

Human Resource Development for Solar Energy

The Future of Solar Energy in India

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Gandhinagar

Dr. Ketan Shukla

(Indian Foreign Service)

Mahatma Gandhi Labour Institute

Solar Power

- The sun is the ultimate source of energy and life on earth. It provides us with a potentially unlimited amount of free, albeit intermittent energy without emitting CO_2.
- 1 year of current fossil fuel use (year 2008) took the earth one million years to store.
- **The sun can be seen as a huge nuclear radiator with radiating power of 300 million megawatt.**
- Solar PV provides power which focus demand only **in most countries**

Particulars	Radiation
The Sun	300000000000000000000000W (300*10^6EW)
Radiates to earth	810000000000000dv(81000TW)
World Power	16300000000000W (16.3TW) 0.2%

Cumulative targets under Solar Mission

India is endowed with vast solar energy potential:

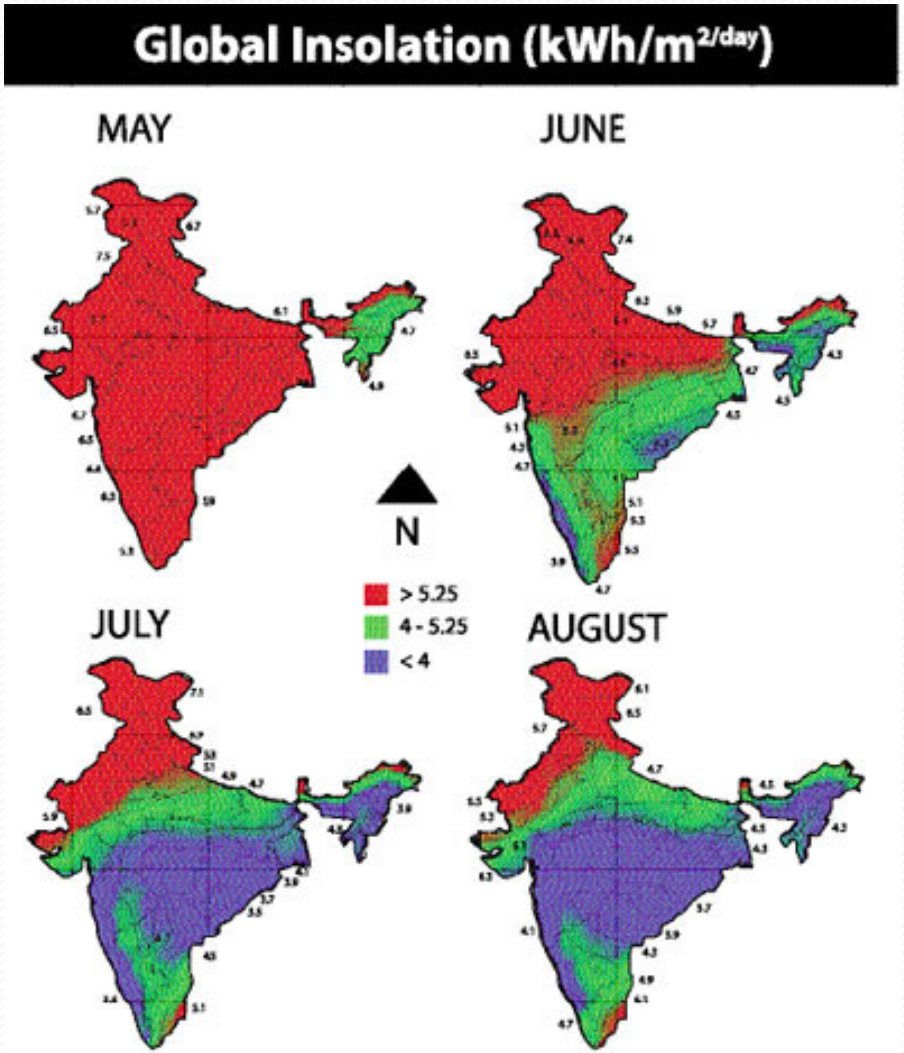
-About 5,000 trillion kWh/year energy is incident over India's land

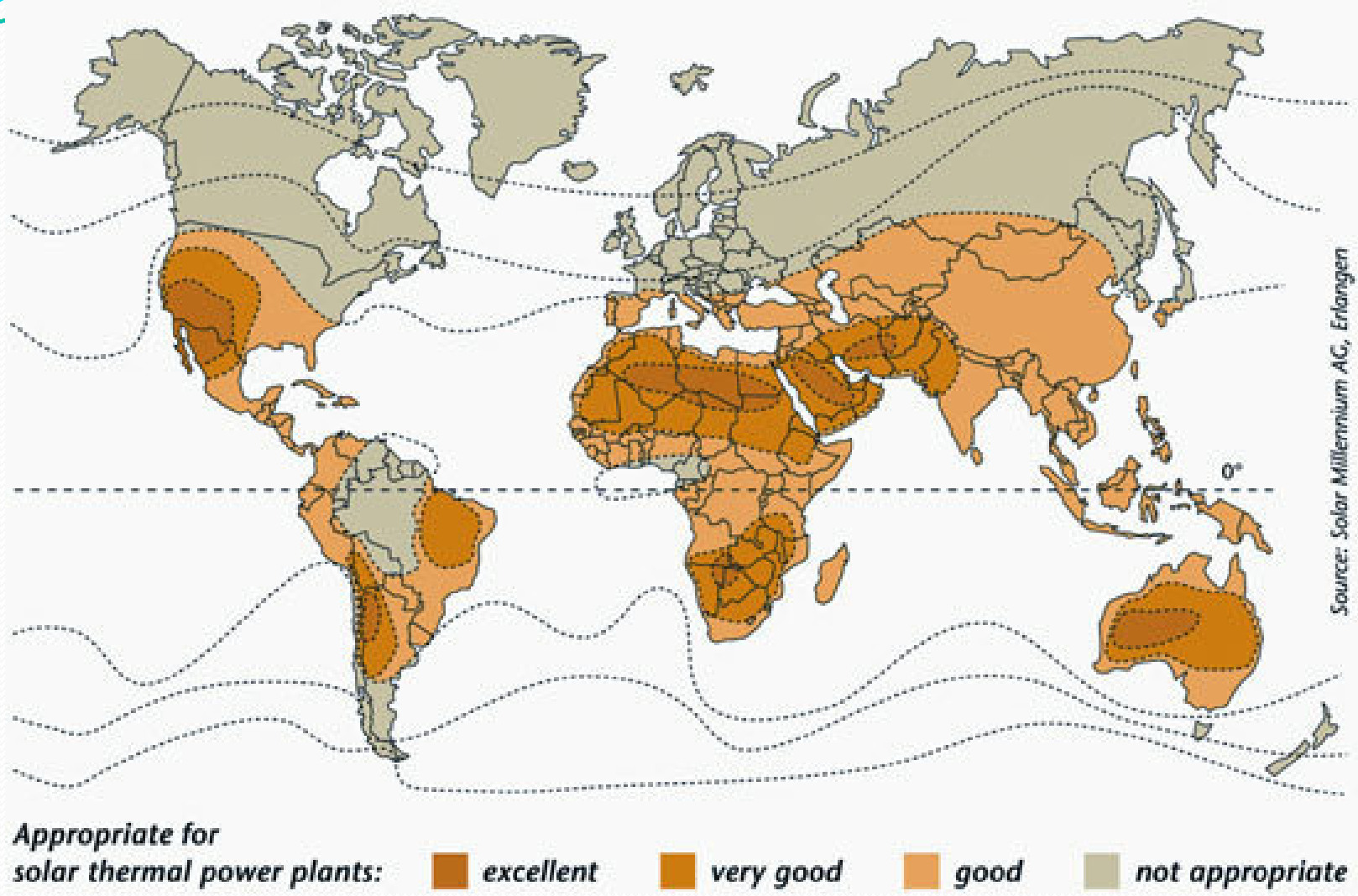
Application segment	Target for Phase I (2010-13)	Cumulative Target for Phase 2 (2013-17)	Cumulative Target for Phase 3 (2017-22)
Grid solar power incl. roof top	1,100 MW	4,000 MW	20,000 MW
Off-grid solar applications (incl. rural solar lights)	200 MW	1,000 MW	2,000 MW
Solar collectors	7 million sq meters	15 million sq meters	20 million sq meters

Source: Jawaharlal Nehru National Solar Mission: Towards Building Solar India

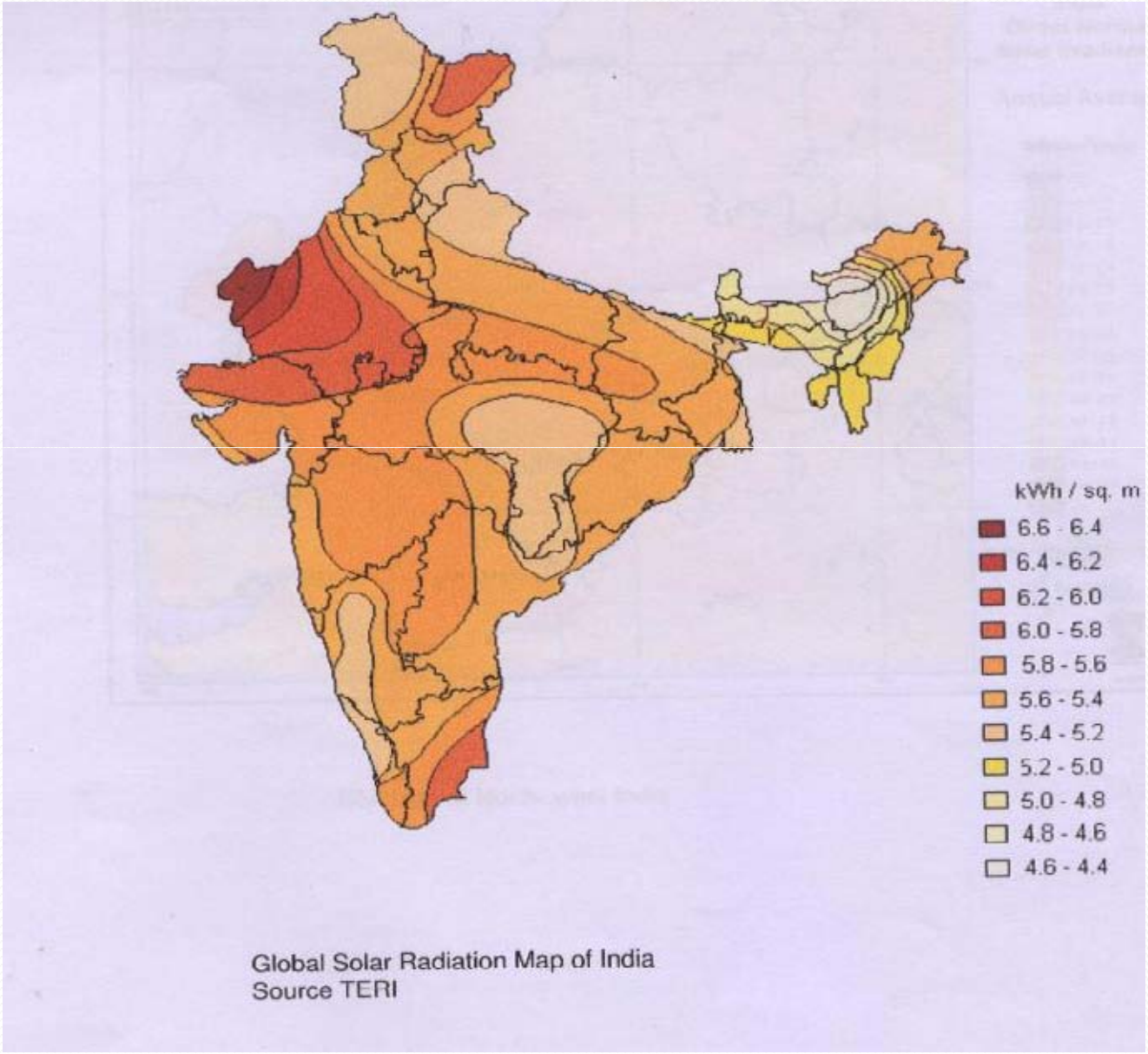
Solar Power Potential

- High Solar Isolation levels in India
- The North Western Part of India (**Gujarat** & Rajasthan) gets high levels of solar radiations, almost throughout the year.
- Solar Radiation Map of India




0°
Source: Solar Millennium AG, Erlangen
Appropriate for
solar thermal power plants:
excellent
very good
good
not appropriate

Solar Radiation Map of India



Global Solar Radiation Map of India
Source TERI

Solar Energy – Advantage Gujarat

- Solar radiation : 5.5 to 6.0 kWh/Sq.m/day with 330 sunny days / year
- Land : 14.40 Million Acres of uniquely positioned waste land in area of high solar radiation
- Water: Narmada water available in Northern part of state having high solar radiation
- Transmission grid : Gujarat have densest transmission network
- Infrastructure: 74,000 Km long road network
- Gas Grid: 2200 Kms long gas grid
- Cut Transportation costs for conventional fuels
- Distributed Generation – so helps in reducing T&D Losses

Gujarat Solar Park

- Land : 2024 ha (1080 ha GoG, 9
- Approx. Capacity: 500 MW
- Land Allotment: Solar Thern
- Fees / Charges :
  - Processing Fee: Rs. 25000 / MW
  - Deposit : Rs. 5 lacs
  - Allotment Price: Rs. 18.5 l
  - Development Charge: Rs. 8-12 l
  - Phase I:
    Location - Village Charanka, Taluka Santalpur, Dist Patan

1MW Multi-Technology PV Plant

250 kW Thin-Film PV

750 kW C-Silicon PV

15 kW Tracker

1 MW Multi-Technology Grid-Connected PV Demonstration Plant.

Facilities: Demonstration PV



15kW Training/ Demonstration Installation

3kW Rooftop Installation

Installations for Technology Comparison

world's first canal-based solar power plant on Sanand Branch Canal of Narmada

- Renewable energy technologies for meeting India's growing energy demands, both for production and substantive purpose in an environmentally benign manner is being discussed nationally as well as internationally .
- With expanding investment flows and growing production capacities, employment in the renewable energy sector has started growing at a rapid pace and this growth is likely to accelerate in the years ahead .
- Compared to fossil power plants, renewable energy is expected to generate more jobs per unit of installed capacity, per unit of power generated and per rupee invested.

- The National Solar Mission announced in the year 2009 provided required boost to solar driven ecologically sustainable growth while addressing India's energy security challenge. The action plan envisaged under the mission is to ramp up grid connected solar power generated up to 1000 MW by the year 2012, an additional 3000 MW by 2017 .
- The Government had set up a target of to achieve 20,000 MW through solar by the end of 13th Plan Period i.e. 2022.

Opportunities and Strategies

- Renewable power excluding hydro above 25 MW, contributes more than 11% of the total installed capacity. In addition, more than 3.25million square meter solar thermal collector area; 1.3 million SPV systems, 4.5 million family-type biogas plants have been installed. Over 5500 villages have also been covered under remote village electrification programme. These achievements clearly show that many Renewable Energy technologies in India .

- To promote decentralized renewable energy systems in far flung remote locations and the contribution of renewable electricity in the national power grid to grow substantially, it is apparent that there will be an immense demand of qualified/skilled manpower in renewable energy science and technologies.
- The educational institutions need to lay importance on renewable energy education considering the all round growth of the renewable energy industry. These institutions need to take adequate steps to introduce renewable energy education at all levels of our education system.

- Advanced renewable technologies are relatively new and therefore proper educational infrastructure in the field of renewable energy technologies needs to be developed with coordinated efforts in the country.

HRD During 11th Plan

- Training of professionals working in the Ministry and its attached offices and autonomous bodies at specialized institutions in India and abroad;
- Training of professionals working in state Nodal Agency/Government/ Utilities on different aspects of technology, its development and project management;
- Training of manpower on social/economic, trade, legal trade, IPR, administration, managerial and environmental aspects;
- Training of the manpower working on various aspect of renewable energy with research & development institutions, NGOs, community based organizations, banking and financial institutions etc.
- Organization of training-cum-study tours;
- Development of training modules including pedagogy through expert(s)/expert institutions(s);
- Addressing long-term HRD needs.
- Energy Chairs in 15 higher educational institutions, providing grant-in-aid support for lab and library upgradation in educational institutions conducting renewable energy courses and increasing the number of fellowships under National Renewable Energy Fellowship Programme.

Major Initiatives during 11th Plan by M.N.R.E.

- **Short Term Training Programs for Professionals:**
- **Short Term knowledge upgradation for MNRE's Scientists/SNA's:**
- IIT, Delhi was sanctioned a project to provide refresher training to Ministry and SNAs Officers in specialized field. Five such training programmes were organized under this activity by CES, IIT, Delhi.
- Three Officers of the Ministry were sponsored for professional courses at TERI University, IIM, Bangalore and Indian Institute of Public Administration.
- A number of Officers and staff of the Ministry were deputed for short term training courses on administrative matters such as RTI, e-Governance, organizational development etc. organized by various professional bodies such as NPC, ISTM etc.

Incorporation of Renewable Energy in the Syllabus of ITIs:-

- Renewable Energy has been incorporated in the syllabus of seven trades of two years regular ITI course. The trades are: Electronics, Electricians, Mechanist, Sheet Metal Work, Welder, Plumber and Fitter.Course material for this has been prepared and provided to Director General of Employment and Training (DGET) for onward distribution/publication for use by ITI instructors and students.
- Training, through TERI and AHEC, Roorkee, of faculty of seven Advanced Training Institutes of Director General of Employment and Training (DGET).

National Renewable Energy Fellowships

- 160 students completed their M.Tech and 52 students were awarded PhD.

RE Chairs and Laboratory Infrastructure:-

- Renewable Energy Chairs have been instituted at IIT Roorkee, IIT Kharagpur. University of Lucknow has been sanctioned a onetime grant for upgradation of their laboratory facilities.

Potential Studies:-

- A study was awarded to CII, Shorabji Godraj, Green Business Centre, Hyderabad for assessment of job potential in the Renewable Energy Sector. Another study was conducted through WISE, Pune.

Centre of Excellence in Renewable Energy Innovation, Incubation and Entrepreneurship:-

- To promote innovation and to encourage innovative RE technologies
- CIIE Initiatives.
- IIM, Ahmedabad is being developed as a Centre of Excellence for Renewable Energy Innovation, Incubation and Entrepreneurship.

- This will automatically create demand for qualified/skilled manpower at various levels. Assessment of job potential in renewable energy field has been done by CII under a project assigned to them by the Ministry. According to the assessment about 3.5 lakh persons are employed in renewable energy sector at present and under a moderate growth scenario of 6% , there will be additional 289 000 persons will get employment by 2015. This number may rise to about 3,50,000 under high growth rate of 15% of renewable energy sector. The job potential of solar sector alone by 2017 is about 3 lakh in view of JNNSM.

12th Plan Period Proposals

- **Continuation of existing programme:**
- **A National Renewable Energy Fellowships**
- The existing provision of providing National Renewable Energy Fellowships to 400 students per annum is proposed to be continued during 12th Plan period.

Course	Duration	Intake every year		Fellowship 1st Year	2nd Year	3rd Year (stabilized no. for subsequent years)
		4th Year	5th Year			
M.Tech	2 year	200	200	400	400	400	400
M.Sc	2 year	100	100	200	200	200	200
JRF	2 year	40	40	80	280*	280*	280*
SRF	3 year	40	40	80	120	120	120
RA/PDF	3 year	20	20	40	60	60	60
TOTAL		**400**	**400**	**800**	**1060**	**1060**	**1060**

- *This includes 200 integrated M.Sc students joining JRF.

Enhancement /Establishment of Renewable Energy Based Infrastructure Facilities:

- Twenty five (25) institutions are planned to be selected for providing such an infrastructure with a minimum grant of Rs. 0.50 crore.
- **Instituting Renewable Energy Chairs to act as focal point for renewable energy education in the institutions.**
- The respective institutions may also augment through funds from their routine grants.
- **National Solar Science Fellow Programme:-**
- Under this programme, 10 eminent scientists will be awarded fellowship of Rs. 1 lakh per month for a maximum duration of three years with contingent grant of Rs. 5 lakh per annum and Research grant of Rs. 15 lakh per annum to work on cutting-edge area of research in solar energy in one of the host institutions.

- **Skill enhancement of professionals through short term training programs:**
- short term training programs, workshops, conferences and symposia.
- **Supporting Incubation Activities**
- Ministry has already been supporting the CIIE Initiatives, IIM, Ahemdabad in developing as Centre of Excellence in Innovation, Incubation and Entrepreneurship development in Renewable Energy area. It is envisaged that Ministry will continue to support this activity for initial two years of the 12th Plan Period with a budgetary support of **Rs. 16.80 crore.**

New Initiatives during 12th Plan

- **A Augmenting the infrastructure and training facilities in ITIs**
- Training of Instructors
- Creating necessary facilities by way of providing tools and equipments at 625 District Level Industrial Training Institutes (ITIs) (Trainees of other ITIs/ITCs in the District will be trained by utilizing this infrastructure till the same is created in their institutions).
- Training of Technicians under CTS and MES.
- **Networking of Renewable Energy Project output and Education/ Research Institutions**
- There are more than 50 National institutions involved in RE education and research.

- **Utilizing High End Facilities**
- The Government is supporting several projects creating high end infrastructure in the Solar Energy Centre, IIT's, IISC and CSIR laboratories. It is important that researchers across the country have access to these facilities. It is proposed that all National facilities and large equipment be listed on the MNRE website and mechanism for providing access to researchers will be created.

- **12th Plan Proposals at a glance**
- **S.No. Plan Target (2012-17) Budget Outlay (2012-17)**
- **Rs. In Crores**
- 1 Provision of 1060 National Renewable Energy Fellowships 85.00
- 2 Enhancing Renewable Energy Based Infrastructure in National Laboratories/ /Educational institutions 12.50
- 3 Renewable Energy Chair (15) in higher education institutions 16.50
- 4 Award of 10 National Solar Science Fellows 16.00
- 5 Skill developments/ continuing education of professionals, Ministry's staff and staff of the SNAs. 15.00
- 6 Capacity Building of ITIs 42.00
- 7 Virtual Institution for Networking 10.00
- 8 Utilization of High End National Facilities by Researchers 7.50
- 9. Support for incubation activities 16.80
- 10. HRD Advisory and Monitoring Committee Activities 2.00
- **Total 223.30**

Summary and Conclusion:

- India is a nation in transition. Considered an "emerging economy," increasing GDP is driving the demand for additional electrical energy, as well as transportation fuels. India is a nation of extremes. Poverty remains in areas with no energy services, while wealth grows in the new business hubs.
- Coal fired generation currently provides two thirds of the generation capacity, and hydropower supplies the other third. Yet, India is blessed with vast resources of renewable energy in solar, wind, biomass and small hydro. In fact, the technical potential of these renewables exceeds the present installed generation capacity.
- **The development and deployment of renewable energy, products, and services in India is driven by the need to :**
  - decrease dependence on energy imports
  - sustain accelerated deployment of renewable energy system and devices
  - expand cost-effective energy supply
  - augment energy supply to remote and deficient areas to provide normative
  - consumption levels to all section of the population across the country
  - And finally, switch fuels through new and renewable energy system/ device deployment

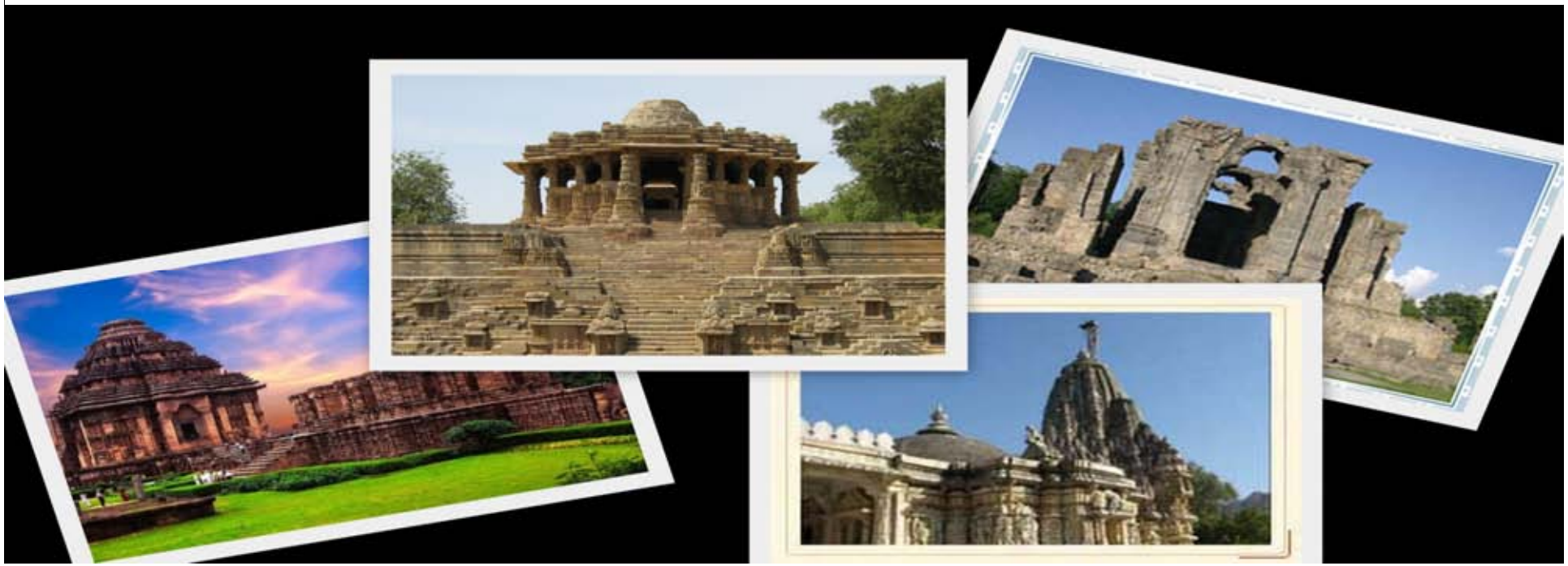
हरिदश्वः सहस्रार्चिः सप्तसप्तिर्मरीचिमान्

तिमिरोन्मथनः शंभुस्त्वष्टा मार्ताण्ड अंशुमान्

Sun is present everywhere,
his countless rays reaches all places,
Sun is the force,
The destroyer of darkness &
bestows happiness & wealth

Sun infuses life and removes all problems

– Aditya Hridyam



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THANK YOU