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Message from Head of the Department

Welcome to V.V.P. Engineering College, which is the only institute that provides the best education along with the culture, tradition, discipline, sports and co-curricular activities.

I am glad to serve as the Head of Electrical Engineering Department as it is the only Department in Gujarat where all the labs including Switchgear lab, High Voltage lab and Machine lab are very well equipped with all the instruments and machines.

The secret of success in life is for a man to be ready for his opportunity when it comes What lies behind us and what lies before us are tiny matters compared to what lies within us .I am proud to say that since last four years our department is getting gold medal in final year examination. Also, our department finds place n top five positions in every semester GTU exams.

Above all, majority of our students got placements n the companies like Adani, Nirma, Essar, Infosys, etc. Also some of the students are also placed in Power Transmition and Distribution companies like GETCO and PGVCL.

Prof. C.K.Vibhakar.

HOD

Electrical engineering Dept.

Making solar thermal power generation in India a reality – Overview of technologies, opportunities and challenges

Prof. Sachin Rajani, Prof. Bharti Parmar and Prof. Alpesh Adesara

Preamble

Energy is considered a prime agent in the generation of wealth and a significant factor in economic development. Limited fossil resources and environmental problems associated with them have emphasized the need for new sustainable energy supply options that use renewable energies. Solar thermal power generation systems also known as Solar Thermal Electricity (STE) generating systems are emerging renewable energy technologies and can be developed as viable option for electricity generation in future.

India's power scenario

India's current electricity installed capacity is 135 401.63MW. Currently there is peak power shortage of about 10 % and overall power shortage of 7.5 %. The 11^{th} plan target is to add 100 000 MW by 2012 and MNRE has set up target to add 14500 MW by 2012 from new and renewable energy resources out of which 50 MW would be from solar energy. The Integrated Energy Policy of India envisages electricity generation installed capacity of 800 000 MW by 2030 and a substantial contribution would be from renewable energy. This indicates that India's future energy requirements are going to be very high and solar energy can be one of the efficient and eco-friendly ways to meet the same.

Solar energy potential

India is located in the equatorial sun belt of the earth, thereby receiving abundant radiant energy from the sun. The India Meteorological Department maintains a nationwide network of radiation stations, which measure solar radiation, and also the daily duration of sunshine. In most parts of India, clear sunny weather is experienced 250 to 300 days a year. The annual global radiation varies from 1600 to 2200 kWh/m^2, which is comparable with radiation received in the tropical

and sub-tropical regions. The equivalent energy potential is about 6,000 million GWh of energy per year. It can be observed that although the highest annual global radiation is received in Rajasthan, northern Gujarat and parts of Ladakh region, the parts of Andhra Pradesh, Maharashtra and Madhyapradesh also receive fairly large amount of radiation as compared to many parts of the world especially Japan, Europe and the US where development and deployment of solar technologies is maximum.

Solar thermal power generation technologies

Solar Thermal Power systems, also known as Concentrating Solar Power systems, use concentrated solar radiation as a high temperature energy source to produce electricity using thermal route. Since the average operating temperature of stationary non-concentrating collectors is low (max up to 1200 ^{0}C) as compared to the desirable input temperatures of heat engines (above 3000 ^{0}C), the concentrating collectors are used for such applications. These technologies are appropriate for applications where direct solar radiation is high. The mechanism of conversion of solar to electricity is fundamentally similar to the traditional thermal power plants except use of solar energy as source of heat.

In the basic process of conversion of solar into heat energy, an incident solar irradiance is collected and concentrated by concentrating solar collectors or mirrors, and generated heat is used to heat the thermic fluids such as heat transfer oils, air or water/steam, depending on the plant design, acts as heat carrier and/or as storage media. The hot thermic fluid is used to generated steam or hot gases, which are then used to operate a heat engine. In these systems, the efficiency of the collector reduces marginally as its operating temperature increases, whereas the efficiency of the heat engine increases with the increase in its operating temperature.

Concentrating solar collectors

Solar collectors are used to produce heat from solar radiation. High temperature solar energy

collectors are basically of three types;

a. Parabolic trough system: at the receiver can reach 400° C and produce steam for generating electricity.

b. Power tower system: The reflected rays of the sun are always aimed at the receiver, where temperatures well above 1000° C can be reached.

c. Parabolic dish systems: Parabolic dish systems can reach 1000° C at the receiver, and achieve the highest efficiencies for converting solar energy to electricity.

Solar chimney

This is a fairly simple concept. The solar chimney has a tall chimney at the center of the field, which is covered with glass. The solar heat generates hot air in the gap between the ground and the gall cover which is then passed through the central tower to its upper end due to density difference between relatively cooler air outside the upper end of the tower and hotter air inside tower. While traveling up this air drives wind turbines located inside the tower. These systems need relatively less components and were supposed to be cheaper. However, low operating efficiency, and need for a tall tower of height of the order of 1000m made this technology a challenging one. A pilot solar chimney project was installed in Spain to test the concept. This 50kW capacity plant was successfully operated between 1982 to 1989. Recently, Enviro Mission Limited, an Australian company, has started work on setting up first of its five projects based on solar chimney concept in Australia.

Solar thermal power generation program of India

In India the first Solar Thermal Power Plant of 50kW capacity has been installed by MNES following the parabolic trough collector technology (line focussing) at Gwalpahari, Gurgaon, which was commissioned in 1989 and operated till 1990, after which the plant was shut down due to lack of spares. The plant is being revived with development of components such as mirrors, tracking system etc. A Solar Thermal Power Plant of 140MW at Mathania in Rajasthan, has been proposedand sanctioned by the Government in Rajasthan. The project configuration of 140MW Integrated Solar Combined Cycle Power Plant involves a 35MW solar power generating system and a 105MW conventional power component and the GEF has approved a grant of US$ 40 million for the project.

The Government of Germany has agreed to provide a soft loan of DM 116.8 million and a commercial loan of DM 133.2 million for the project. In addition a commercial power plant

based on Solar Chimney technology was also studied in North-Western part of Rajasthan. The project was to be implemented in five stages.

In the 1 st stage the power output shall be 1.75MW, which shall be enhanced to 35MW, 70MW, 126.3MW and 200MW in subsequent stages. The height of the solar chimney, which would initially be 300m, shall be increased gradually to 1000m. Cost of electricity through this plant is expected to be Rs. 2.25 / kWh. However, due to security and other reasons the project was dropped. BHEL limited, an Indian company in power equipments manufacturing, had built a solar dish based power plant in 1990's as a part of research and development program of then the Ministry of Non-conventional Energy Sources. The project was partly funded by the US Government. Six dishes were used in this plant. Few states like Andhra Pardesh, Gujarat had prepared feasibility studies for solar thermal power plants in 1990's. However, not much work was carried out later on.

Opportunities for solar thermal power generation in India

Solar thermal power generation can play a significant important role in meeting the demand supply gap for electricity. Three types of applications are possible

1. Rural electrification using solar dish collector technology

2. Typically these dishes care of 10 to 25 kW capacity each and use striling engine for power generation. These can be developed for village level distributed generation by hybridizing them with biomass gasifier for hot air generation.

3. Integration of solar thermal power plants with existing industries such as paper, dairy or sugar industry, which has cogeneration units.

Many industries have steam turbine sets for cogneration. These can be coupled with solar thermal power plants. Typically these units are of 5 to 250 MW capacities and can be coupled with solar thermal power plants. This approach will reduce the capital investment on steam turbines and associated power-house infrastructure thus reducing the cost of generation of solar electricity

4. Integration of solar thermal power generation unit with existing coal thermal power plants. The study shows that savings of up to 24% is possible during periods of high insolation for feed water heating to 241^0C

Barriers

Solar thermal power plants need detailed feasibility study and technology identification along with proper solar radiation resource assessment. The current status of international technology and its availability and financial and commercial feasibility in the context of India is not clear. The delays in finalizing technology for Mathania plant have created a negative impression about the technology.

Way ahead

Solar thermal power generation technology is coming back as commercially viable technology in many parts of the world. India needs to take fresh initiative to assess the latest technology and its feasibility in the Indian context. These projects can avail benefits like CDM and considering the solar radiation levels in India the se plants can be commercially viable in near future. The MNRE and SEC (Solar Energy Center) should take initiative to study these technologies and develop feasibility reports for suitable applications. Leading research institutes such as TERI can take up these studies.

11 Proven ways to gain unstoppable confidence

Prof. C.K.Vibhakar.

1 - KNOWLEDGE IS POWER
Those who know are ultimately much more confident in any arena than those shrouded in ignorance. Use your spare time to read up on the things that interest you, on the things that you are curious about, and build up a solid base of knowledge and critical thinking. The more you know, the more sure of yourself you will be in any situation.

2 - EXPERIENCE
Uncertainty is the biggest drain on your self-confidence. Succumbing to doubt ensures you will never believe in yourself. The more often you do something, the more certain you become. With certainty comes confidence.

3 - CARE-FREE ATTITUDE
Try to walk through your day with as easy and care-free of an attitude as you can muster, because someone who is it ease with him or herself is someone who is confident. Build unstoppable confidence by not getting hung up on the petty issues and minor irritations that help wear you down.

4 - HONEST SELF-ASSESSMENT
Take stock of yourself. Brainstorm for a bit and compose a list of your good qualities and bad, the things you excel at and the things you need to improve upon, and once you have a clear picture of yourself much of the uncertainty that breeds doubt will wash away.

5 - ANALYZE
Take the time to properly think through every problem, and the confidence in your skills will grow.

6 - BE THOROUGH
Try to be as complete and thorough at every task you attempt . Completing tasks builds confidence in your ability to always see projects through to their proper conclusion .

7 - IDENTIFY YOUR LIMITS, AND EXCEED THEM

Once you have assessed yourself, make a list of goals you wish to accomplish, and get to work. You now know your true limits, so the only thing left to do is push beyond them and set your sights on new frontiers.

8 - BE OPEN TO HELPING OTHERS

Don't close yourself off to friends, acquaintances and coworkers. The more you put yourself out there in business and social situations, the more quickly you will build confidence in your ability to navigate these sometimes tricky waters.

9 - COMPOSE YOURSELF

Dress well, groom yourself, compose your identity as a person who is well put together, and you will feel confident when meeting new people and doing new things.

10 - BE DECISIVE

While it is okay to take time to analyze and think situations through, the time comes when you must be decisive and act. Decisive people are confident; not confident people are decisive.

11 BE COMPLETE

Know yourself fully, wash away your own doubts about yourself, your identity and your capabilities, and present every aspect of yourself in every situation and you will have no reason to doubt your confidence. Become your full, real self.

A lot of confidence building techniques simply do not work. I've tried everything out there and studied confident people to see what makes them who they are. Continue reading this article for the top 11 traits you can develop to build strong self-confidence that attracts the people, job, and pleasures of life you want.