Implementation of Hybrid Power Generation System

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ABSTRACT

Nowadays the one element Electricity has become the chief necessity for us. It is not feasible to perform the daily routine domestic task and industrial operation without Electricity. Parallel to the requirement of it, there are also several hurdles during production of it. Although several researcher put their effort to solve issues but still there are some issues. These issues are Lack of clean, reliable energy sources, intraday load and need. Along with these issues there are some hurdles are also such as no access to electricity, Pollution from thermal power plants, Poor pipeline connectivity & infrastructure, inadequate last mile connectivity, Average transmission, distribution & consumer-level losses etc. In existing works the SOLAR PV –WIND Hybrid power generation system review has been applied. It is capable to assist the procedure of generating clean energy. Along with this, there are some challenges of tradition work. These challenges are not 24 hours availability of solar energy. In winter the solar production is not capable to provide the energy. Considering the limitation of exiting work proposed work is integration of hydro electricity power, solar system, Nuclear power and wind energy.

Keywords: *Solar power, Wind Energy, Hydraulic power, Nuclear power*

1. INTRODUCTION

Electricity is considered as usually generated at a power station. It is done by electromechanical generators. That has been primarily driven by heat engines fuelled by combustion as well as nuclear fission. Different energy sources include solar photovoltaics & geothermal power. Electricity generation is known as process of generating electric power from sources of primary energy. It has been first stage in delivery of electricity to users for electric utilities in electric power industry. After those stages such as transmission, distribution, energy storage & recovery, using pumped-storage methods take place.

1.1 Heat (Thermal) Energy

Thermal energy is energy possessed by an object or system due to movement of particles within object or system. Thermal energy is one of various types of energy, where energy could be defined as 'the ability to do work.' Work is movement of an object due to an applied force. A system is simply a collection of objects within some boundary. Therefore, thermal energy could be described as ability of something to do work due to movement of its particles.

1.2 Wind Energy

Wind power is use of air flow through wind turbines to mechanically power generators for electric power. Wind power is considered as alternative to burning fossil fuels. It is plentiful as well as renewable. It has been widely distributed. It is clean and produces no greenhouse gas emissions at the time of operation. It needs no water and it occupies little land. Its effects on environment are less than those of non renewable power sources.

1.3 Hydroelectricity

Hydroelectricity would be traditional technique of generated electricity. Jack Caveman stuck some research leaves on a pole & put it in a moving stream. Water would turn pole that compressed speck to make their lovely low fat primitive bran muffins. People have used moving water to help them in their work throughout history, & modern people make great use of moving water to produce electricity.

1.4 Hydro electric power generation

The process of power generation from hydro electric power generation system has been mention in following figure. The flow of water flow from Dams, tidal barrage, wave power is redirected to water valve. Then it is passed through water turbine and produces AC power with help of synchronous generator.

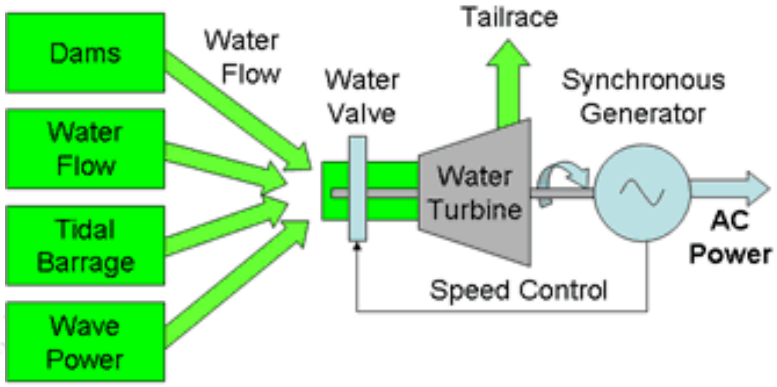

Fig 1.1 Hydro Electric power generations

The utility electricity sector in India has National Grid with installed capacity of three hundred thirty Giga Watt on 31 January 2018. Renewable power plants have thirty two percent of total installed capacity. Gross electricity produced by utilities in India has been 1236.39 TWh. Total electricity generation in country has been 1433.4 TWh during fiscal year 2016-17. The gross electricity consumption has been found 1,122 kWh per capita in year 2016-17. Electric energy consumption in agriculture was recorded highest in 2015-16 among all countries. India is known as world's third largest producer. It is fourth largest consumer of electricity. On March 29, 2017 Central Electricity Authority explored that for first time India has become net exporter of electricity. India has exported 5798 GWh to neighbouring countries. It has imported of 5585 GWh.

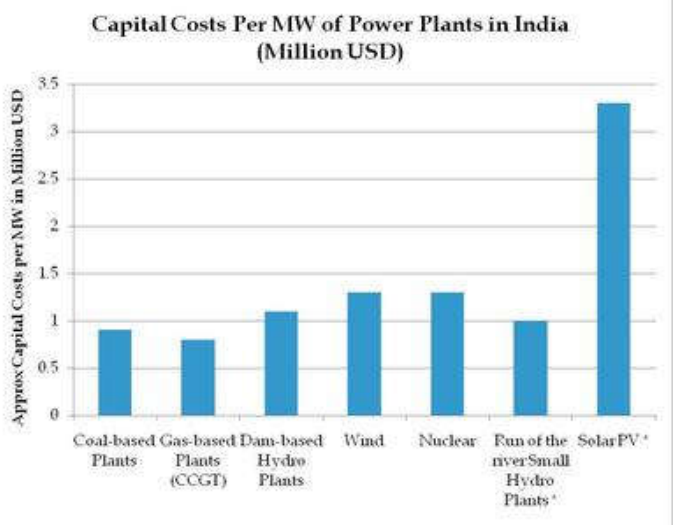

Fig 1.2 Electricity production in India

2. OBJECTIVE RESEARCH

There are several objective of this research which have been mention below:

i) To provide more reliable system for electric power
ii) Remove the dependency on wind pressure and intensity of sun using features of hydropower and nuclear power.
iii) To enhance the availability of power supply
iv) To facilitate the remote application: satellites, rural hospital equipment, telecommunication equipments etc.
v) To reduce the loss of electricity
vi) To reduces water consumption in electrical processes.

3. PROPOSED WORK

Considering the limitation of exiting work he have proposed new work in which the integration of hydro electricity power, solar system, Nuclear power and wind energy would be made. It would increase the reliability and consistency of electricity production. According to proposed model there is no need to depend only on wind and sun. Proposed model would be capable to produce electricity in absence of wind and sun. However there are several benefits as well as limitations of hydro electric power generation system.

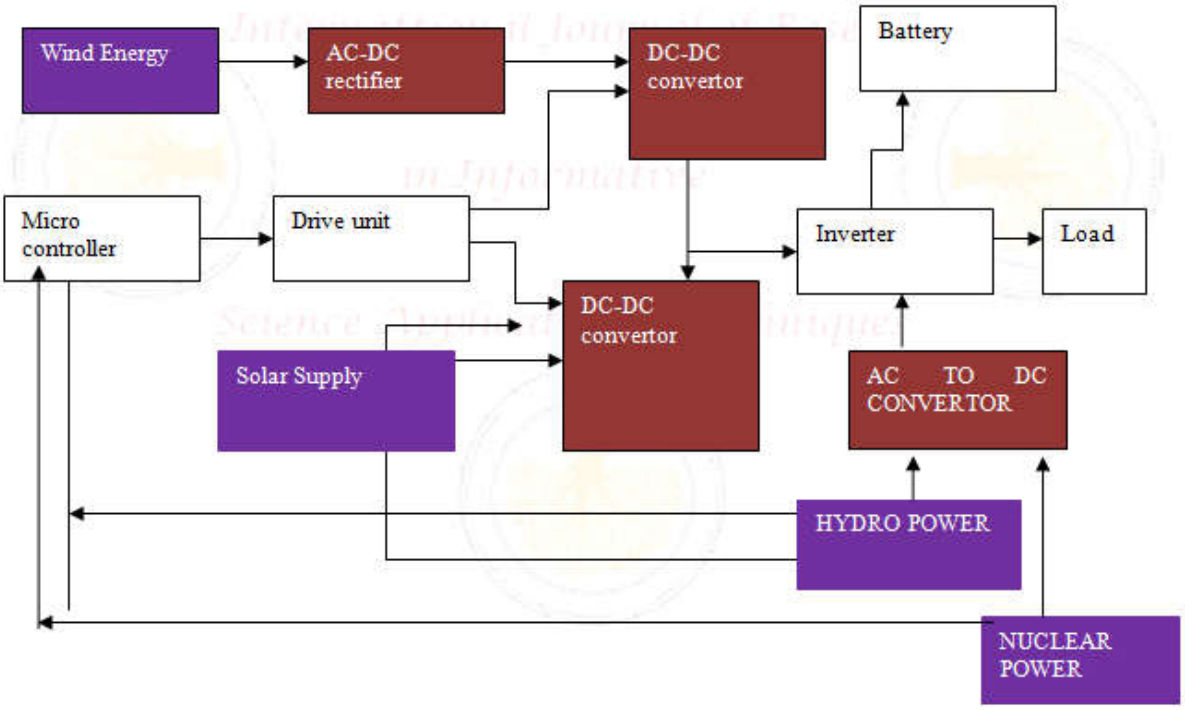

Fig 3.1 Proposed Models

Benefits of proposed model: The proposed model is more reliable as compare to traditional model. Proposed model is not dependent on wind pressure and intensity of sun only. This system is having features of hydropower and nuclear power. It would provide benefit of tradition system as well as it would enhance the availability of power supply. Proposed system would capable to generate more electricity as compare to traditional system. Failure of one sub unit would not influence the overall productivity.

4. RESULTS AND ANALYSIS

4.1 Hydraulic simulation: In this section the simulation of hydraulic power system has been made considering factors such as HEAD, FLOW, Weight of water, Power coefficient. The following form has been made in MATLAB to simulate power production by hydraulic system in different circumstances.

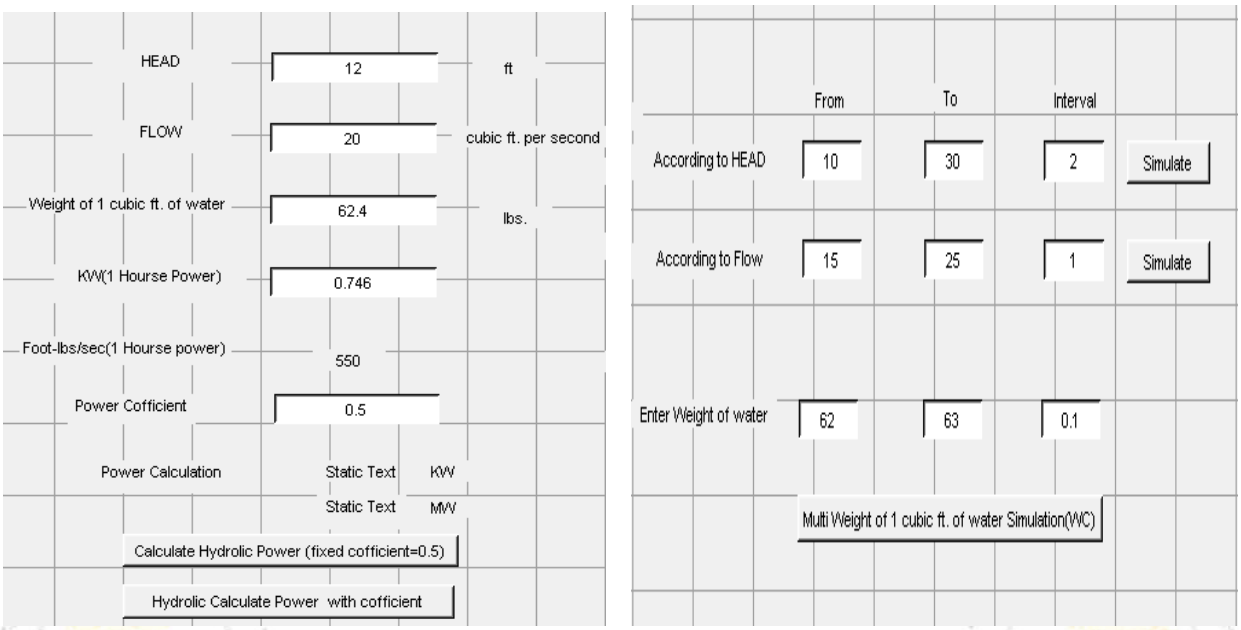

Fig 4.1 Hydraulic power simulation system

4.2 Different cases for Hydraulic simulation

Case 1: The simulation is made on Head of 10 feet to 30 feet with interval of 2. All other variable such as water weight and flow are constant.

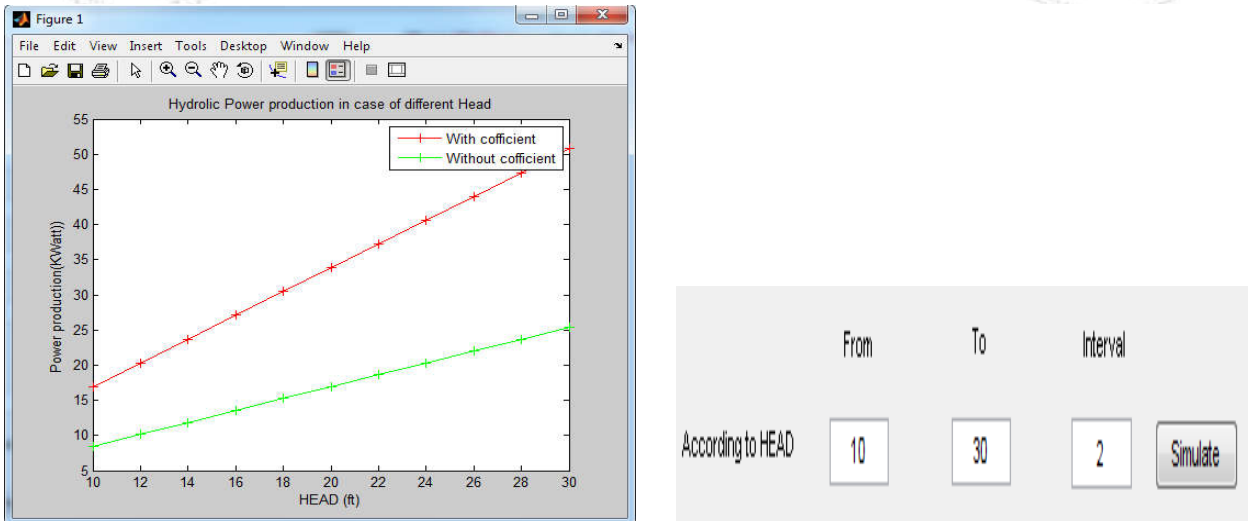

Fig 4.2 Hydraulic power simulation in case of Head from 10 to 30 feet

Case 2: The simulation is made on Head of 10 feet to 40 feet with interval of 5. All other variable such as water weight and flow are constant.

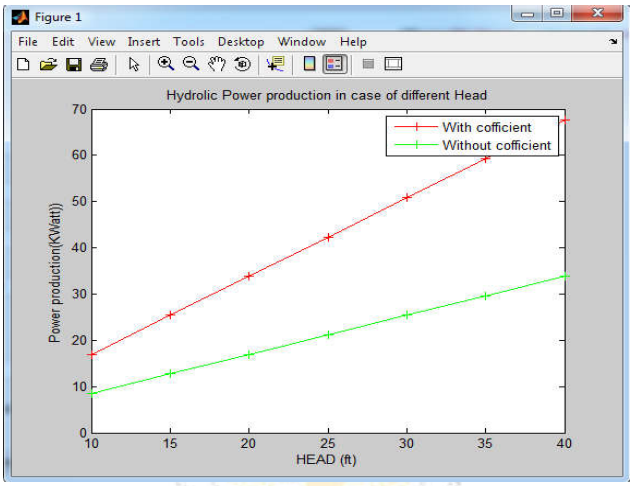

Fig 4.3 Hydraulic power simulation in case of Head from 10 to 40 feet

Case 3: The simulation is made on flow of 15 to 25cubic feet per second with interval of 2. All other variable such as water weight and Head are constant.

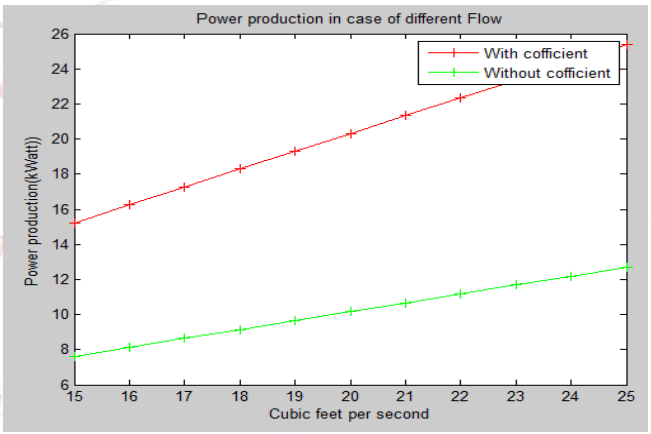

Fig 4.4 Hydraulic power simulation in case of flow of 15 to 25cubic feet per second with interval of 2

Case 4: The simulation is made on flow of 18 to 20cubic feet per second with interval of 0.5. All other variable such as water weight and Head are constant.

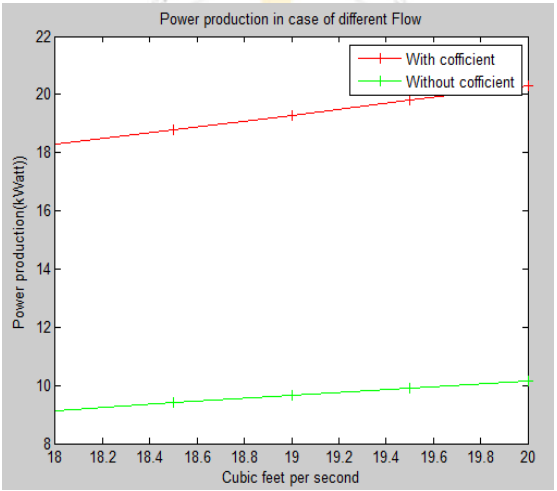

Fig 4.5 Hydraulic power simulation in case of flow of 18 to 20cubic feet per second with interval of 0.5

Case 5: The simulation is made on weight of water from 62 to 63lbs with interval of 0.1. All other variable such as Head and flow are constant.

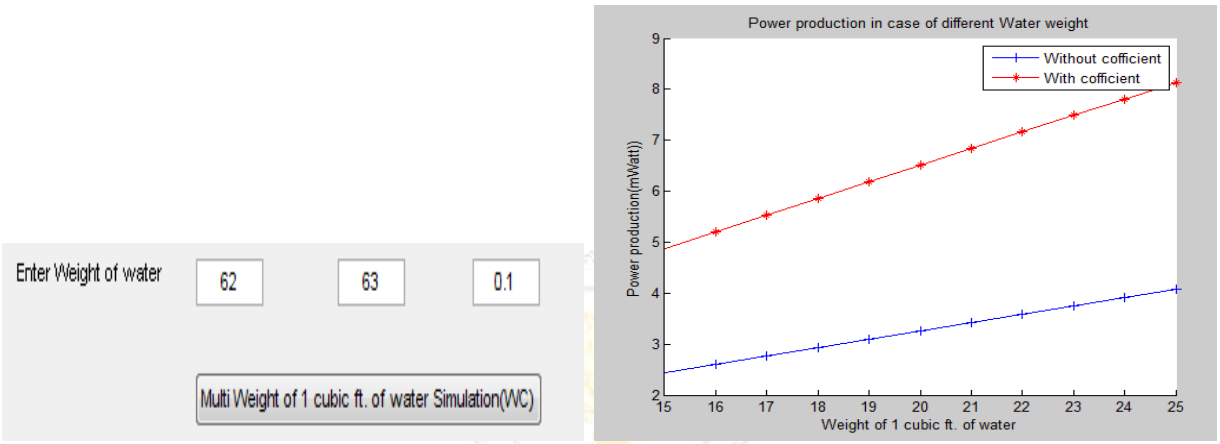

Fig 4.6 Hydraulic power simulation in case of weight of water from 62 to 63lbs with interval of 0.1

Case 6: The simulation is made on weight of water from 62 to 64lbs with interval of 0.2. All other variable such as headed flow are constant.

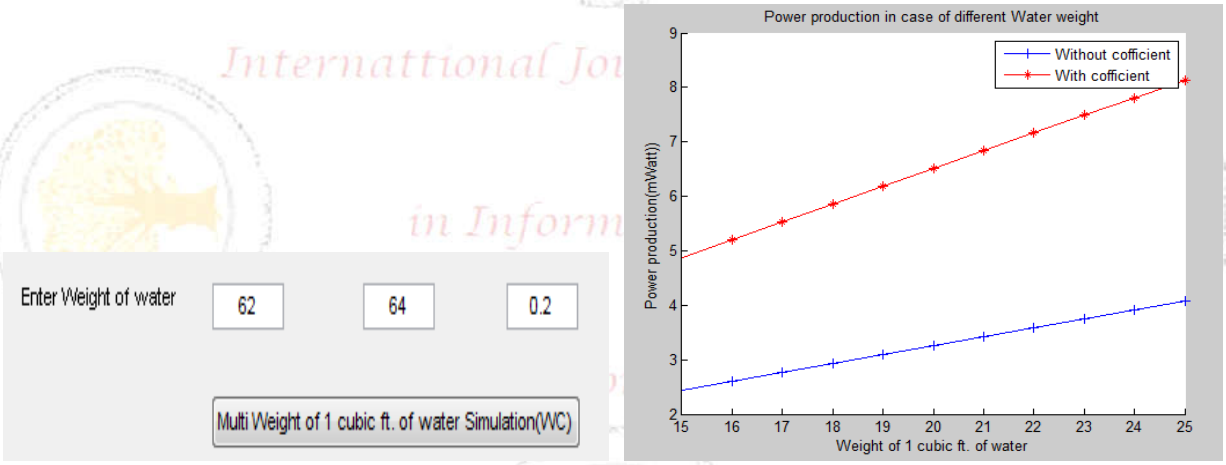

Fig 4.7 Hydraulic power simulation in case of weight of water from 62 to 64lbs with interval of 0.2

4.3 Wind power simulation

In our research we made the power calculation according to blade length, wind speed, Air Density and power coefficient. We developed a simulator in MATLAB to calculate power calculated in case of different blade length at different wind speed.

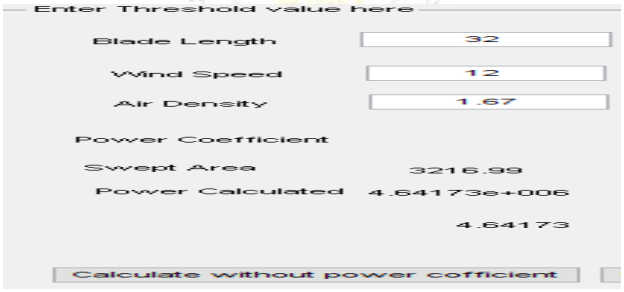

Fig 4.8 Wind power simulation

4.4 Solar power calculation

Calculation of the annual solar energy output of a photovoltaic system depends on solar panel area, solar panel yield, annual average solar radiation on tilted panels and performance ration.

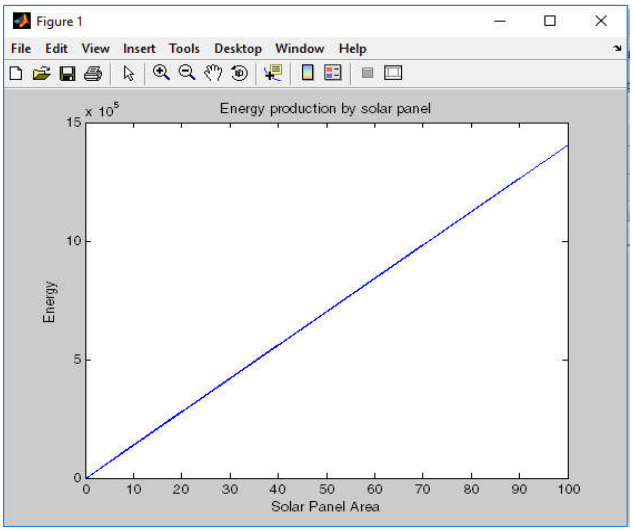

Fig 4.9 Simulation for Solar energy (kWh) according to solar panel area

4.5 Nuclear power Simulation

It is known that nucleus of a large atom might split into two in several situations. A certain amount of huge atom's mass has been converted to pure energy in such process

Table 4.1 Table for power production from energy sources

Material	Energy Density (MJ/kg)	100W light bulb time (1kg)
Wood	10	1.2 days
Ethanol	26.8	3.1 days
Coal	32.5	3.8 days
Crude oil	41.9	4.8 days
Diesel	45.8	5.3 days
Natural Uranium (LWR)	$5.7x10^5$	182 years
Reactor Grade Uranium (LWR)	$3.7x10^6$	1,171 years

Natural Uranium (breeder)	$8.1x10^7$	25,700 years
Thorium (breeder)	$7.9x10^7$	25,300 years

5. CONCLUSION

Electricity is major requirement for daily life activities. Without electricity the domestic and industrial operation cannot be performed. But there exists several issues during these processes. However lot of research have been made to solve issues but still there are some problems such as Lack of clean & reliable energy sources, Intraday load & need, no access to electricity, Pollution from thermal power plants, Poor pipeline connectivity & infrastructure, Inadequate last mile connectivity, Average transmission, distribution & consumer-level losses etc. Here the discussion has been made on those issues and the focus is to solve such issues using proposed work. However there are several benefits as well as limitations of hydro electric power generation system. In tradition research SOLAR PV –WIND Hybrid power generation system approach has been used. As it is known that Renewable energy sources such as energy generated from solar, biomass, wind, geothermal, hydro power, and ocean resources have been considered as a technological option. It could help in generating clean energy. Considering the limitation of exiting work proposed work is integration of hydro electricity power, solar system, Nuclear power and wind energy.

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