

**Project Fact Sheet**

Status: 01/2002

<u>Country</u>	<u>Project No.</u>	<u>Amount</u>	
India	1) Investment 2000 65 482	Soft Loan	DEM 116.8 million
		Market Loan	DEM 133.2 million
	2) Technical Assistance	GEF-Grant	USD 45.0 million
		GEF-Grant	USD 4.0 million

<u>Project</u>	<u>Sector</u>
Solar Thermal Power Plant Mathania	1) Investment Energy generation, solar energy

<u>Borrower/ Recipient</u>	<u>Project Executing Agency</u>
Republic of India	Rajasthan State Power Corporation Ltd.

Project Appraisal Document  
Government of Germany: 30.6.2000

<u>Consultant</u>	<u>Progress Reporting</u>
1) Tender: Fichtner Solar	
2) Implementation: n.n.	
3) Replication: n.n.	

<u>Financing and Loan Agreements</u>	<u>Date of Effectiveness</u>
1) PDF	1) 23 August 2001
2) Investment	2)
3) TA	3)

<u>Reserved Funds (USD million)</u>	<u>Disbursements (USD million)</u>		
1) 0.75	1)	=	%
2)	2)	=	%
3)	3)	=	%

Project objectives and project outputs

At the site of Mathania/Jodhpur in Rajasthan, an integrated gas-steam-power plant with an additional solar thermal steam generation (Integrated Solar Combined Cycle Plant, ISCC) and an overall installed capacity of 140 MW is being planned. This plant will be operated efficiently and sustainably with lower impacts on the global environment than a conventional expansion alternative (**project objective**).

The achievement of the project objectives is to be measured by the following individual project indicators (for rationale see also annex 3):

- On the basis of a field of 219,090 m<sup>2</sup> of solar trough surface and an annual direct irradiation of 2,285 kWh/m<sup>2</sup>, the ISCC will generate net power of 65 GWh/a (which will displace corresponding amounts of fossil fuel<sup>1</sup>) from the second year after commissioning. Specifically, this corresponds to a net conversion efficiency of 13% of the directly irradiated solar energy at the site of Mathania. When commissioned, the availability factor of the solar field, including the solar steam generator, will be at least 97% during operation of the power plant and during periods with usable solar irradiation (200 Watts/m<sup>2</sup>).
- The availability factor of the conventional power plant after commissioning will be at least 86% (without the solar steam generator) in order to achieve a power plant capacity utilization of 80%.
- The power plant is expected to supply electrical energy of approx. 800 GWh to the electrical grid of Rajasthan each year. However, an indicator cannot be determined until after completion of the tender because the definition of an indicator presupposes exact knowledge of the design.
- The operation of the Mathania plant will result in an annual abatement of 682,000 tons of CO<sub>2</sub> emissions, as compared to a hard coal power plant of average efficiency in Rajasthan (e.g. Suratgarh).
- To measure the thermal efficiency of the combined cycle part of the power plant, a heat efficiency indicator will be established as follows: The heat consumption of the ISCC during non-solar operation and without additional firing, will be not more than 8,040 kJ/kWh (based on net generation) with wet cooling. If dry cooling is chosen this value will have to be adjusted.

The sustainable and economically efficient operation of the ISCC will prove the usefulness of solar trough technology in a developing country and provide an incentive for the worldwide replication of this technology, resulting in considerable cost reductions **(overall objective 1)**. The additional energy supplied will enable productive consumers to increase both production and productivity, which in turn will boost economic growth **(overall objective 2)**. At the same time, the avoidance of CO<sub>2</sub> emissions from the power plant will contribute towards reducing global warming (secondary objective), albeit in a limited fashion.

Indicators for Overall Objectives:

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- Indicator for replication: ISCC or comparable solar thermal technology is used in further applications of power or steam generation in India and other countries of the solar belt, and such usage requires diminished subsidy support (overall objective 1).
- The share of productive consumption in the power consumption increase is over 60% (overall objective 2).
- The regulatory board performs its statutory functions and regularly passes tariff orders enabling average revenues from the sale of electrical energy to increase in real terms (overall objective 2).

### Project activities and results

- 1)
  - Construction of an Integrated Solar Thermal Combined Cycle Power Plant (ISCC) with a gross output of approximately 140 MW<sub>e</sub>
  - Operation contract for five years
  - Implementation consultant for EPC and operation contract

Result is a functional power plant which is operated for the first five years by a private company

- 2)
  - Replication activities
  - Training of staff (induction, technical and economics training)

Results are the utilisation of Mathania experience in other projects, the availability of a replication strategy for India, technology transfer to India, the utilisation of the training offered by the project, and the worldwide availability of information on the project.

### Activities/ measures financed from the GEF grant

- 1) Investment: Part of the steam turbine (16%) and the solar field (60%)
- 2) Replication activities: 100%

<u>Time schedule</u>	<u>PAD</u>	<u>Last progress report</u>	<u>Current progress report</u>
1) Investment:			
Start of implementation	9/2002		
Implementation time	36 months		
Start of testing	1/2005		
Commissioning	9/2005		
2) TA (Replication)			
Start of implementation	9/2002		
Implementation time	92 Monate		
Completion	4/2010		

Reasons for deviation as compared to last report

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<u>Project cost</u>	<u>PAD</u>	<u>Last progress report</u>	<u>Current progress report</u>
1) Investment:			
Total cost (USD million)	201.48		
Total cost (INR million)	9,358.89.		
Exchange rate (USD 1= INR...)	46,45		
Including: Consulting (USD million)	2.37		
2) TA (Replication)			
Total cost (USD million)	4.00		
Total cost (INR million)	185.80		
Exchange rate (USD 1= INR...)	46,45		

Reasons for deviation as compared to last report

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<u>Classification of the Project:</u>	<u>PAD</u>	<u>Last progress report</u>	<u>Current progress report</u>
Gender Equality Need for action	GO No		
Environment and Resources Protection Need for action	UR 2 *) Yes		
Poverty Alleviation	MSA / A0		
Participation / Good Governance	PD / GG 1		
Cofinancing	Yes		
Project Risk	medium		
Potential for Mitigation	medium		

\*) UR 2 = environment and resources protection is a main objective of the project