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Encourage Geothermal Energy in India
Possible Contributions by the Indo-German Energy Programme

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ABSTRACT

Geothermal resources in India are known to be able to contribute to the country's energy supply by more than 10,000 MW of sustainable power. Nevertheless the number of geothermal energy projects is still very small. This presentation tries to increase this number by pointing out how the Indo-German Energy Programme (IGEN) of German Technical Cooperation - Deutsche Gesellschaft fuer technische Zusammenarbeit (GTZ) GmbH - can support feasible projects in the country by giving technical and financial assistance to project developers or technology suppliers.

GTZ is a non-profit enterprise owned by the Government of the Federal Republic of Germany.

Expensive renewable energy can only be commercialised if it comes hand in hand with energy efficiency. In this field the geothermal projects can directly benefit from the vast experience of GTZ in supporting the Bureau of Energy Efficiency, Ministry of Power, Government of India (BEE, MoP) in implementing the energy conservation act under the IGEN.

1. INTRODUCTION

India is the world's fifth largest consumer of energy. The current energy demand is expected to increase four times by 2023. Energy supply was not able to keep pace with demand. Many areas of India are suffering from power shortages and have to apply costly diesel generators. Therefore energy efficiency and renewable energy are becoming increasingly important in India to achieve energy security and to reduce greenhouse gas emissions from predominantly coal fired power plants.

In the past India has promoted renewal energy mainly in rural areas without grid connection. With the National Action Plan for Climate Change (NAPCC), India gives a new momentum to the promotion of renewable energy. A National Solar Mission is being launched by the Ministry of New and Renewable Energy (MNRE), Government of India, which shall significantly increase the share of solar in the Indian energy mix. This includes installation of solar power plants in the megawatt range across the country.

Currently there are very few renewable projects in urban and industrial areas in India. Solar power for example but of course other renewable as well could be an alternative to costly diesel generated backup power in urban and industrial locations. Due to the absence of successful projects and uncertainties in the regulatory framework there is a lack of confidence to invest and a shortage of professionals. Successful pilot projects and a regulatory framework for grid connection with appropriate feed-in tariffs are required to facilitate the commercialisation of renewable energy in these areas.

Therefore it has been agreed between the German Federal Ministry for Environment, Nature and Nuclear Safety (BMU) and MNRE in November 2008 in New Delhi to initially focus their efforts on commercialization of solar energy in urban and industrial areas and to develop jointly a project proposal in this field.

The Indo-German Energy Programme by GTZ will implement this project in the upcoming years. The Project will further strengthen the cooperation with the MNRE which has already begun under the BMU financed RESRA Project (Renewable Energy Supply for Rural Areas). As the GTZ Solar Project will focus on urban and industrial application of solar energy and therefore complement the activities under the RESRA Project which is focusing on the renewable energy supply for rural areas.

The Indian Eleventh Five Year Plan targets social & economic development ("inclusive growth"); balance regional development; correcting urban-rural imbalance; encouraging environment management and energy conservation. The rural electrification continues to be one top priority of the Government of India as most of India's rural population still has restricted access to reliable supply of electricity. One reasons for this is the poor expected return on electricity supply and electricity consumption in rural areas due to inefficient systems such as pumps for irrigation. In addition, the current renewable energy schemes do not make an effort to exploit the potential of higher revenue return from income generating activities or rural enterprises, and focus primarily on rural household lighting. The mid-term appraisal of the Tenth Five Year Plan reported that the scheme of village and household electrification that provided 40% capital subsidy was not successful. Significant shortfalls are reported in this sector and the National Development Council suggested a need to accelerate rural electrification during the Eleventh Plan.

New renewable energy projects also provide an opportunity to accelerate the national mission "Electricity to all by 2012".

Expensive renewable energy can only be commercialised if it comes hand in hand with energy efficiency. In this field renewable energy projects can directly benefit from the vast experience of GTZ in supporting the Bureau of Energy Efficiency (BEE, MoP) in implementing the energy conservation act under the IGEN.

Further synergies can be gained by joining with the German Development Bank KfW to overcome financial obstacles in funding renewable projects.

2. THE INDO-GERMAN ENERGY PROGRAMME

Commissioned by the German Federal Ministry for Economic Cooperation and Development (BMZ) GTZ and KfW jointly implement the Indo-German Energy Programme (IGEN). The broad focus of IGEN is to support the Indian Government, Ministry of Power on the implementation of the Energy Conservation Act in India. The Act positively intervenes at all levels of society, such as energy-intensive large industries, manufacturers of household appliances and industrial equipment, residential households as well as engineering consultancy enterprises and power stations. The bilateral cooperation involves local and international professionals and supports:

- Labeling of household appliances and energy intensive industrial equipment with respect to energy efficiency
- Certification of energy managers and energy auditors
- Setting norms and standards for energy intensive industries
- Transfer and promotion of cutting edge technology to reduce energy consumption
- Private public partnerships to promote awareness on the need to save energy and
- Operation of one of the largest web portals (www.energymanagertraining.com) on this subject in India.

The CDM-India component of the programme fosters high quality Clean Development Mechanism (CDM) projects in India. These projects are widely replicable and provide experience through “learning by doing”. Its primary aim is capacity building and providing support to public and private sector institutions for preparation and implementation of internationally acceptable projects under the Clean Development Mechanism. CDM-India actively cooperates with the National CDM Authority (NCDMA) of India for institutionalising CDM projects in India.

About 3,000 large energy intensive industries falling under the provisions of the Energy Conservation Act are under obligation to reduce energy consumption. Over 23,000 manufacturers of household appliances of which only about 110 are in the organized sector and a workforce of one million are affected by the Act. Over 600 industrial equipment manufacturers of which 120 are from the organised sector with a workforce of 500,000 are urged to improve their technology to reduce energy consumption. An estimated 50 million power grid connected households will reduce electricity costs through more efficient appliances.

Since 2008 IGEN is focusing on fostering renewable energies in India as well. In cooperation with MNRE some renewable energy projects were started, others are under preparation. As the programme is open to all kind or renewable energy sources geothermal energy can contribute as well.

3. GEOTHERMAL POTENTIAL IN INDIA

The following section is giving an overview on the geothermal potential in India. It is based on a short analysis made by GTZ in 2008 to get some basis data while discussing the opportunities for geothermal projects.

According to this investigation there are five major areas in India where the geothermal potential seems interesting enough for geothermal projects:

- Himalayas
- Krishna-Godavari
- Western Coast
- Son-Narmada-Tapti (SONATA)
- Cambay

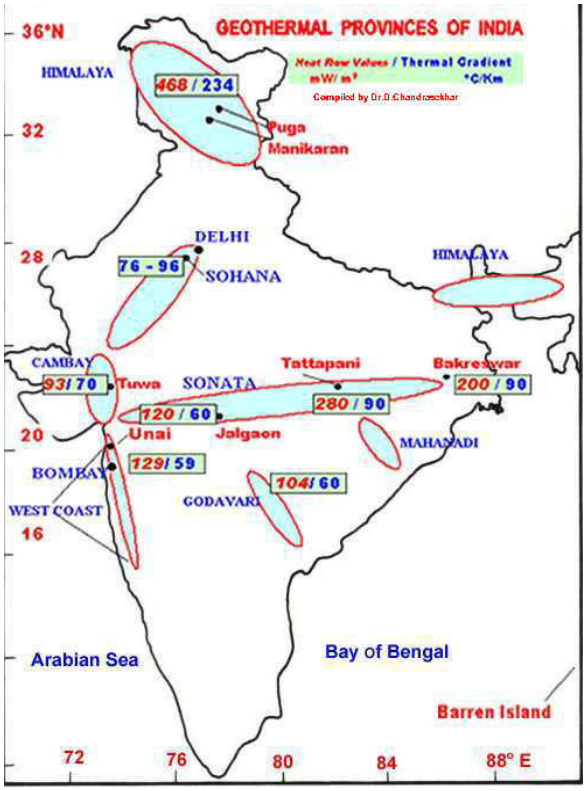

Figure 1: Geothermal Provinces of India, (http://www.geos.iitb.ac.in/geothermalindia/pubs/geoweb.htm)

3.1 Himalayas

The area of the Himalaya geothermal province comprises of approx. 1,500 km² with an occurrence of more than 100 thermal sources. The estimated temperature of the geothermal reservoir is higher than 260 degrees centigrade. The area shows the highest geothermal gradient in India: more than 100°C/km and a heat flow value of 100 mW/m². The flow rate varies from 200 – 1,000 l/min. With magmatic processes near the surface and young intrusive granite the Himalayas are the most interesting province for geothermal energy in India (Chandrasekharam, 2001)

The geothermal potential in Puga Velley seem to be sufficient for room heating, geothermal power supply and the heating of green houses as well giving the population the opportunity for growth of vegetables which are imported from southern regions today.

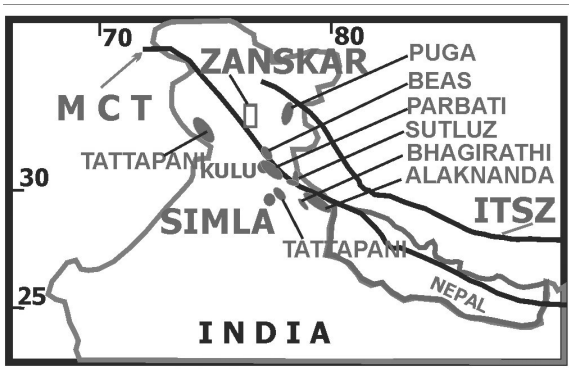

Figure 2: Geothermal provinces of Himalayas (Chandrasekharam, 2001)

3.2 Krishna-Godavari

The area between the rivers Krishna and Godavari shows a heat flow of 100 – 180 MW/m² and a geothermal gradient of 60 – 80 °C/km in springs near the surface. 13 thermal springs can be found in the south east of this area showing surface temperatures of 50 to 60 °C. At two of these springs, Manauguru and Bugga, the estimated temperatures are expected between 173 (Manuguru) and 250 °C (Bugga). The potential for geothermal power is estimated at 50 – 100 MWe. Infrastructure for feed in to the grid is there. A first geothermal project is executed by GeoSyndicate, Mumbai (www.geosyndicate.com) with Panaxgeothermal, Australia as a joint venture partner (www.panaxgeothermal.com.au). The project expects to exploit a reservoir in 2.5 km with temperatures of 175 - 215 °C. The province is estimated to have a potential of up to 38 MW power.

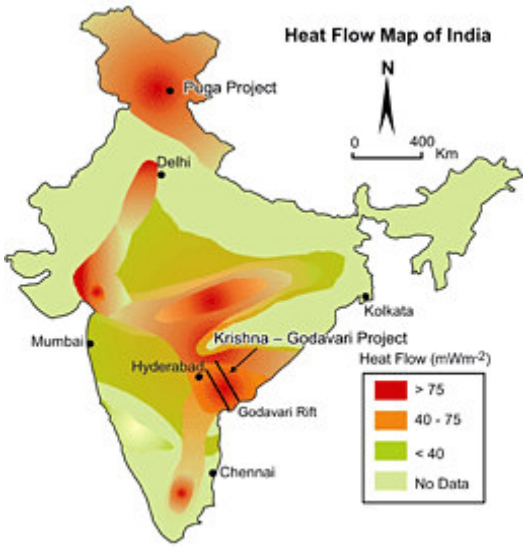

Figure 3: Heat flow map of India showing the Krishna-Godawari area. (www.geosyndicate.com)

3.3 Western Coast

Parallel to the western coast an area with a length of 300 km and a width of 20 – 30 km shows hot springs with temperatures between 42 °C (Rajapur) and 71 °C (Unhavre) (Sarolakar, 2005a). Theses springs are currently used for therapeutic a touristic purpose.

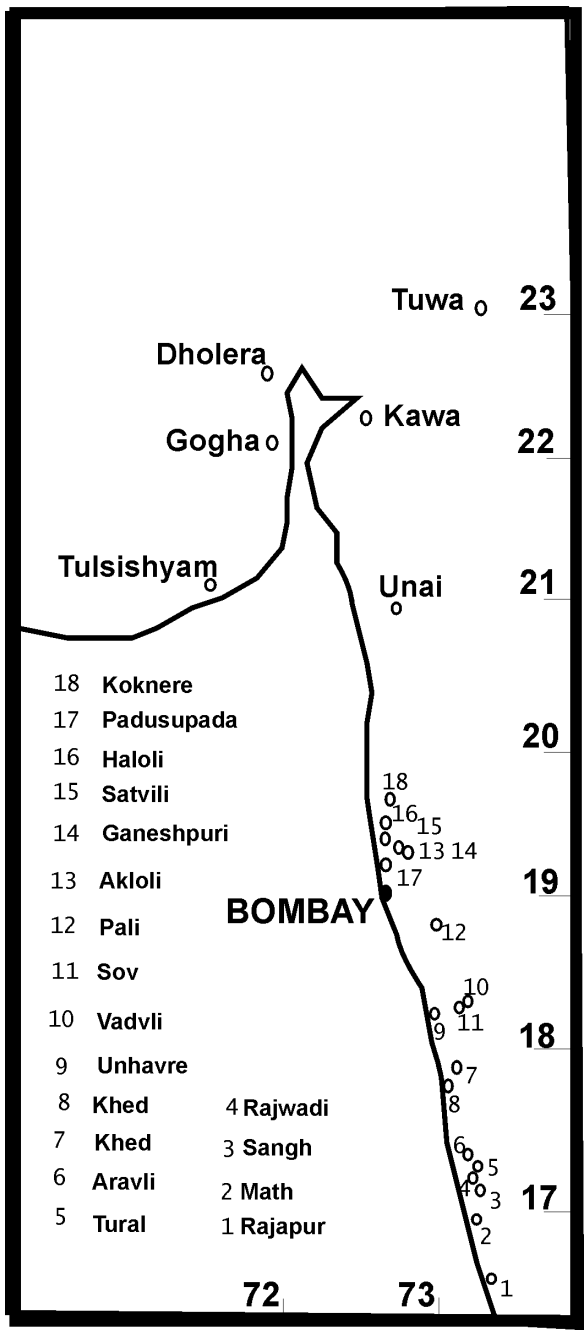

Figure 4: Thermal springs on the western coast (http://geoheat.oit.edu/bulletin/bull22-4/art2.pdf)

3.4 SONATA Geothermal Province

The Son-Narmada-Tapi rift (SONATA) is located between the indo-gangetic plain in the north and the Precambrian shield in the south. The rift system in central India is said to have a high geothermal potential.

The area comprises of approx. 80,000 km² and shows nine thermal springs with temperatures from 52 - 97 °C. The reservoir is expected at 3 km depth with a temperature of 217 °C. The thermal gradient is > 100 °C/km.

Most oft the springs can be found on the Tatapani-fracture zone. The infrastructure is good (SAROLKAR, 2005b).

3.5 Cambay

The Cambay rift valley in Gujarat and Rajasthan shows 22 hot springs on a length of 200 km and a width of 50 km. The geothermal gradient is higher than 60 °C/km and the heat flow is more than > 80 mW/m² with a reservoir temperature of 150 °C (CHANDRASEKHARAM, 2000b).

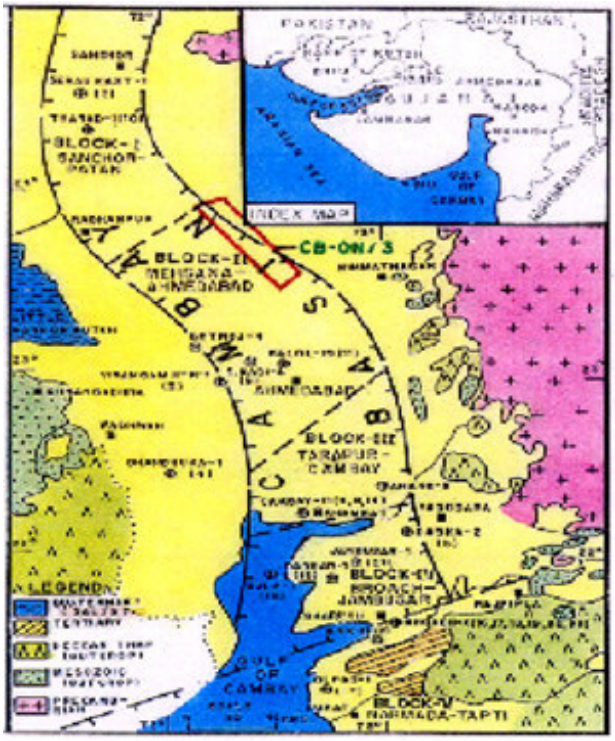

Figure 5: Map of Cambay rift valley (www.essar.com, 12.12.2008)

4. CONCLUSION

According to Chandrasekharam (2000b) India has a geothermal potential of approx. 10,600 MW which is currently not used for power production or heating purpose. As the power demand in India is rising and the climate change suggests climate neutral solutions to meet this demand the time for geothermal power projects is there. The Indo-German Energy Programme of GTZ and KfW can provide support for project developers by funding feasibility studies, establishing public private partnership solutions for the implementation of new technologies to the Indian market or giving loans for project financing.

Project developers are invited to contact the author if interested in support from the programme.

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