UTILIZATION OF SOLAR ENERGY IN VIDARBHA REGION

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ABSTRACT-The paper details the utilization of solar energy resources in vidarbha region. In Vidarbha Thermal Power Plants generates about 4260MW electricity. Yet more than 71 coal power plants with a total generation capacity of almost 55,000 MW were being planned in the region. Mostly power generation is made by thermal power station using energy sources coal and water, which damages the environment thereby increasing global warming. Due to ever increasing requirement of fossil fuel for these Power Plants, prices are rising at the same time depletion, due to deforestation. This leads to high biodiversity of eco system. Due to rising costs for all fossil fuels the poor people may face the problem for cooking and heating, burning of fossil fuels such as coal, oil and gas, led to elevate CO_2 emissions. The carbon dioxide is accountable for 50-60% rise in temperature of the earth's surface. Similarly water plays key role for power generation, as it is being used by all power stations, soon scarcity of water, which is matter of concern. Now many countries are opting for renewable energy like wind energy, solar energy for Sensible technology which is simple and reliable. But inadequate energy supply leads to or maintains poverty, which commonly is accompanied by population explosion: a vicious circle.

This ever increasing problem can be solved by using solar energy, being the Vidarbha region having almost 300 sunny days (Average temperature @30C) which is perfect climate for solar energy. Most parts of Vidarbha receive good solar radiation 4- 7 kWh/sq. m/day Possible to meet growing energy demands and cover deficit. It is an abundant, pollution free renewable source of energy that only needs to be harnessed to be of use to man. Solar power plants in use in the world are equipped to transform solar radiation into electrical energy via any one of a number of cycles or natural phenomena.Few however have the ability to store sufficient energy during the day so that a supply can be maintained during night time also. The solar updraft tower meets these crucial conditions and makes it possible to take the crucial step towards a global solar energy economy.

Keywords: Solar Energy, Global Warming, Solar Draft, Power Generation

I .Need for utilization of Solar Energy:

In Vidarbha region is a hottest region having almost 300 sunny days (Average temperature @30C) which is perfect climate for solar energy. Indeed, it would dump greenhouse heat to space for its power while producing biodiesel, electricity, fish, fresh water, salt and real estate - all in quantities demanded by developed-world populations - without adding to, and possibly even Sequestering, greenhouse gases. Solar updraft towers could thus help assure the economic and environ– mentally benign provision of energy in sunny regions. Today in Vidarbha many Power Plants mostly coal based-thermal power plants functioning which indeed leads to CO_2 emissions with scarcity of water ,thus suffering poor people from use of fossil fuel for cooking with diseases due to ever increasing pollution of CO2 emissions ,dust, global warming. Solar radiations available in abundant can be utilized to solved this serious problem. Thus Vidarbha region can play vital role in utilizing solar radiation for power generation and helps in conserving the natural resources, water and preventing deforestation which reduces CO2 emissions –pollution. In recent years Government of India focusing on using renewable sources of energy with subsidy for loan on development of infrastructure and land acquisition. These abundant available energy can change the scenario of Vidarbha in respect of financial development raising the region in National Development. Achieving solutions to the environmental problems that humanity faces today requires long-term potential actions for sustainable development.

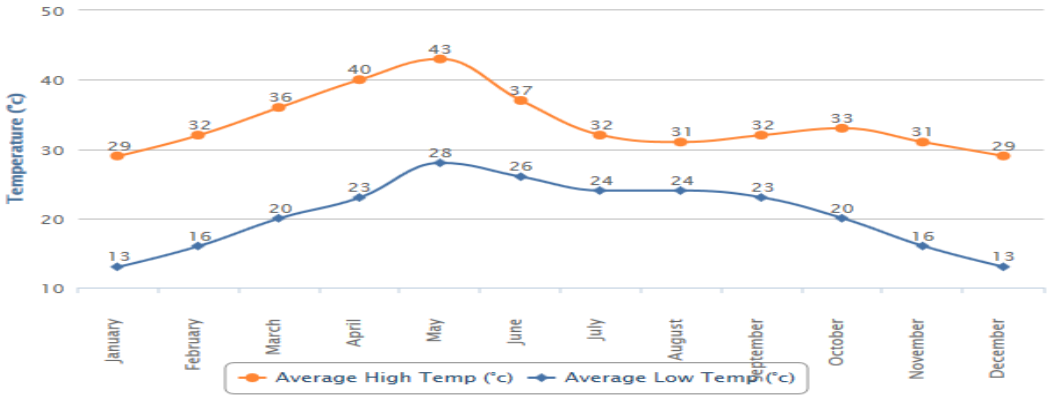

Fig 1: Average Temperature (° C) Graph for Nagpur Region

II. Scenario of Power Generation in Vidarbha

Vidarbha being a large producer of coal about 10.3 billion tons, Thermal Power Plants generates about 4260MW electricity. Yet more than 71 coal power plants with a total generation capacity of almost 55,000 MW were being planned in the region. Granted a total water allocation of 2,049 million cubic metres of water per year, the thermal power plants had been allotted the equivalent irrigation water for approximately 409,800 hectares of arable land. if all the plants allocated water are built the IIT Delhi study[1] on water availability shows a scarcity of the water that may arise conflict between thermal power plants and agriculture. This must be prevented, otherwise depletion of water. Similarly the existing coal production in Vidarbha can support about 7,000 MW capacity while the production capacities that have secured environmental clearance can additionally support around 10,000 MW installed capacity, assuming that all coal goes only for thermal power plants and not for other uses like cement, irrigation.

Table 1: Details of Coal Based Thermal Power Plant

Coal-based thermal power plants	**Number**	**Generation(MW)**	**Water allocated** (MCM^3/year)
Approved	**33**	**24655.5**	**1008.89**
Pending Approval	**38**	**30041.5**	**1040.31**
Total	**71**	**54697.0**	**2049.2**

Table 2: Generation Capacity in Vidarbha

Project Name	Plant capacity (MW)	District	Company	Ownership
Chandrapur TPS	2340	Chandrapur	Mahagenco	State
Khaperkheda TPP	840	Nagpur	Mahagenco	State
Koradi TPs	1040	Nagpur	Mahagenco	State
Paras TPP	500	Akola	Mahagenco	State
Wardha Warora TPP	540	Wardha	WPCL (KSK Energy)	Private

Table 3: District wise proposed Power Plant

District	Proposed Capacity Addition (MW)
Nagpur	10,350
Chandrapur	8,155
Gondia	5,940
Bhandara	5,280
Yavatmal	4,450
Amravati	3,450
Gadchiroli	1,990
Wardha	1,330
Akola	250
Total	**41,195**

III. Problem arising due to Power Generation in Vidarbha

3.1 Depletion of Ground and Surface Water Resources

The digging to very low levels for extraction of coal (about 100-200 feet for opencast mines and about 300-400 feet for underground mines) results in drying up of wells and tube wells. Even surface water sources like nallahs and tanks / ponds face similar problem. Daily water needs of Villagers are now difficult, while agriculture is also severely impacted.

3.2 Displacement

The displacement of large number of villages and people results due to need for large quantities of lan power plants and coal mines.

3.3 Displacement and Pollution

Due to large number of Thermal power plants and coal mines coming up, huge impacts are likely to aggravate displacement of population, pollution, land degradation, diversion of water from agriculture and other needs, destruction of ground water resources, damage to infrastructure like roads etc. Share of carbon emission increases drastically about 65-70%, results in health problems, unbalancing ecosystem

Table 4 : Fossil fuel share in carbon emission and energy generation

Fuel	Share of Energy Generation %		Share of Carbon emission %	
	India	World	India	World
Coal	55	20.3	69.78	41.2
Oil	30.5	41.3	26.31	42.65
Natural Gas	7.0	21.1	3.9	16.12

3.4 Solar energy:

The strength of solar radiation that comes to the Earth is 175×10^9 MW and this surpasses for 10^5 times the strength of all power plants on Earth when they work with full strength. The solar irradiation reaching the earth is entirely pure. This is because, all chemical and radioactive polluting byproducts of the thermonuclear reactions remain behind the sun. The proportion of energy reaching the earth (30 Days shining) is sufficiently larger than the energy equivalent of the total of all the planet's fossil fuels, both used and unused. Most parts of Vidarbha receive good solar radiation 4- 7 kWh/sq. m/day Possible to meet growing energy demands and cover deficit areas Can substantially reduce consumption of kerosene and diesel for lighting and power generation. The daily average solar energy incident over India varies from 4 to 7 kWh/m^2 with about 1,500–2,000 sunshine hours per year (depending upon location), which is far more than current total energy consumption.

India is densely populated and has high solar insolation , an ideal combination for using solar power in India.

In the solar energy sector, some large projects have been proposed, and a 35,000 km^2 (14,000 sq mi) area of the Thar Desert has been set aside for solar power projects, India's Ministry of New and Renewable Energy has released the JNNSM Phase 2 Draft Policy, by which the Government aims to install 10 GW of Solar Power and of this 10 GW target, 4 GW would fall under the central scheme and the remaining 6 GW under various State specific schemes.

Jawaharlal Nehru National Solar Mission is one of the major global initiatives in promotion of solar energy technologies, announced by the Government of India under National Action Plan on Climate Change. Mission aims to achieve grid tariff parity by 2022 through large scale utilization and rapid diffusion and deployment of solar technologies across the country at a scale which leads to cost reduction

IV. Solar Updraft Tower:

Solar updraft tower will play an important role in the field of renewable energies. The solar updraft tower meets the above crucial conditions and makes it possible to take the crucial step towards a global solar energy economy. Economic appraisals based on experience and knowledge gathered so far have shown that large scale solar updraft towers ($\geq$ 100 MW) are capable of generating energy at costs close to those of conventional power plants. This reason is enough to further develop this form of solar energy utilization to encompass large, economically viable units. Proposals for solar updraft towers have typically assumed that they would be single use structures: solar to electricity via heat differentials between high altitude air and ground level greenhouse-enclosed air. The resulting system has marginal economic value. In a future energy economy, solar updraft towers could thus help assure the economic and environmentally benign provision of electricity in sunny regions.

The solar tower or solar chimney offers a method for large scale generation of electricity from solar energy. The solar updraft tower (SUT) is a renewable-energy power plant for generating electricity from solar power. Sunshine heats the air beneath a very wide greenhouse-like roofed collector structure surrounding the central base of a very tall chimney tower. The resulting convection causes a hot air updraft in the tower by the chimney effect. This airflow drives wind turbines placed in the chimney updraft or around the chimney base to produce electricity. Plans for scaled-up versions of demonstration models will allow significant power. The solar updraft tower's three essential elements - solar air collector, chimney/tower, and wind turbines -have been familiar for centuries.

V. Working Principle of Solar Updraft Tower

The Solar Chimney operates like a hydroelectric power plant, but instead of water, it uses hot air this is particularly useful in arid areas. The solar chimney power plant system, which consists of four major components i.e. collector, chimney, energy storage layer and one or more turbo generators at the base. Air underneath the low circular transparent glass open at the circumference is heated by radiation from the sun. The chimney, a vertical tower tube with large air inlets at its base, stands in the centre of the collector. The joint between the collector and the chimney is airtight. The wind turbine is installed at the bottom of the chimney for the large-scale solar chimney system, there may be several wind turbines inside as it is difficult, at the current time, to produce wind turbines with rated load over 10MW.The project works on the principle that in the collector, solar radiation is used to heat an absorber (ordinarily soil or water bags) on the ground, and then a large body of air is heated by convection currents as the density of hot air inside the system is less than that of the cold air in the environment at the same height, the hot air is forced by the buoyancy to move up the chimney as a hot wind which acts as a driving force by this suction effect it flows through either one large turbine or numerous smaller turbines. The energy of the air flow is converted into mechanical energy at the base of the tower, and ultimately into electrical energy by electric generators

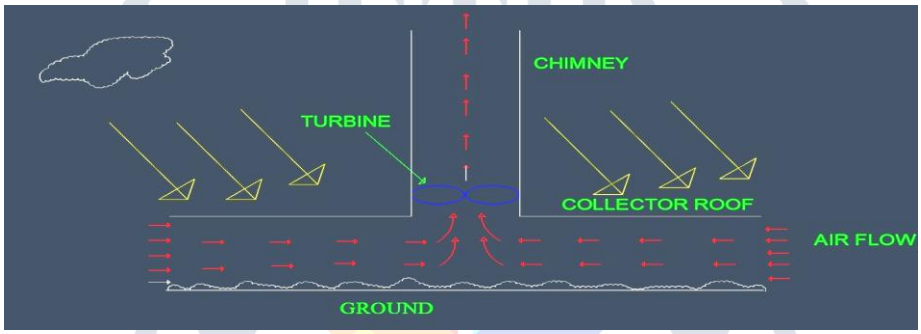

Fig 2 : Solar Updraft Tower

VI. Conclusion*:*

Abundant Solar radiations available in Vidarbha can be utilized to solved the serious problem depletion of fossil fuel and scarcity of water. The solar updraft tower meets the above crucial conditions and makes it possible to take the crucial step towards a global solar energy economy .Thus Vidarbha region can play vital role in utilizing solar radiation for power generation and helps in conserving the natural resources, water and preventing deforestation which reduces CO_2 emissions –pollution ,limiting high biodiversity of eco system These abundant available energy can change the scenario of Vidarbha in respect of financial development raising the region in National Development. Achieving solutions to the environmental problems that humanity faces today requires long-term potential actions for sustainable development.

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