Progress Report on India one:

- Uniqueness of India One
- Demonstration of combination of Technologies
- Total electrical units generated through India one
- Total savings through India One
- Total carbon emission savings from India One
- Ecological benefits from the campus
- Awareness, Training through India one
- Various collaborations with India One
- Social development and capacity Building

Uniqueness of India One:

"India One" is a **1 MW** electrical Solar Thermal Power Plant with **16 hrs thermal energy storage** allowing for **round the clock operation**. This captive power plant supplies power to Brahma Kumaris headquarters in Abu Road, Rajasthan with total capacity of 25,000 people.

India One" is a **1 MW** electrical Solar Thermal Power Plant has been partly funded by **Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB), Government of Germany within the bilateral "ComSolar" initiative, executed for them through the German development agency, GIZ (Gesellschaft für Internationale Zusammenarbeit) and Ministry of New and Renewable Energy, Government of India under R&D Scheme**

The key features plus Research and Development achievements at India One Solar Power Plant are as follows:

- 770 numbers of 60. square meter parabolic reflectors with unique static focus design, using special solar grade mirrors with 93% reflectivity and equipped with fully automatic dual axis tracking mechanism to adjust daily and seasonally, to the position of the Sun.
- 770 numbers of indigenously designed cast iron cavity receivers, generating directly superheated steam, up to 450 degrees Celsius temperature and 42 bar pressure. Due to the static design, receivers are cost effective and feature long lifetime with minimum required maintenance.

The 60m2 parabolic reflector by tracking the sun, concentrates the solar rays in the static cast iron receiver. Each receiver which is made out of 3 tons of cast iron acts as thermal energy storage for the night or partial cloudy condition. The cast iron core is surrounded by steam coil, which acts as steam generator by exchanging the heat from iron core to water. The high temperature steam runs through turbine connected to generator that produces electricity. "India One" is a captive, off grid power plant providing power for Shantivan complex at Abu Road.

The technology has been developed in-house and it's a good example of **"Make in India"** initiative.

India One Solar Thermal Power Plant got successfully commissioned in the beginning of 2017. It is a good showcase for solar thermal power plants with storage in the world.

First time in the world:

- 60 SQM parabolic reflector designed with space frame structural engineering that gives static focus of high temperature.
- Static cast iron receiver that can be mounted on ground at a fixed location.
- The cast iron receiver that enables 24 hours heat storage capacity.
- 100% automization of the reflector for daily tracking of the sun, for seasonal tracking and for seasonal change adjustments through optical camera-based tracking mechanism.
- Direct super-heated steam generation without any heat transfer fluids (like thermic fluids, molten salt) or any heat exchangers.

Demonstration of combination of Technologies:

Apart from “India One solar thermal Power plant”, at the end of 2018, Brahmakumaris have successfully Installed and commissioned “1 MW Solar Photovoltaic Plant” connected to the Grid.

This plant is commissioned through net metering scheme of state government, wherein the output of this plant is feed into the National grid which in turn gets credited in the net consumption of electrical units by the organization.

Total electrical units generated through India one:

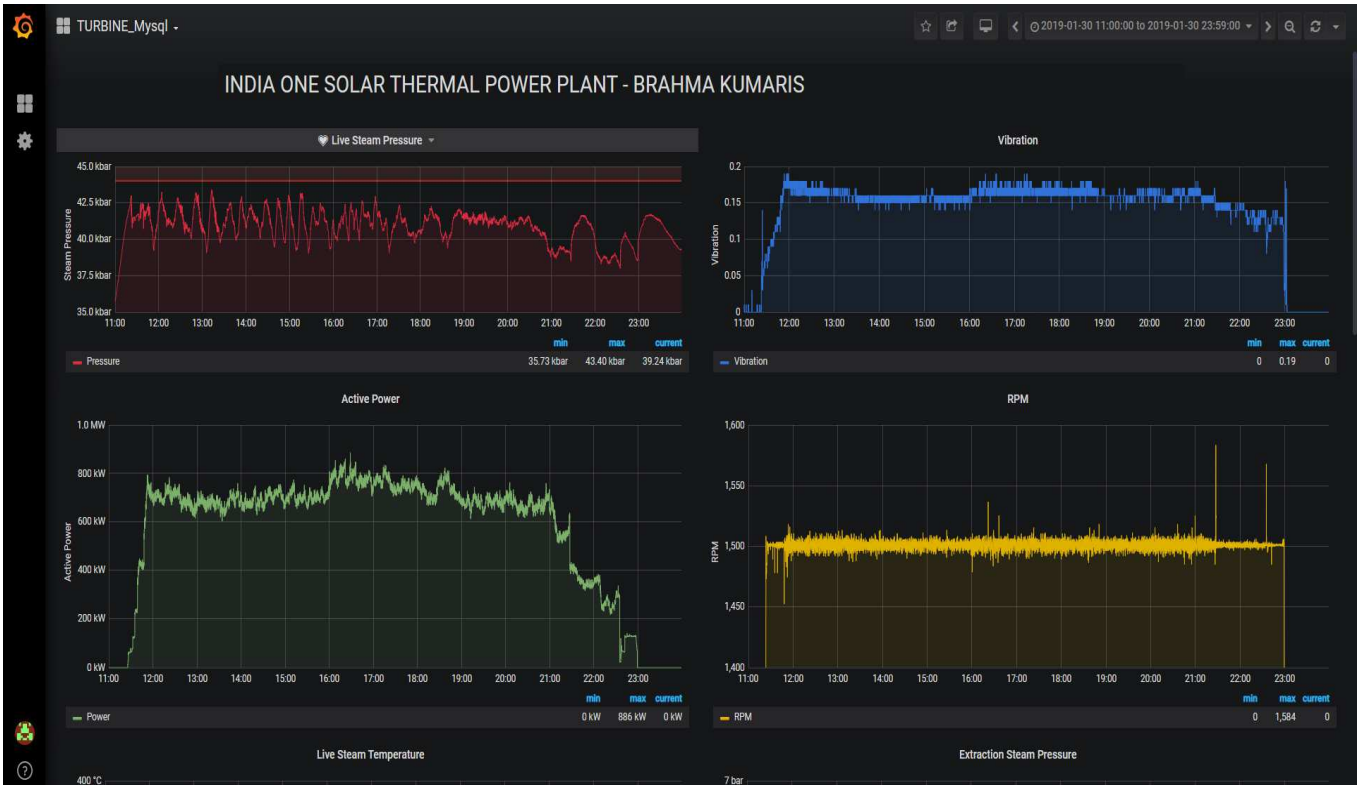
- Avg of 3 million electrical units per year (This includes both Solar thermal and Solar Photovoltaic at India One campus)
- The solar plant is running successfully from last 4 years
- 4 years x 3 million units = Avg **12 million electrical units till date**

Total savings through India One:

- On an average the net savings from India One power generation is around 150,000 USD per year
- The average savings from last 4 years is approx. 600,000 USD till date

Total carbon emission savings from India One:

- On an average the carbon emissions saving from India one power generation is around **2,550 Tons of carbon**
- The average carbon emissions savings from last 4 years is approx. **10,200 Tons of carbon**



Ecological benefits from the campus:

The tree plantation at India-One restores biodiversity, absorbs carbon and prevents dust on the large 60m2solar plates. India-One Solar Plant became operational in 2017, and the tree planting started long before, in 2010. More than 3500 trees of approximately 45 varieties have been planted.

"A mature tree absorbs carbon dioxide at a rate of 48 pounds per year. In one year, an acre of forest can absorb twice the CO2 produced by a car driving an average annual mileage - www.tenmilliontrees.org"

These trees absorb about 42 tonnes of CO2 per year. These trees are performing their duties since last 10 years now.

Sr.No	Name of Tree	Quantity
1	Various wood Tree	550
2	Mango Tree	500
3	Dragon Fruit	250
4	Banana Tree	350
5	Azadirachta indica	150
6	Lemon	150
7	Papaya Tree	150
8	Palm Tree	150
9	Pomegranate	145
10	Sapota	110
11	Teak Wood	90
12	Custard Apple	85
13	Guava	75
14	Moringa Tree	60
15	Polyathia (Ashoka)	55
16	Jungle wood tree	55
17	Ficus Benjamina	50
18	Rose plants	50
19	Orange	40
20	Sweet Lime	40
21	Lychee	35
22	Wild Sweetsop	35
23	Jack Fruit	30
24	Acai Berry	30
25	Gooseberry	25
26	Tamarind	25
27	Bamboo	25
28	Almond Tree	25
29	Coconut	21
30	Pear Tree	20
31	Peach	20
32	Fig Tree	20
33	Jujube Tree	20
34	Betal Leaves	20
35	Water Apple	18
36	Indian Pine tree	10
37	carandas plum	8
38	Mulberry	5
39	Curry Tree	5
40	Ficus religiosa	3
41	Butter Fruit	2
42	cashew	2
43	Big Lime	2
Grand Total		**3511**

India-One Garden

A beautiful and lush garden has been created at the solar field. There are Holy basil plants, mint plants, lemon grass plants, Aloe vera shoots, sugarcane shoots and vegetable plants. The garden is used for meetings and gatherings enjoying the serene atmosphere at the plant.

Harvest

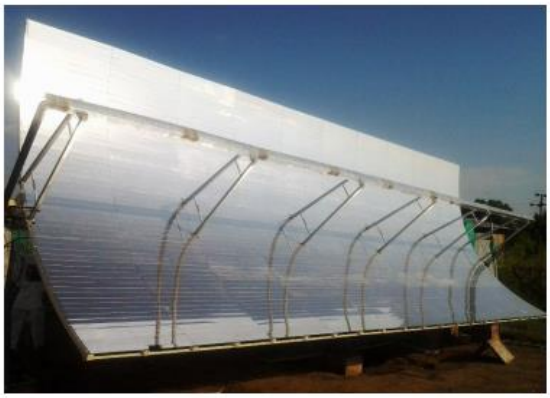
- Approx. 12,000 Alfanso Mangoes harvest per year
- Approx. 50,000 Sapota harvest per year
- Approx. 10,000 lemons harvest per year

Jogging Park of around 2 Kms closed circuit in the lush green tree's surroundings for nature lovers and health conscious visitors.

Ecological zone for many birds and bees.

Awareness Cum Training Center on Concentrating Solar Thermal Technologies:

Ministry of New and Renewable Energy, Government of India under the UNDP-GEF assisted Concentrated Solar Heat Project awarded World Renewal Spiritual Trust with the assignment of Awareness Cum Training Center on Concentrating Solar Thermal Technologies. From 2014 to 2017, more than 500 entrepreneurs, industrialists, institutions, manufactures, academicians and governmental officials took part and benefit from the programs organized by the CST Center.



Various collaborations with India One:

The **World Renewal Spiritual Trust (WRST)** and its parent organization Brahma Kumaris have been actively involved in the research and development of alternative renewable energy concepts for more than 15 years. Apart from being an expression of respect for the natural resources and providing sustainable energy for the BK community, it has also been an opportunity to work together with other organizations and institutes to learn and share new technologies for wider use.

Research Collaboration with various organizations and institutes:

- **In 1996,** R&D Demonstration with GTZ (Deutsche Gesellschaft fur Technische Zusammenarbeir GmbH – GATE (German Appropriate Technology Exchange) – Installation and Testing of Solar cooking plant for canteen Kitchens in India
- **In 1998**, R&D Demonstration with MNRE (Ministry of New and Renewable Energy), GOI, "Development and demonstration of improved solar steam cooking system for 10,000 people at Abu Road
- **In 2004**, R&D demonstration with MNRE (Ministry of New and Renewable Energy), GOI, "Development and Testing of 16m2 Parabolic Dish with cavity Receiver for a solar steam system
- **In 2010,** R&D demonstration with MNRE (Ministry of New and Renewable Energy), GOI, "Implementation of an R&D cum Demonstration project – 1 MW el. (3.5 MW) solar thermal power plant with 16 hours thermal storage for continuous operation"
- **In 2011,** Recognition as Scientific and Industrial Research Organization (SIRO) with Ministry of Science and Technology, GOI
- **In 2014**, with UNDP-GEF Concentrated Solar heating Project – Ministry of New and Renewable Energy, GOI – Development of Awareness cum Training Centre on Concentrated Solar Technologies at Brahma Kumaris, Shantivan, Abu Road
- **In 2016,** Research Collaboration with IISc Bangalore for "Development of High Integrated Receiver for supercritical Co2 integrated with static focus Parabolic Dish
- **In 2018,** with Indian Institute of Technology, Bombay, "Design and Development of a Single Cylinder Free Piston Sterling Engine (FPSE) for net 3kW Electrical Output using Solar Energy as input"

Social development and Capacity Building:

One of the aims of India One Solar Plant has been to build capacity and contribute to creation of the sustainable local communities. It is being achieved by:

- **creating employment for 300 local tribal people for 3 years,**
- **skill development of neighborhood inhabitants,**
- **overall improvement in their wellbeing with health checkups,**
- **de-addiction camps,**
- **provision of clean drinking water,**
- **meditation courses.**

Awareness cum documentary on solar thermal for visitors:

Every Year nearly 1 million visitors and tourists visit India One Solar Thermal power plant. These visitors are given Plant tour, basic knowledge and awareness on solar and documentary film in two languages. (English and Hindi)