of Ethiopian hydro-resources on the land mass. The topographic conditions and the amount of rainfall are most suited for the generation of electricity. There is variation in the rainfall in the country. The western and southern region gets adequate rainfall and the northern and central region gets moderate rainfall. The immediate neighbors are to receive an important contribution from Ethiopia. Countries like Kenya, Somalia, Eritrea, Sudan and Djibouti can be potential consumers for the hydro-electric power to be produced in Ethiopia. These countries are in dire need for power (electricity) to boost their economies. Ethiopian Electric Power Cooperation (EEPCO), since 2007, had been already involved in the project of transporting hydro-electric power to the country of Djibouti and Sudan. The cost involved in generating hydropower potential is extremely low. The expense of hydro establishment in Ethiopia is around US\$1200 per introduced kw, which is

generally a large portion of the expense brought about for different plants being worked in eastern Africa. The meaning of hydropower in Ethiopia is unique in relation to other. Ethiopian Electric Power Cooperation (EEPCo) and the (PHP) pico hydropower operate with the capacity of 3KW. Its main feature is that there is no distribution of grid, and the supply is restricted to only few households.

However, the range of supply of pico-hydropower can only be increased to 10KW, which is understandable, as most commonly used Injera cookers has the capacity of 5 kW. One Injera cooker can supply power to the two households, it can fully consume the power supply and hence, they do not require any distribution network. While classifying small scale schemes of micro-hydropower between the ranges of 11-500 KW, there is an enough reason to make a distinction between low ranges, individual villages which do not have a capacity of high voltage transmission in the range of 31-500 KW for the high voltage supply of several villages. They are connected by low voltage (LV) distribution grid and HV lines.

For the development of MHP, the largest area of catchment is 1000km², since the majority of the schemes of micro-hydropower are classified with 500kW. Deducting the catchment area larger than 1000km² from the 315,000 km², and ignoring the respective moisture plus and the perennial flows, a fit area of 200000 km² is considered good for the MHP development. As noted above, the theoretical MHP potential of Ethiopia is 100 MW. In the western part of the country are concentrated the most suitable harnessing sites with consistent flow of the current and adequate topographic condition.

If we consider the same criterion for the development of PHP, the lease area which must be considered for harnessing is 15 KM². However, in all actuality this specific size of zone is commonly not accessible to the solitary farmers. The PHP potential is fairly confined, and encourages just barely any

plants in the zones which had extremely meager populace. In addition to the hydropower schemes of EEPCO, the utilization of small scale hydropower had been done. During the interval of 1950 to 1970, there had been installation of several MHP schemes by EEPCO. They have the capacity of 1.5 MW. But all of them do not operate. The MHP plants were shut down, once they were connected to ICS. However, there plants which are still operational and they can be easily relocated and rehabilitated. The Yaye plant is going to be rehabilitated by GIZ Energising Development (EnDev) Ethiopia, and utilise the power which is generated into the national matrix, when the plan gets dynamic and operational.

Further, there had been implementation of four new MHP sites, the turbines which are cross flow in the zone of Sidama/SNNR within the operational limit of 7 kW (Gobecho I), 30 kW, 55 kW (Hagara Sodicha), 33 kW (Erete) separately, and a progressed watermill in Jim Yma Zone/Oromia (Leku) into 20 kW MHP, and furthermore 10 kW MHP plant in Kersa.

In addition to it, many micro-hydro schemes, consisting of 32 cross flow of turbines, which have power flour mills with output ranging between 5 and 22kW. Ethiopian Evangelical Church Mekane Yesus (EECMY) commissioned all the changes mentioned above. However, due to some technical problems and lack of dry season, and lack of management, 35-40% of the plants do not function any more. The REF and EECMY have considered more MHP plants such as 55kW scheme to be installed on the Bege River and 5.5 kW scheme on Sire. A NGO, running in Ethiopia, called Ethiopian Rural Self-Help Association (ERSHA), in 1994, introduced another hydro-fueled grain factory close to Ambo, which is currently pronounced operational. Notwithstanding it, the establishment of 65 MHP is remembered for the current GTP (2010-2015).

Solar Power

The sun oriented energy potential in the Ethiopia is incredible. As indicated by occasional and provincial variety it gets a sun oriented radiation of 5000-7000 kWh/m². The sun based radiation which is gotten on a normal premise is 5.2 kWh/m²/day. There is an occasional variety, which ranges from 4.55-5.55 kWh/m²/day. In the extreme western area it is 4.25 kWh/m²/day to 6.25 kWh/m²/day in the Adigrat region. The Northern Ethiopia is still a long ways behind. Till now, the utilization of Photovoltaic (PV), to meet the off-matrix control, was kept to those ventures which were financed by benefactors. The undertakings dependent on PV based innovations (separation – training radios and antibody coolers) had been used by UN associations, for example, UNICEF and WHO, in provincial zones. Notwithstanding it, Italian government had helped Government of Ethiopia (GoE) actually and monetarily in the foundation of PV-based joint venture in the rustic zones. Most extreme PV sun oriented energy is utilized by Ethiopian telecom. It has widely used PV sunlight based to supply capacity to telecom establishment in provincial regions, which had developed numerous folds as of late. In 2007, twelve of PV vendors existed in the capital. However, there exists an introduced limit of around 5 MW, and an estimated PV showcase capability of 52 MW, with the pervasiveness of sun based home framework (SHS) advertise, there had been a huge extension of media transmission segment, even 10% of existing potential had not been abused. The cost which is acquired for SHS is high, which can be decreased by roping in more clients. In the coming days, framework associated and enormous sun oriented energy frameworks with start competing with little scale hydropower frameworks. Notwithstanding the PV SHS, the market for sunlight based water warming (SWH) additionally exists; it uses sun powered radiation to warm water which can definitely lessen use wood and utilization of power. In Ethiopia, there is a significant potential for Solar

thermal. Be that as it may, lately, when contrasted with PV, SWH application is becoming quicker in Addis Ababa. There exist both imported and privately produced variations of SWH in the market. As of late, the modest Chinese models are probably going to drive different models out of the market.

Wind Energy

There exists a brilliant wind asset in Ethiopia whose speeds differ from 7 to 10 m/s. The capability of wind speed in Ethiopia is 10,000 MW. In 1971, the wind data began to be collected by Ethiopian National Meteorological Services Agency (NMSA). As many as 39 recording stations were used for in the some selected locations. Once, these stations were established, a regular recording of the data relate to the wind velocity were measured and made available to the consumers. However, a lot of effort needs to be done as far as the generation and distribution of quality of data is to be produced. There is a large potential for wind energy in Ethiopia. There is large variation in the wind energy, due to the variation in the terrains. There exists an area of high wind velocity in the eastern half of the country. The speed varies up to 10 m/s across eastern and western areas of the Rift Valley.

There is a considerable variation in the wind velocity on daily basis. Generally speaking, the velocity of the wind is higher between the periods of early morning and mid-day. In the hilly zones, there exist two pinnacles seasons – March to May and September to November; in the eastern marshes, the breeze speed arrives at its most extreme among May and August. In larger part of the zones, most extreme breeze speeds are 3-4 times more noteworthy than the base. A high wind of 6 m/s and medium speed of 3.5 speeds blows in the vast majority of the Eastern parts and focal Rift Valley zones of the nation. By 2015, Ethiopian Electricity control collaboration (EEPCo), have plans to create 7 breeze locales, which would have the limit somewhere in the range of 50 and 300

MW. In sum, the total capacity would be would be around 720MW. Wind vitality is viewed as best substitute for hydropower. The two sources unfurl their potential in the cyclic way, in the blustery season, the hydropower potential is high and there is low wind potential, conversely, hydro-potential is low and wind potential is high in the dry season. Condition is affected by wind powered plants.

Geothermal Energy

One of the significant wellsprings of energy in Ethiopia is geothermal assets. Such an asset is evaluated to be 5 GW, in which 700 MW are fit for production of power. The area of geothermal assets is in the Rift Valley region, there exists a temperature scope of 50-300 degree Celsius, and such an area wins in the profundity of 1300 – 2500 m. The single geo-warm plant of limit 7.3 MW have been charged up until this point, which started in 1998/1999, yet was shut because of the upkeep issue in 2002. It was made operational once more, yet with a much diminished rate. The geothermal assets are still in use simultaneously.

Fossil Fuels

Ethiopia is characterized under oil creating nation so far. In any case, the investigations led (with respect to prospect and investigation) since 1960s have shown that there are oil and gas that can be found and used at business levels.

There is a hold of 70 billion cubic meter petroleum gas and a few hundred million tons of coal and oil. Some presumed worldwide oil organizations are utilized here to complete non-renewable energy source studies, investigation and prospecting. In view of such investigations, up until this point, the eastern marshes of Ogaden desert, has the most extreme capability of petroleum gas and oil in Ethiopia. These incorporate the Hilala oil fields and Kalub gas fields.

Actually, the framework and formative works are in progress in numerous pieces of the fields. Subsequently, since a long time ago there was a conception about taking best utilization of its petroleum derivative in Ethiopia will be acknowledged, and become reality very soon.

In the Gambella district of the Western piece of the nation, the potential for petroleum product is viewed as very important. The Gambella locale not at all like Ogaden area, where investigation started 4 decades sooner, is the latest site to be distinguished as the potential site for non-renewable energy source.

It is likewise to be examined in subtleties. The official variant of the administration and that of the privately owned businesses working here is that, wells that have been uncovered so far have ended up being dry.

In spite of some political unsettling influence that continues in the territory, the investigation work has continued in the territories near the Sudanese outskirts.

Indian Energy Cooperation in African

India cooperating African in the field of energy in various ways. India provides technological support; 3.2 billion has been given for establishing solar panel production unit outside Maputo in Mozambique. In Ethiopia 12 engineers provide support and training in Electrical power.

Ethiopia has numerous renewable energy potential but it has no capacity to generate energy using these resources due to lacking of technology capacity. India has expertise and experience to generate Hydroelectricity, Geothermal, wind and solar energy. Several Indian companies gave satisfactory performance in this field. So Indian companies can cooperate with Ethiopia by sharing its experiences and providing technology in energy sector. So that Ethiopia can achieve its goal.

Therefore there is possibility of energycooperation between India and Ethiopia.

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