SOLAR ENERGY FOR SUSTAINABLE DEVELOPMENT

Th. Asha Sinha
G. P. Women's College, Imphal Manipur

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Abstract

Energy has always been the key to the man's greatest goals and to his dreams that lead to better quality of life. In India energy problem is very serious and main objectives is move to find solution to match demand and supply of energy source. In our world today we have two lagging resources – energy and water. The need for conserving energy and developing alternative energy is a must and also to bring about change in the mind to focus on renewable resource of energy. To get power, the promising option is to make more extensive used of the renewable sources like sun. This paper is an attempt to make aware of the global energy problem and leading role of the alternative energy sources for future survival and to encourage students and young generation to give innovative ideas.

Keywords: *energy, solar energy, development, sustainable development*

All education spring from the images of the future and all education create the images of future. Alternative energy source is the subject of global attention. It is essential that awareness about energy system should be brought in the mind of the people so that they will become conservative and start adopting the new technologies. Unless more and more people start using these in near future, the energy scarcity may reach alarming levels. India is a country having over 300 sunny days a year and solar system can prove a boon. Energy is a crucial input in the process of economic, social and industrial development. Energy consumption the developing country is increasing at a faster rate. As conventional energy sources are depleting they by day utilization of alternative energy sources is the only solution. India has made rapid strides towards economic self reliance over the last few years. On the energy demands and supply site, India is facing severe shortages. To overcome energy crisis, government has developed related to alternative energy sources. The new agricultural technologies can be developed base on non-conventional energy sources.

Research and development by few established companies have provided good results. However, the total contribution of energy through these alternatives means still less than four percent of the total energy generation as of today. The increased power demand depleting fossil fuel resources and growing environmental pollution have led the world to think seriously for other alternative sources of energy. Basic concept of alternative energy relates to issues of sustainability, renewability and pollution reduction. In reality alternative energy means anything other than deriving energy via fossil fuel combustion. In this paper an attempt has been made to project the dynamics of solar energy resources prevailing in our country for sustainable development. The generation of awareness at the grass root levels is the need of the hour.

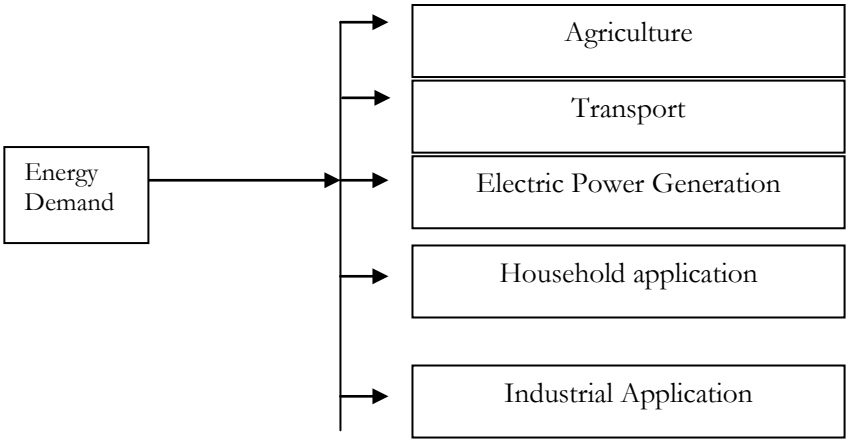
Energy supply and demands

Our energy requirements have increased in the years following the industrial revolution. This rapid increase in use of energy has created problems of demand and supply. It this growing world energy demand is to be met with fossil fuels, there will be no more available for producing the energy after few years. It is a need of today's

world to concentrate on renewable energy source to satisfy the demand and conserve our finite natural resource for the generation to come.

An overview of the concerns about energy demand and supply-

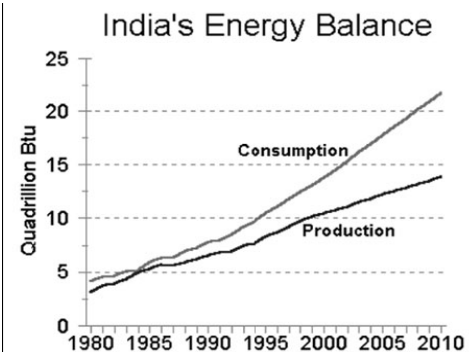
Demand



Demand and supply forecasts for power in India.

Table.No.I

YEAR	PEAK LOAD	INSTALLED CAPACITY	PEAKING CAPABILITY
2001/02	95.76	126.04	88.92
2006/07	130.94	181.1	129.81
2011/12	176.65	242	146.67



Source: U.S. Energy Information Administration

Solar Energy

Solar energy is one of the most resourceful sources of energy for the future. One of the reasons for this is that the total energy we receive each year from the sun is around 35,000 times the total energy used by man. However, about 1/3 of this energy is either absorbed by the outer atmosphere or reflected back into space.

Solar energy is the energy force that sustains life on the earth for all plants, animals and people. The sun's warmth can be stored to produce energy. Mirrors and glass

were used to collect heat in ancient times, but the first houses to use solar heating were not built until 1955. Solar energy is becoming more popular and the technology is getting better all the time. The world's largest solar energy generating plants are in the Mohave Desert, California, U.S.A. They are designed to use the sun's rays to heat oil which drives a generator. It creates enough electricity for a small town.

Top Energy Users

These countries guzzle more energy than any others in the world. The figures below show the amount of gas, coal or other power needed to produce the same amount of energy as a total tonne of oil. This is the standard way of comparing energy produced and consumed from different sources.

Table 2 Energy Consumption 2004

Country	Oil	Gas	Coal	Nuclear	HEP*	Total
USA	937.6	582.0	564.3	187.9	59.8	2,331.6
China	329.9	37.1	963.5	11.3	74.2	1,410.0
Russia	128.5	361.8	105.9	32.4	40.0	668.6
Japan	241.5	64.9	120.8	64.8	22.6	514.6
India	119.3	28.9	204.8	3.8	19.0	375.8
Germany	123.6	77.3	85.7	37.8	6.1	330.4
Canada	99.6	80.5	30.5	20.5	76.4	307.4
France	94.0	40.2	12.5	101.4	14.8	262.9
UK	80.8	88.2	38.1	18.1	1.7	226.9

Sources :- Whitakers World of Facts, 2007

Table 3 Top Coal Producers

Country	2004 production (tones oil equivalent)
1. China	989,800.000
2. USA	567,200.000
3. Australia	199,400.000
4. India	188,800.000
5. South Africa	136,900.000
UK	15,300.000
World Total	2,732,100.000

Sources :- Whitakers World of Facts, 2007

Solar energy is a renewable resource that is in exhaustible and is locally available. It is a clean energy source that allows for local energy independence. The sun's power flow reaching the earth is typically about 1.000 watts per square water (w/m_2), although availability varies with location and time of year. Capturing solar energy typically requires equipment with a relatively high initial capital cost. However, over the lifetime of the solar equipment, these systems can prove to be cost-competitive, as compared to conventional energy technologies. The key to successful solar energy installation is to use quality components that have long lifetimes and requires minimal maintenance.

Electricity from sunlight

Most of the all renewable energy comes directly or indirectly from the sun. The three main types of energy system comes from solar energy can be classified into passive, active and photovoltaic. Sun differentially heats the atmosphere, causing winds, evaporates water and recycles it as rain, which lets our river flow and thus hydropower and wind power is also derived from sun. Potentially sun is the most abundant source of energy and even if a small portion of this energy were harnessed, it could solve many of our current energy requirement problems.

Electricity can be produced from sunlight through direct heating fluids to generate steam for large scale centralized electrical generation (solar thermal electrical generation) electricity can alternatively be produced from sunlight through a process called photovoltaic (PV) which can be applied, in either a centralized or decentralized fashion. Photovoltaic solar cells, which directly convert sunlight into electricity are made up of semi conducting materials. The simplest PV cells – power are watches and calculator, which more complex systems can light houses and provide power to the electrical grid.

PV is relatively new and unknown technology, which offers a new vision for consumers and business as to how power can be provided.

PV technology is already proving to be a force for social change in rural areas in less developed countries. The unique aspect of PV is that it is a radical or disruptive type of technology as compared to conventional power generation technologies.

PV is a technology that does not build from the old technology base, but rather replaces that base from the bottom up.

PV allows people the opportunity to ignore traditional electrical power supply structures and meet their own power needs locally. In rural region of the world today, where there are no power companies offering electricity, PV is often the technology of choice.

The best performing renewable energy electrification system are those that meet the expectations of the users. It is important to satisfied the basics needs of the users in order to insure acceptance of renewable energy system. Ownership and subsequent accountability is the key to the system sustainability for PV.

Application of common Photovoltaic

(1) Residential power: Over 500,000 homes worldwide use PV power as their only source of electricity. In Texas, a residence located more than a mile from the electric grid can install a PV system more inexpensively than extending the electric grid. A Texas residence opting to go solar requires about a 2 kW PV array to meet its energy needs, at a cost of about Rs. 675,000. The first rule with PV is always energy efficiency. A PV system can provide enough power for an energy efficient refrigerator, lights, television, stereo, and other common household appliances.

(2) Water Pumping: Pumping water is one of the most competitive arenas for PV power since it is simple, reliable, and requires almost no maintenance. Agricultural watering needs are usually greatest during sunnier periods when more water can be pumped with a solar system. PV powered pumping systems are excellent for small to medium scale pumping needs (e.g., livestock tanks) and rarely exceed applications requiring more than a 2 hp motor. PV pumping systems main advantages are that no fuel is required and little maintenance is needed.

(3) Telecommunications: This was one of the early important markets for PV technologies, and continues to be an important market. Isolated mountaintops and other rural areas are ideal for stand-alone PV systems where maintenance and power accessibility makes PV the ideal technology. These are often large systems, sometimes placed in hybrid applications with propane or other type of generators.

(4) Gate Openers: Commercially available PV powered electric gate openers use wireless remote controls that start a motorized actuator that releases a gate latch, opens the gate, and closes the gate behind the vehicle. Gates are designed to stop if

resistance is met as a safety mechanism. Units are available that can be used on gates up to 16 feet wide and weighing up to 250 pounds. Small PV modules of only a few watts charge batteries. Digital keypads are available to allow access with an entry code for persons without a transmitter. Solar powered gate-opening assemblies with a PV module and transmitter sell for about Rs.31500.

(5) Commercial Lighting: PV powered lighting systems are reliable and a low cost alternative widely used. Security, billboard sign, area, and outdoor lighting are all viable applications for PV. It's often cheaper to put in a PV lighting system as opposed to installing a grid lighting system that requires a new transformer, trenching across parking lots, etc. Most stand-alone PV lighting systems operate at 12 or 24 volts DC. Efficient fluorescent or sodium lamps are recommended for their high efficiency of lumens per watt. Batteries are required for PV lighting systems. Deep cycle batteries specifically designed for PV applications should be used for energy storage for lighting systems. Batteries should be located in protective enclosures, and manufacturer's installation and maintenance instructions should be followed. Batteries should be regulated with a quality charge controller. Lighting systems prices vary depending on the size.

(6) Electric Fences: PV power can be used to electrify fences for livestock and animals. Commercially available packaged units have maintenance free 6 or 12 volt sealed gel cell batteries (never need to add water) for day and night operation. These units deliver safe (non-burning) power spikes (shocks) typically in the 8,000 to 12,000 volt range. Commercial units are UL rated and can effectively electrify about 25 to 30 miles of fencing.

(7) Remote Site: PV is best suited for remote site application that have small to moderate power requirements, a small power consuming application were the grid is in existence.

Benefits of Alternatives Energy

Energy is a crucial input in the process of economic, social and industrial development. As conventional energy sources are depleting day by day, utilization of alternative energy source is the only solution. Alternative energy options enable local institutions to manage their own energy needs and thus provide rural development opportunities. In addition, dissemination and popularization of energy – efficient devices and alternatives to conventional fuel can do the following:

Enhance income: Alternative energy sources can provide local employment opportunities through direct use of energy in small-scale industry and agriculture, through construction, repair, and maintenance of energy devices, or through the sale of energy to local utilities. In India, for example, the use of solar water-heating systems to meet the hot-water demand of hotels and hospitals.

Provide better lighting: Better lighting enables the poor to stretch their period of economic activity; their children can help them in daily chores and then study in the evenings.

Benefit women: Lower dependency on fuel wood and other household fuel sources reduces the drudgery of women by shortening or eliminating the distances they travel for fuel collection. The improved cook stove, for example, has been associated with an average net annual saving of seven person-days of labour a year in India.

Help the environment: Efficient use of conventional sources of energy or use of renewable energy helps save the environment from further degradation and gives it an opportunity to regenerate.

Benefit human health: Use of improved cook stoves and biogas plants, for example, helps reduce or eliminate health problems associated with using conventional cook stoves, including respiratory diseases and eye problems.

Provide sustainable fuel systems: Afforestation and agro forestry, combined with the introduction of energy-efficient devices, can help to create a sustainable fuel-use system within the rural community and sustain the ecological balance of a region.

Achievements and Activities of MANIREDA

Manipur Renewable Energy Development Agency (MANIREDA) has made the following contributions for the villagers of Manipur and the projects under progress are given in Table No. IV, V, VI.

Table 4 Activities of Manireda

Sl.No	Particulars	Qty. (Nos)	Power Output (KW)	Remarks
1.	Electrification of remote/difficult villages through solar lightning systems.	140 villages		136 villages by solar systems, 3 villages by Biomass Gasifier and 1 village through small hydel project.
2.	Solar water pumping systems	28	27.00	26 Nos. of 900 watts and 2 Nos. of 1800 watts systems.
3.	SPV Systems installed	18,801	846.15	8152 HLS Model- V 3220 HLS Model-II 1300 HLS Model – I 225 Street Lights 5904 Solar Lantern
4	Energy awareness cum educational parks	3		
5	Solar water heater (100 LPD)	25		For demonstration purposes.
6	Box type solar cooker	250		For demonstration purposes

B. Projects under progress

Table 5

Sl.No.	**Particulars**	**Qty.(Nos)**	**Power output (KWH)**	**Remarks**
1.	Romte villages electrification (1074 nos. of HLS Model – II and 101 nos of SLS	14 villages	47.11	Targeted for completion by 31/6/2008
2	SPV demomstration programme 2006-07 1000 solar lantern, 350 HLS Model-II	1350	22.95	Targeted for completion by 31/6/2008
3	Energy Awareness cum Educational Park	7		Ar seven educational Institutions

C. Project in Pipeline

Table 6

Sl. No.	Particulars	Qty.(Nos)	Power output (KW)	Remarks
1	Remote village electrification	441 villages		Targeted for completion by 31/3/2012.
2	SPV Power plants	11	145	50 kW at Ccpur public Hospital,25 kW at State Academy of Training and 10 kW each one at MANIREDA office and one each in 7 Districts.

Conclusions

Energy is the backbone of technology and economic development. The future is bright for continued PV technology dissemination around the world. PV technology fills a significant need in supplying electricity, creating locals jobs and promoting economic development in rural areas, while also having the positive benefits of avoiding the external environmental costs associated with traditional electrical generation technologies. Solar energy means a fossil fuel saving, emission free environment, contribution to energy conservation better economy and modern life style with clean and cheap renewable energy. Solar energy is presently being used on a smaller scale in furnance for homes and to heat up swimming pools. Protection of environment and climate and their preservation for the generations to come is a demanding social, scientific and economical task. Utilization of renewable energy, efficient conversions of fossil fuel are not only environmentally and climatically beneficial, they also preserve the finite energy sources. Efforts should be made to find renewable sources of energy to minimize the ever growing environmental as well as social problem. In this emerging trend of finding alternative sources of energy the state of Manipur has developed the potential to utilize solar energy to supplement energy production, solar energy has become a recent trend in Manipur to check health hazard and environment problem. Solar Energy Projects being implemented the most is in developing nations. More specifically we find them in Asia, Africa, Latin America. Research is in underway for new fabrication techniques. Today oil companies for example, are aware of the renewed interest in solar power. They are diversifying their holdings in other forms of energy.

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