

# OVERVIEW OF SOLAR RESOURCE ASSESSMENT IN INDIA



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## Station layout of the standard SRRA stations

- Pyrheliometer (ISO 1st class)
- Pyranometers (ISO 2nd std.)
- temperature
- humidity
- pressure
- rain
- wind

1 min averages

fully autonomous

data transfer via GSM/GPRS



**SRRA station at Sadodar, Gujarat**

# Locations



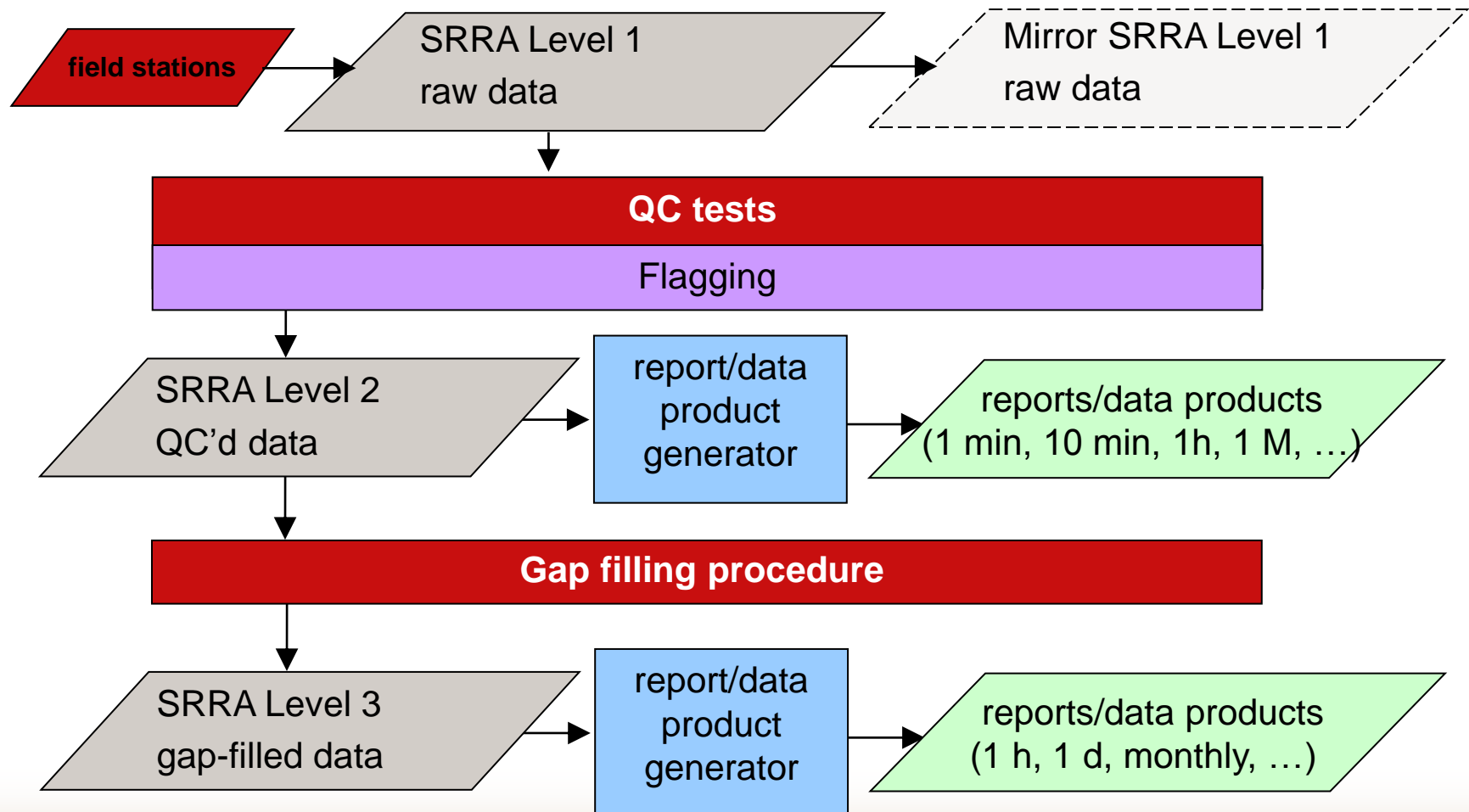
Phase I	51
Phase II	60
MEDA	04
AMS	04
Total	119

- Coal based power plants
- Gas/Oil based power plants



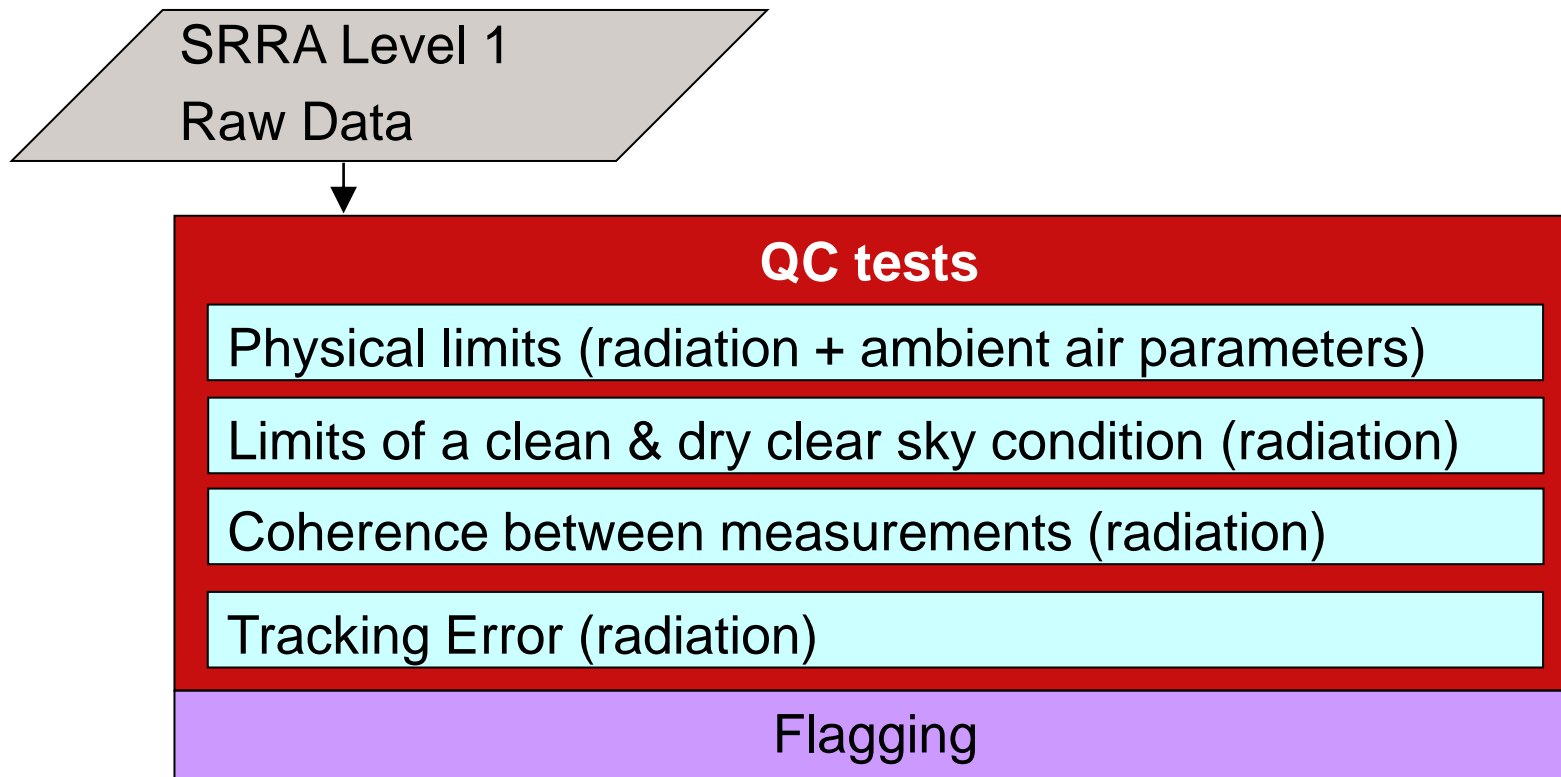


## SolMap – Solar Resource component: data flow





## Quality Assessment

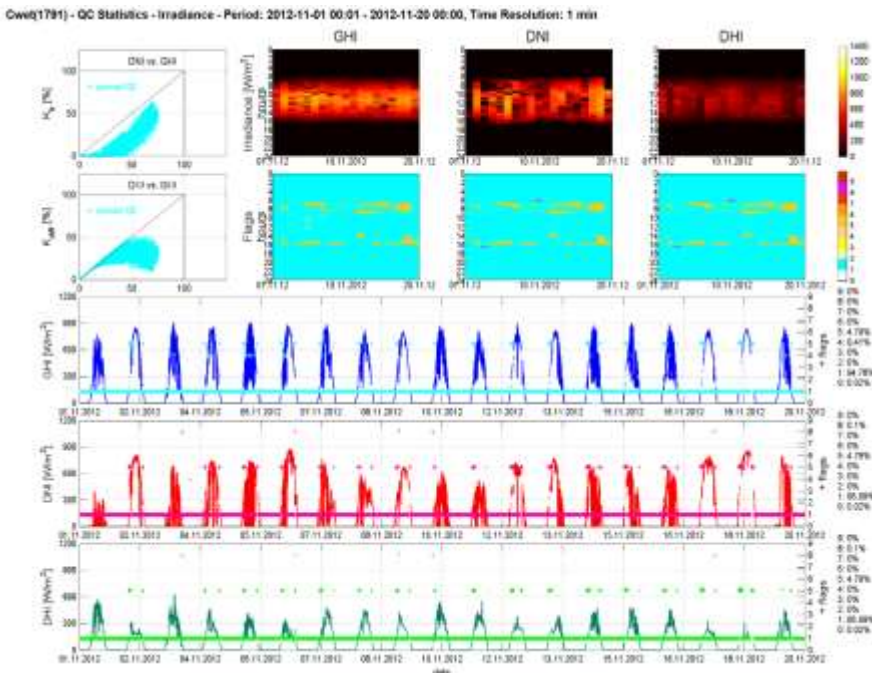




# Quality Check Procedure

Usually daily QC processing of the newest data from L1 to L2

- flagged L2 data
- quality assessment summary sheets
- automatic error alert emails to operators



Government of India  
Ministry of New and Renewable Energy

## Solar Radiation Resource Assessment (SRRA)

Data Analysis jointly implemented under Indo-German Energy Program by MNRE, C-WET & GIZ

### Summary of Monthly Values of Solar Radiation and Meteorological Parameters

Month: August 2012

Station Name	Station ID	State	District	Date of Commissioning	Latitude[°N]	Longitude[°E]	Elevation[m]
Cari	1791	Tamil Nadu	Chennai	2011-03-28	13.08	80.22	1

Prepared by		Reviewed by		Approved by	
Name:	Prasen Kumar S	Name:	Prasen Kumar Das	Name:	GIZ Director
Date:	2012-02-28				

2012-08	GHI	DNI	DHI	Air Temp	RA	AstP	Hum Acc	Wind speed	Wind dir
Average	1.76	186	2.01	19	2.40	77	1000	4.3	2.9
min	0.53	1047	0.38	9	2.40	7	1000	0.0	0.0
max	148.52	189	32.57	39	36.65	99	1000	20.9	74.8

GHI	Global Horizontal Irradiance	Air Temp	Air Temperature	Wind sp	Wind direction
DNI	Direct Normal Irradiance	Hum	Relative Humidity	AstP	Atmospheric Pressure
DHI	Diffuse Horizontal Irradiance	Hum Acc	Hum Accumulation		

Values of all parameters mentioned above are averaged (summed/maximum/minimum) values to 1 minute (scale) over the entire month including night hours. For wind, maximum wind speed refers to 1 or 10 sec values and average wind direction refers to geographical wind direction. Average, Minimum, Maximum and Sum of the daily sums appeared in this month.

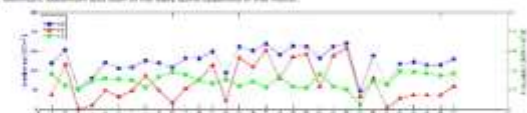


Figure 1: Daily average values of solar radiation (GHI, DHI & DNI)





## Experience from Phase I of SRRA

- World's largest pyrheliometric network of 51 radiation monitoring stations in India with high resolution: installed & operating
- SRRA network operated with an average of 92% correct values during Jan 2012-March 2013
- SolMap implemented the quality control, analysis and made data products from measurement stations
- Solar Data Sharing and Accessibility Policy (2013) of MNRE is in place and data products made available to public: more & more used by industry: drawing considerable attention globally : 39 purchase requests already worth INR 23.8 Lac
- 4 TMYs made by combining SRRA's measured data with satellite based models
- Methodologies adopted are recognised by global scientific community



## SRRA phase II

- By seeing the success of SRRA phase I MNRE initiated phase II
- 60 SRRA stations will be commissioned under phase II covering entire India
- 4 Advanced measuring stations (aerosol and other measurements) will get commissioned
- MEDA ( Maharashtra State government's energy development agency) is funding for additional 4 stations in Maharashtra
- SolMap will have crucial role in data analysis, products generation and technical support in phase II

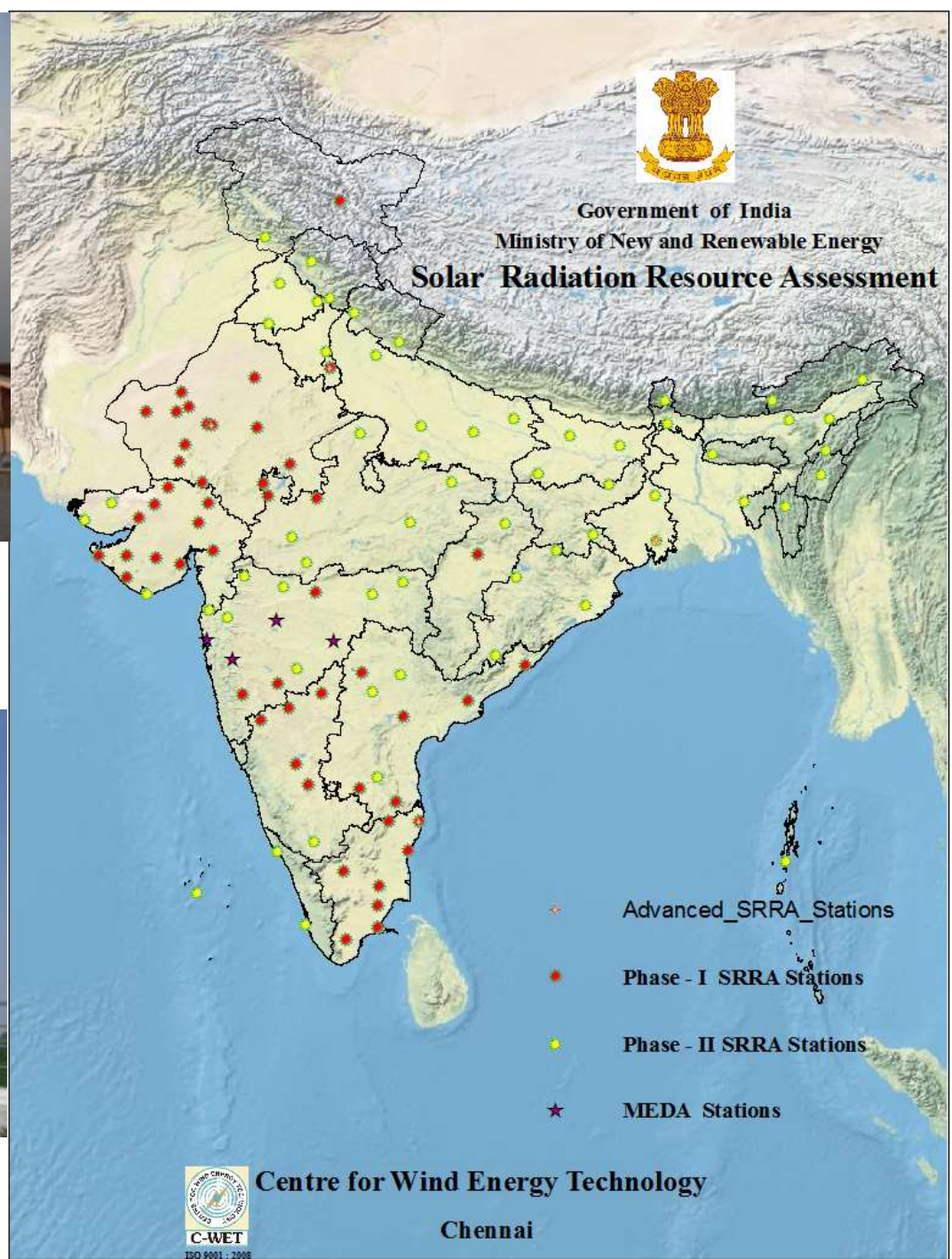




SRRRA phase II: Murthal station



Calibration Lab





## RMSE, MBE, and Correlations (R) Between Satellite-Predicted (NREL 2002-11) and Measured DNI

<b>Station</b>	<b>Hours</b>	<b>DNI (RMSE)</b>	<b>DNI (MBE)</b>	<b>DNI (R)</b>
Amarsagar	2,076	170	60	0.82
Bhogat	1,866	134	60	0.91
Bijapur	2,194	117	52	0.93
CWET	2,377	191	115	0.85
Kadiri	2,337	174	114	0.91





# Thank you

