

Solar Power Project – Viability

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- Registered on 16/12/2003 to promote sustainable energy and sustainable development.
- Committed towards addressing the shortcomings existing in the sustainable energy sector in India.



- Renewable energy consultancy
 - National and international
 - More than 150 projects
- Solar Energy
 - Lender's Engineer – **225 MW**
 - Detailed Project Reports – **144 MW**
 - Feasibility Reports – **35 MW**
 - Solar Study / Research Reports – **12 nos.**
 - Books Published – **2 nos.**
 - "Solar Entrepreneur's Handbook"
 - "A Solar Future for India"

CSE Clientele



सत्यमेव जयते
Ministry of New and Renewable Energy
Govt. of India

Ministry of New & Renewable Energy, Govt. of India



GVK Power & Infrastructure Ltd, India



Deccan Water Treatment Pvt. Ltd. Pune



National Thermal Power Corporation



Confederation of Indian Industry

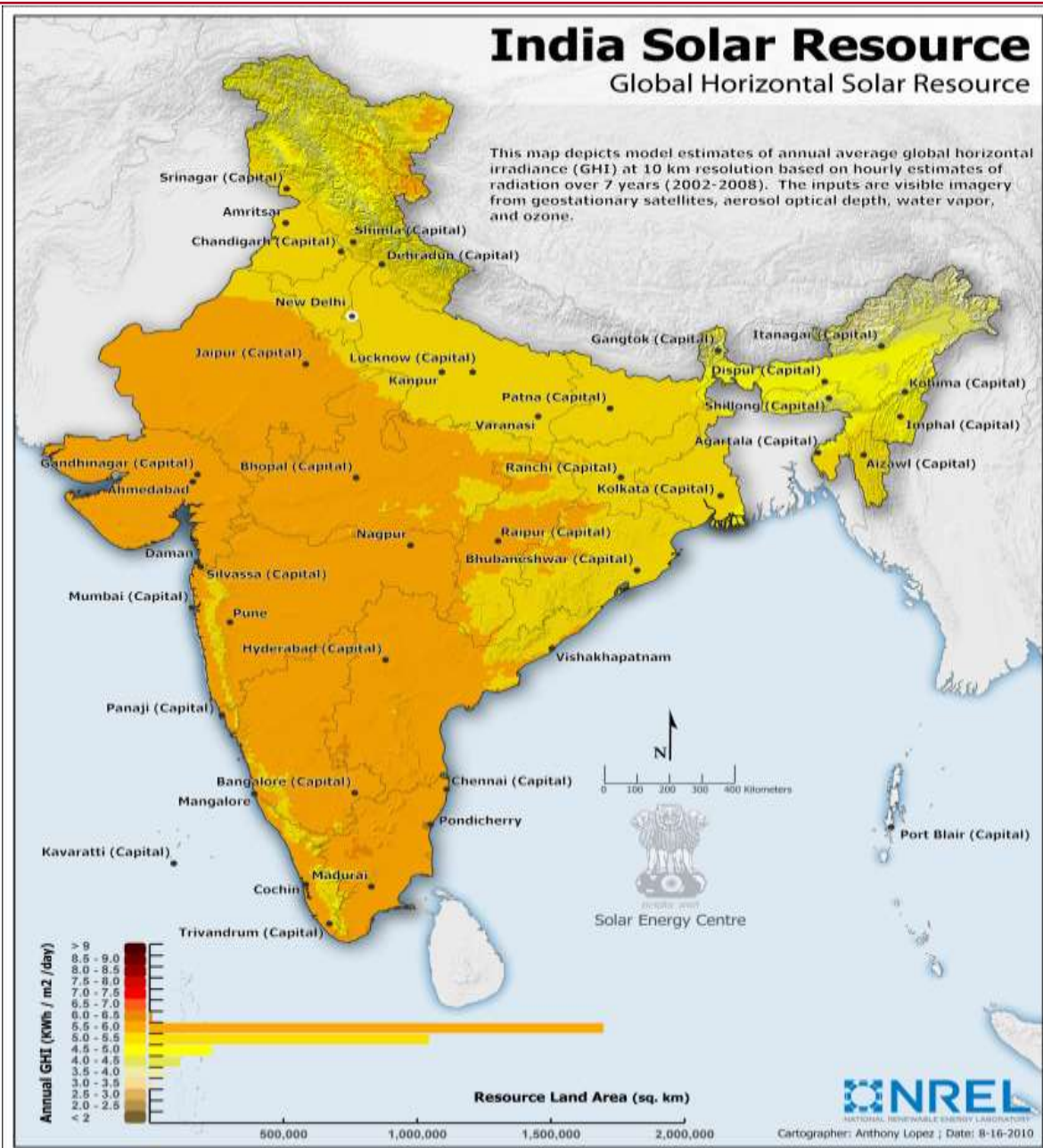


Karnataka Renewable Energy Development Ltd (KREDL), Karnataka

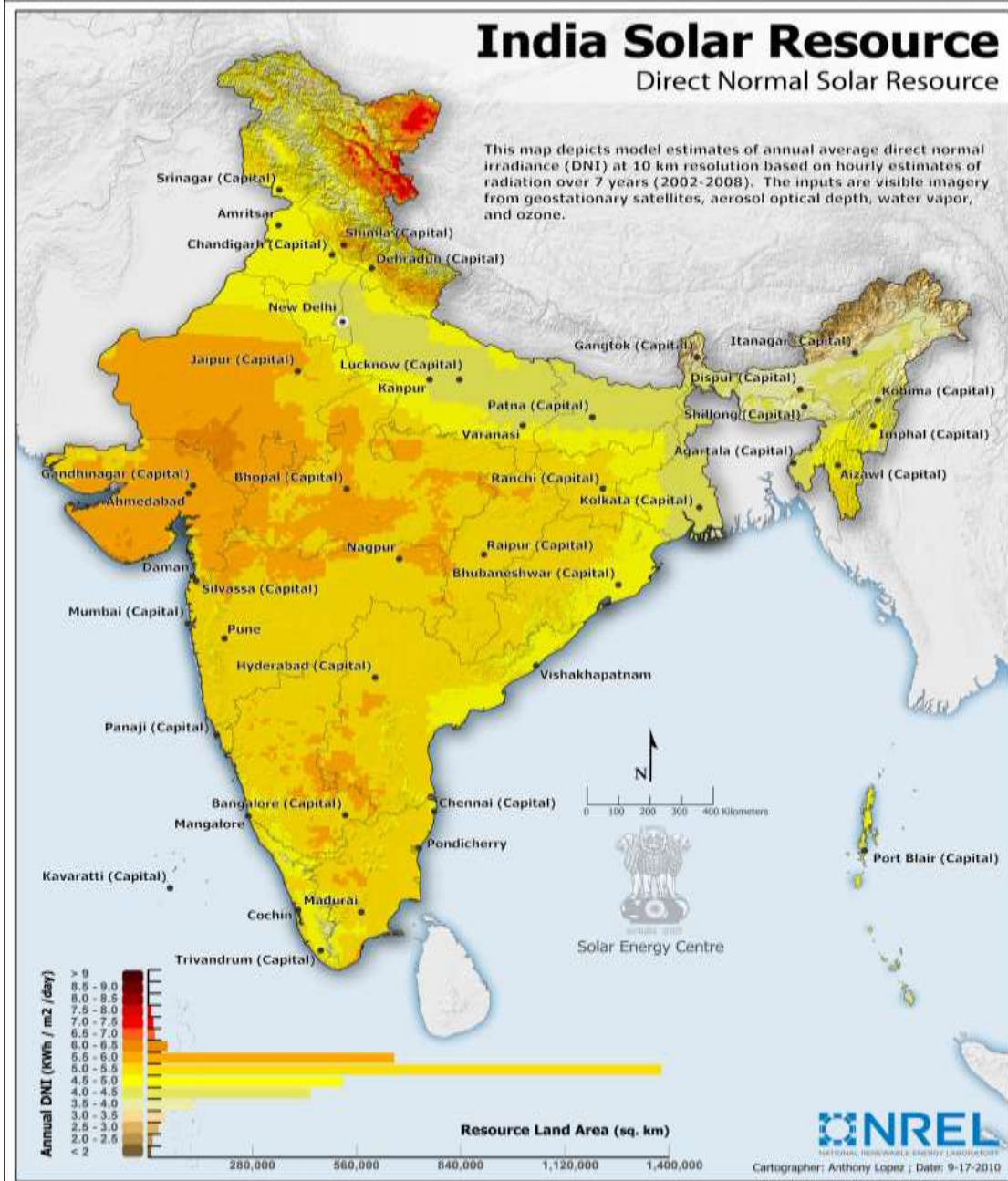
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Solar Radiation Map



Solar Radiation Map



- **Solar Photovoltaic Power (SPV)**
 - Convert sunlight falling on PV cell into D.C. electricity
- **Solar Thermal Power (CSP)**
 - Solar energy is focused through mirrors to heat working fluid
 - Heated working fluid produce steam
 - drive a turbine-generator to produce electricity

SPV: Input Parameters (CERC)

Parameter	Unit	Assumptions
Installed Power Generation Capacity	MW	1
Power Plant Cost	Rs. Lakh/MW	800
Capacity Utilization Factor	%	19
Tariff Period	Years	25
Debt : Equity Ratio		70 :30
Levellised Tariff	Rs/kWh	8.75
Repayment Period (including Moratorium)	Years	12
Interest Rate	%	13
Operation & Maintenance	Rs. Lakh/MW	11.63
O & M Expenses Escalation	%	5.72
International Funding Interest Rate	%	4

- Income Tax :
 - 30% to companies
 - Surcharge on IT : 5%
 - Education Cess : 3%
- Effective IT: $30\% + (30\% * 5\%) + (30\% + (30\% * 5\%)) * 3\% =$
32.45%
- MAT :
 - 18.5% to companies
 - Surcharge on MAT: 5%
 - Education Cess: 3%
- Effective MAT: $18.5\% + (18.5\% * 5\%) +$
 $(18.5\% + (18.5\% * 5\%)) * 3\% =$ **20.01%**

- Tax holiday: 10 years
- Accelerated Depreciation : 80%
- Additional Depreciation for power generation projects : 20%
- Hence, Solar power projects can avail 100% depreciation in the first year

Output

S N	Parameter	Value
1	Project IRR (Pre Tax)	15.15 %
2	Project IRR (Post Tax)	13.83 %
3	Equity IRR	15.22 %
4	Average DSCR	1.38

- **Capacity Utilization Factor**
- **Project Cost**
- **Interest Rate: Domestic Financing**
- **Tariff (Rs./kWh)**
- **Interest rate: International Financing**

Output

S N	Parameter	Value	Status
1	Project IRR (Pre Tax)	14.08 %	↓
2	Project IRR (Post Tax)	12.92 %	↓
3	Equity IRR	13.49 %	↓
4	Average DSCR	1.31	↓

Output

S N	Parameter	Value	Status
1	Project IRR (Pre Tax)	12.81 %	↓
2	Project IRR (Post Tax)	11.82 %	↓
3	Equity IRR	11.48 %	↓
4	Average DSCR	1.22	↓

Output

S N	Parameter	Value	Status
1	Project IRR (Pre Tax)	15.15 %	=
2	Project IRR (Post Tax)	13.91 %	↑
3	Equity IRR	14.54 %	↓
4	Average DSCR	1.34	↓

Output

S N	Parameter	Value	Status
1	Project IRR (Pre Tax)	13.54 %	↓
2	Project IRR (Post Tax)	12.45 %	↓
3	Equity IRR	12.63 %	↓
4	Average DSCR	1.27	↓

Output

S N	Parameter	Value	Status
1	Project IRR (Pre Tax)	15.15 %	=
2	Project IRR (Post Tax)	13.07 %	↓
3	Equity IRR	23.12 %	↑
4	Average DSCR	1.91	↑

Comparative Analysis

Case	Project IRR (Pre Tax) %	Project IRR (Post Tax) %	Equity IRR %	Average DSCR
Base Case	15.15	13.83	15.22	1.38
CUF 1% less	14.08	12.92	13.49	1.31
Tariff Rs. 1/kWh less	12.81	11.82	11.48	1.22
Interest 1% more	15.15	13.91	14.54	1.34
Project cost 10% more	13.54	12.45	12.63	1.27
International Funding @4%	15.15	13.07	23.12	1.91

Even under worst scenario, DSCR is comfortable

CSP: Input Parameters (CERC)

Parameter	Unit	Assumptions
Installed Power Generation Capacity	MW	1
Power Plant Cost	Rs. Lakh/MW	1200
Capacity Utilization Factor	%	23
Auxiliary Consumption	%	10
Tariff Period	Years	25
Debt: Equity Ratio		70:30
Levellised Tariff	Rs/kWh	11.90
Repayment Period (including Moratorium)	Years	12
Interest Rate	%	13
Interest Rate (International Funding)	%	4
Operation & Maintenance	Rs. Lakh/MW	15.86
O & M Expenses Escalation	%	5.72

Tax Assumptions

- Income Tax :
 - 30% to companies
 - Surcharge on IT : 5%
 - Education Cess : 3%
- Effective IT: $30\% + (30\% * 5\%) + (30\% + (30\% * 5\%)) * 3\% =$
32.45%
- MAT :
 - 18.5% to companies
 - Surcharge on MAT: 5%
 - Education Cess: 3%
- Effective MAT: $18.5\% + (18.5\% * 5\%) + (18.5\% + (18.5\% * 5\%)) * 3\% =$ **20.01%**

- Tax holiday: 10 years
- Accelerated Depreciation : 80%
- Additional Depreciation for solar power generation projects : 20%
- Hence, Solar power projects can avail 100% depreciation in the first year

Output

S N	Parameter	Value
1	Project IRR (Pre Tax)	15.13 %
2	Project IRR (Post Tax)	13.82 %
3	Equity IRR	15.19 %
4	Average DSCR	1.37

- **Capacity Utilization Factor**
- **Project Cost**
- **Interest Rate: Domestic Financing**
- **Tariff (Rs./kWh)**
- **Interest rate: International Financing**

Output

S N	Parameter	Value	Status
1	Project IRR (Pre Tax)	14.26 %	↓
2	Project IRR (Post Tax)	13.08 %	↓
3	Equity IRR	13.78 %	↓
4	Average DSCR	1.32	↓

Output

S N	Parameter	Value	Status
1	Project IRR (Pre Tax)	13.45 %	↓
2	Project IRR (Post Tax)	12.38 %	↓
3	Equity IRR	12.49 %	↓
4	Average DSCR	1.26	↓

Output

S N	Parameter	Value	Status
1	Project IRR (Pre Tax)	15.13 %	=
2	Project IRR (Post Tax)	13.90 %	↑
3	Equity IRR	14.51 %	↓
4	Average DSCR	1.34	↓

Output

S N	Parameter	Value	Status
1	Project IRR (Pre Tax)	13.52 %	↓
2	Project IRR (Post Tax)	12.45 %	↓
3	Equity IRR	12.61 %	↓
4	Average DSCR	1.27	↓

Output

S N	Parameter	Value	Status
1	Project IRR (Pre Tax)	15.13 %	=
2	Project IRR (Post Tax)	13.06 %	↓
3	Equity IRR	23.02 %	↑
4	Average DSCR	1.9	↑

Comparative Analysis

Case	Project IRR (Pre Tax) %	Project IRR (Post Tax) %	Equity IRR %	Average DSCR
Base Case	15.13	13.82	15.19	1.37
CUF 1% less	14.26	13.08	13.78	1.32
Tariff Rs. 1/kWh less	13.45	12.38	12.49	1.26
Interest 1% more	15.13	13.90	14.51	1.34
Project cost 10% more	13.52	12.45	12.61	1.27
International Funding @ 4%	15.13	13.06	23.02	1.9

Even under worst scenario, DSCR is comfortable

Input parameters and its sensitivity

Sensitivity - High

Capital Cost

Tariff

**Energy
Generation**



Sensitivity - Moderate

Interest Rate

O&M



Sensitivity - low

**Interest on working
capital**

O&M Escalation factor

**Solar projects, whether
SPV or CSP are
commercially viable
business in present
regulatory regime**

Thank You