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Ministry of New & Renewable Energy (MNRE)

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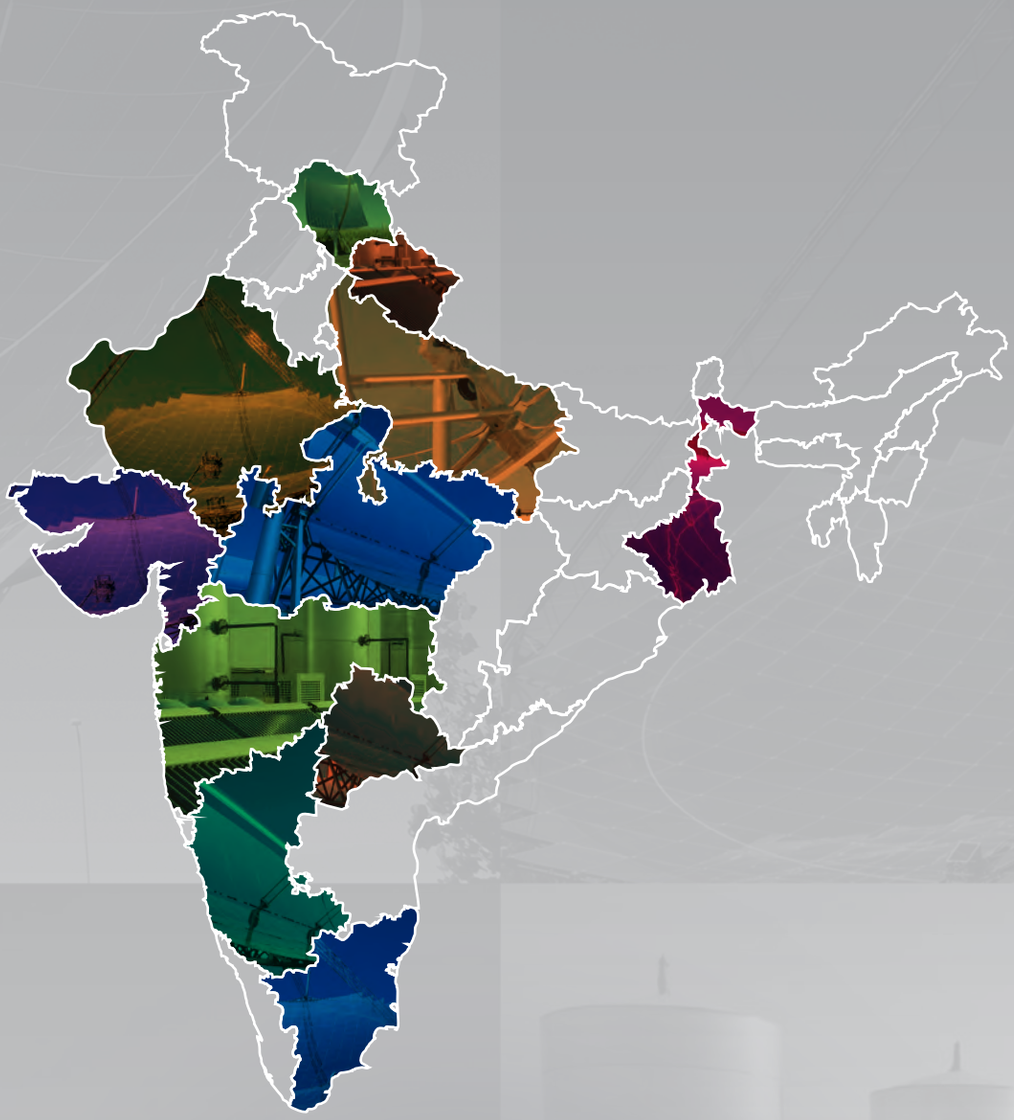

WORKSHOPS ON CST APPLICATIONS IN INDUSTRIES

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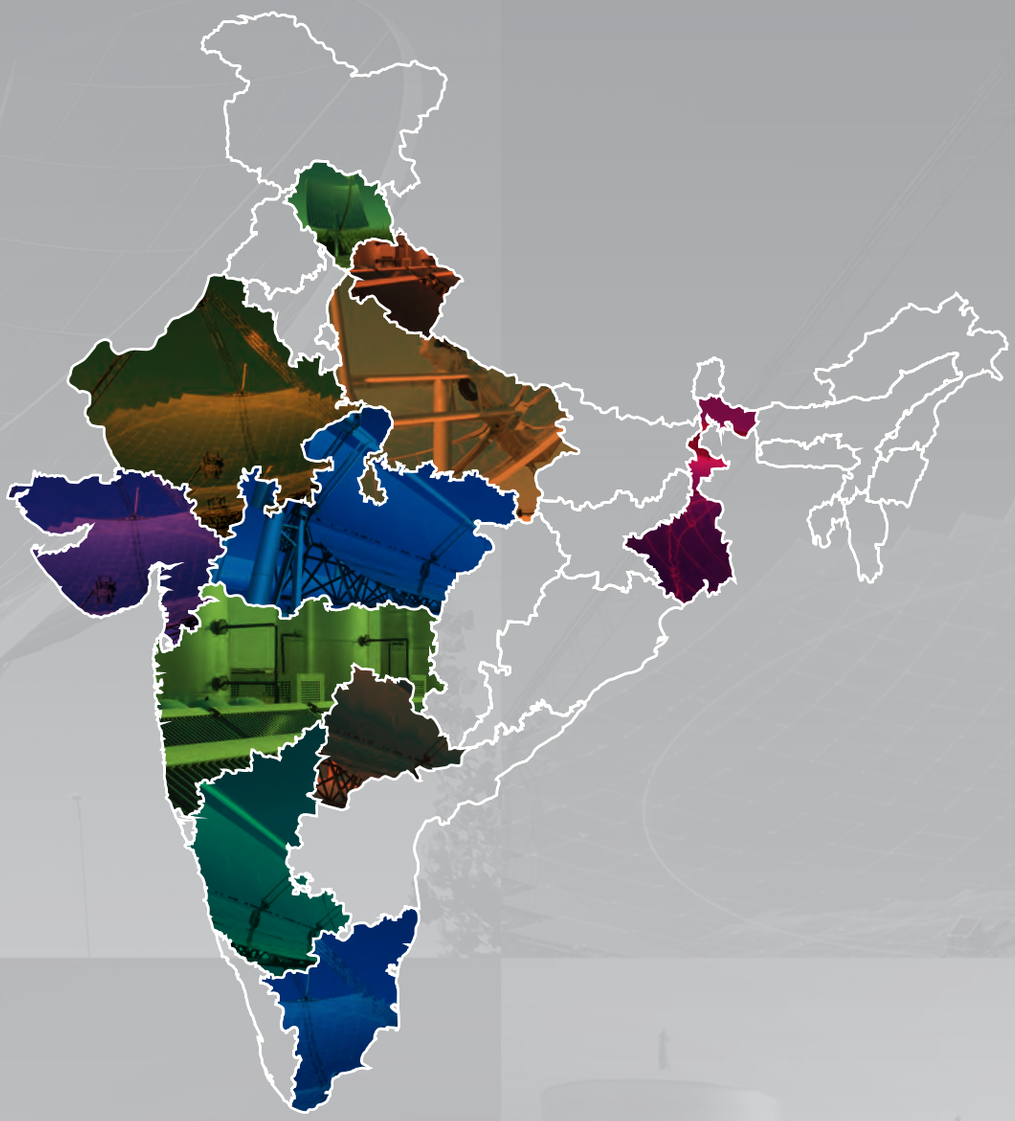

WORKSHOPS ON CST APPLICATIONS IN INDUSTRIES

KREDL

RREC

WBREDA
Department of Power and N.E.S. Govt. of West Bengal

HIMURJA

TEDA

GEDA
GUJARAT ENERGY DEVELOPMENT AGENCY
(A GOVERNMENT OF GUJARAT ORGANIZATION)

UNEDA

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List of Abbreviations

Baddi Barotiwala Nalagarh Development Authority	BBNDA
Concentrated Solar Thermal	CST
Direct Normal Irradiance	DNI
Global Environment Facility	GEF
Gujarat Energy Development Agency	GEDA
Green House Gases	GHG
Himachal Pradesh Energy Development Agency	HIMURJA
Jawahar Lal Nehru National Solar Mission	JNSSM
Karnataka Renewable Energy Development Ltd	KREDL
Maharashtra Energy Development Agency	MEDA
Ministry of New and Renewable Energy	MNRE
Madhya Pradesh Urja Vikas Nigam	MPUVN
Ministry of Micro, Small and Medium Enterprises	MSME
National Project Manager	NPM
Perform Achieve Trade	PAT
Public Private Partnership	PPP
Renewable Purchase Obligation	RPO
Rajasthan Renewable Energy Corporation Ltd	RRECL
Solar Heat Obligation	SHO
State Industrial Development Corporation of Uttarakhand Limited	SIDCUL
Southern India Engineering Manufacturers' Association	SIEMA
Tamil Nadu Energy Development Agency	TEDA
Telangana New and Renewable Energy Development Corporation Ltd	TNREDCL
United Nations Industrial Development Organization	UNIDO
Uttar Pradesh	UP
Uttar Pradesh New Energy Development Agency	UPNEDA
Uttarakhand Renewable Development Agency	UREDA
West Bengal Renewable Energy Development Agency	WBREDA

Table of Contents

Foreword 1

State-level Series of Awareness Generation Workshops conducted under the MNRE-GEF-UNIDO Project 3

MNRE-GEF-UNIDO Project 4

State 1: Uttarakhand 10

State 2: Himachal Pradesh 13

State 3: Gujarat 15

State 4: Karnataka 18

State 5: Madhya Pradesh 21

State 6: Tamil Nadu 24

State 7: Maharashtra 27

State 8: West Bengal 30

State 9: Uttar Pradesh 31

State 10: Rajasthan 33

State 11: Telangana 35

Foreword

India's need for energy is ever increasing and this particularly amplified in the last decade. With growing demand for energy, the dependence on conventional fuels has increased, greatly impacting the fuel price on the higher side as well. As a result of the increasing development in India, energy demands and it's associated costs have risen on almost a daily basis. Indian industrial sector has been witness to these changes closely. Industrial sector is responsible for 45% of the energy demand of the country. A huge amount of fossil fuels are being consumed to meet the electricity and fuel oil demand from the industrial sector. Providing an alternative innovative solution to meet heating/ cooling demands of the industrial sector is the Concentrating Solar Thermal (CST) technology.

From the perspective on natural resources, India enjoys abundant sun energy. Harnessing this natural resource through innovative technologies can help lessen the burden on fossil fuels and continue the upward trends of country's development.

CST presents a suitable option to reduce the dependence of the India's vibrant industrial sector on conventional fuels. Each of these types of CST technologies differ in the peak temperatures produced and correspondingly varying thermodynamic efficiencies, due to the differences in the way that they track the sun and focus light. New innovations in this technology are leading systems to become more and more cost-effective. The technology can be applied to various applications which include process heating needs in industrial sectors, cooking applications, laundry, space cooling, cold storages,

With rich solar resources in the backdrop, the Government of India has recently modified Jawaharlal Nehru National Solar Mission (JNNSM) introduced in 2010 with a target of 20 GW solar power to an ambitious 100 GW solar power by 2022. Government's emphasis on solar energy is due to the fact that it produces clean and emission free energy while reducing country's dependence on fossil fuels. Apart from power generation, solar energy through the use of CST technologies can also play an important role in saving fuel used for heating and cooling applications in industrial, institutional and residential sectors.

The series of workshops being conducted under the MNRE-GEF-UNIDO project provided the perfect opportunity to create awareness among the industrial sector towards the benefits of adoption such technologies. Furthermore these workshops also allowed the project to discern some of the loopholes when looking at on ground application of CST technologies in the country. With various discussions being held in different parts of the country, the project also was able to gather other areas of applications for CST sectors such as working with power plants which have enough requirement for hot water.

State-level Series of Awareness Generation Workshops conducted under the MNRE-GEF-UNIDO Project

January – September 2016

UNIDO, jointly with MNRE, organized a series of awareness workshops since beginning of the year 2016 in different states in association with the respective State Nodal Agencies (SNAs). Table below provides details of the locations of each of the workshops. These workshops were coupled with visits to CST project sites, and presentations by their owners about their actual experiences with the systems. A total of 11 workshops and 17 site visits were conducted as a part of this campaign.

The workshops were attended by about 1000 participants and brought together 11 SNAs, 15 Channel Partners/ Manufacturers of CST technologies and 23 existing consumers of CST technologies. They provided a platform to get in touch with potential consumers and helped the PMU build a pipeline of projects that would be supported under the MNRE-GEF-UNIDO project.

The schedule of the workshops is provided below:

S.No.	State	Location	Site Visit Date	Workshop Date
1	Uttarakhand	Haridwar	11 January 2016	12 January 2016
2	Himachal Pradesh	Baddi	-	21 January 2016
3	Gujarat	Ahmedabad	25 February 2016	26 February 2016
4	Karnataka	Bangalore	17 March 2016	18 March 2016
5	Madhya Pradesh	Bhopal	21 March 2016	22 March 2016
6	Tamil Nadu	Coimbatore	01 June 2016	02 June 2016
7	Maharashtra	Pune	23 June 2016	24 June 2016
8	Andhra Pradesh	Hyderabad	30 June 2016	01 July 2016
9	West Bengal	Kolkata	-	15 July 2016
10	Uttar Pradesh	Lucknow	-	22 July 2016
11	Rajasthan	Jaipur	28 July 2016	29 July 2016

This report has been divided into Sections. The first section provides a summary of the common key takeaways from the entire series along with details of the MNRE-GEF-UNIDO project and the CST scheme being regulated by the Government of India through MNRE. The second section covers each workshop separately highlighting specific takeaways and outcomes from each of them.

MNRE-GEF-UNIDO Project

Project Title:	Promoting business models for increasing penetration and scaling up of solar energy
Project start Date:	01 January 2015
Duration of the project:	5 years

Introduction

UNIDO in cooperation with MNRE is implementing a Global Environment Facility (GEF) funded project on accelerating adoption of CST technologies by India's industrial sector.

The overall objective of the MNRE-GEF-UNIDO project is to develop business models for promoting solar energy based heating/cooling and, where feasible, tri-generation projects (combining power, heating, cooling) through different CST technologies in industries and commercial sectors with a view to replace fossil fuels and reduce greenhouse gas (GHG) emissions. The project mainly targets the medium temperature range (150-450 °C).

The project focuses on demonstrating technical and financial viability of CST projects and thereby enhancing local manufacturing capability for industrial applications. Other results, the project aimed at achieving are:

- Installation of 15 to 25 demonstration projects and 50 replication projects, with built-in financial support to be obtained through MNRE subsidy, GEF-UNIDO support and loan from IREDA and other potential banks
- Aim of the project has been to strengthen the policy and institutional framework at both the national and state level for medium and high temperature applications in selected industrial & commercial sectors
- Technology packages were developed for planning and operating demonstration projects and steps recommended for removal of financial barriers in the adoption of CSTs

- A pipeline for replication has been developed for assisting similar projects elsewhere in the country. Technology standards, required certifications for components and performance guidelines were developed as well
- The capacity of different levels of key players is being enhanced in the target industries, as well as the documentation of best practices on solar energy based medium and high temperature to bridge the current gap between the research level and the industrial sectors would be undertaken.

Project Objective

While preparing the project, key issues for the adoption of CST technologies were identified. These major barriers include lack of awareness, lack of confidence among the potential users and finally the financial barrier in terms of higher costs and unattractive payback periods. The project has been designed to complement MNRE's support programme and to overcome these barriers associated with CST sector. During its five years duration, the project will assist in the commercialization of CST technologies by innovating the technical and financial support (the two key elements of the project). In addition the project aims to provide technology application information packages and standardization of CST performance measurement.

Target industrial sectors

Applications of solar heat at medium and high temperatures would be considered during the project in the following industrial sectors.

S. No.	Sector	S. No.	Sector
1	Textiles (Weaving, Finishing)	8	Rubber
2	Pharmaceuticals	9	Chemical & Fertiliser
3	Tobacco	10	Petroleum Refineries
4	Breweries	11	Desalination
5	Pulp & paper	12	Ceramic tile & pottery
6.	Electroplating	13	Plaster of Paris, Steel re-rolling, Cement, Mining
7	Food processing (including Dairy & Sugar)	14	Other industries including tertiary using steam or cooling

Technological support: Details

The project aims at reaching 45000 m2 of CST collector area applied in the Indian industrial sector leading to an emission reduction of 39000 tonnes of CO2. Out of a large number of industrial sectors, specifically 14 sectors were identified where the use of CST technologies is most suited. PTC, dish collectors of different types and LFR systems are the prominent CST technologies identified for this project. UNIDO is developing technology packages and standards for equipment. The formats for

EOIs and DPRs are available and can be requested from UNIDO. The DPR will also include detailed integration engineering which remain a lacuna in most projects so far

Financial support: Details

To address the financial bottleneck, UNIDO has partnered with IREDA to develop a financial model in which a bridge loan against subsidy could be provided. Through this package, the capex needs during the design and installation phase of the project would be addressed. IREDA would bundle the funds including the subsidy amounts from MNRE, UNIDO's funds for 5 percent interest subvention and IREDA's own funds which will be disbursed as loan in the form of a single financial package by IREDA. Through this financial package, 75 per cent of the project cost would be available at the start of the project.

Soft loan Scheme

The Loan scheme aims to provide upfront financial assistance to beneficiaries to overcome the financial constraints faced in the adoption and penetration of CST technologies. Under this scheme, financial assistance is available for up to 75 % of the CST project costs.

Scheme Highlights

Part A: Soft Loan From Ireda

Rate of Interest	7%	After considering UNIDO interest subvention
Repayment Period	7 years	1 year moratorium + 6 years repayment

Part B: Bridge Loan against MNRE Subsidy

Rate of Interest	12%	The rate is applicable till the project is commissioned. On commissioning, the MNRE subsidy will be passed to the project and the bridge loan will be closed

Note: *The Project would be eligible for interest rebate of 1 % in the event of Borrower furnishing security of Bank Guarantee/ Pledge of FDRs as the primary security, equivalent to the amount sanctioned by IREDA for both soft loan and bridge loan.*

Indicative Project Cost Structure:

Minimum Promoters Contribution	25%
Soft Loan	45%
MNRE Subsidy	30%
Total	**100%**

Note: *Quantum of Soft Loan will depend on the MNRE subsidy and approval by UNIDO-PMU. The Project would be eligible for interest rebate of 1 % in the event of Borrower furnishing security of Bank Guarantee/ Pledge of FDRs as the primary security, equivalent to the amount sanctioned by IREDA from Scheduled Commercial Banks as described in RBI Act or Unconditional or Irrevocable guarantee from All India Public Financial Institutions with "AAA" or equivalent rating*

MNRE's CST Scheme

Within the sustainable energy basket, the CST technology programme is playing a significant role in the off-grid and decentralized solar applications. Now the need of the hour is to adopt environmentally benign energy sources by sectors that consume conventional fuels.

MNRE, Government of India is implementing the "Off-Grid and Decentralized Solar Applications" scheme to promote the use of CST technology. The initiative aims to promote applications of CST technologies in the industrial sectors, commercial establishments and other institutions. CST technologies can be used to provide steam/ hot oil/ pressurized water in the temperature range of 90 - 300˚C for various applications including community cooking, laundry, space cooling etc. While community cooking has become a popular application in both educational and religious organizations, CST technologies are being increasingly adopted to meet the process heat requirements in dairying, pharmaceuticals, chemicals, textiles and many other industrial sectors. The country has installed over 200 systems covering more than a total area of around 45000 m2 in various parts of the country.

MNRE is providing a Central financial assistance (CFA) of 30% of the system cost to promote the use of solar in these remote locations. In hilly areas, north-eastern regions and islands an increased subsidy of 60 per cent in is provided to non-profit bodies and institutions. Other incentives include accelerated depreciation benefits. Besides this, through the multilateral agencies such as UNIDO additional support in the form of soft loans, capacity building efforts, awareness generation and knowledge transfer is being provided. This is the right opportunity for all potential beneficiaries to enter into this sector, especially considering the limited span of the additional support being provided for this sector. In a nutshell, up to 50 % financial incentive is provided to CST projects through the MNRE scheme and the additional support from MNRE-GEF-UNIDO CST project.

Key take-aways from the Series of Awareness generation workshops

- Parabolic trough collector (PTC), dish collectors (fixed focus and paraboloid), Linear Fresnel Reflector (LFR) systems and Compound Parabolic Collectors are the prominent CST technologies.
- A majority of applications in the industrial processes are in temperatures ranging from 50°C to 250°C and this temperature range can easily be provided by solar technologies. There is a strong emphasis on the usage of the solar concentrator technology by integrating it into the industrial process. The thermal systems like boiler etc. have to be retained and not discarded. The industrial process can be 100 % reliant on using the traditional thermal energy during non-solar hours and during solar hours, the utility will run at reduced capacity based on the solar thermal output.
- In the CST sector, most systems and its integration require a high degree of customization as per the beneficiary's temperature and pressure demand .
- MNRE is promoting CST based systems for process heat, community cooking and space cooling applications in various sectors and is providing financial support for commercial organizations under the off-grid scheme. In terms of economics, currently the financial incentive provided for CST installations by MNRE includes a subsidy of up to 30 per cent of the solar project cost provided by MNRE. Tax benefits from the Government are also available in the form of accelerated depreciation (AD) in the first year. MNRE has plans to standardize certain product specification so as to have assured quality and reduced prices.
- UNIDO through the MNRE-GEF-UNIDO CST project is extending additional support for the CST sector. The main objective of the UNIDO project is to support the ongoing CST programme of MNRE. Under this project, UNIDO plans to complete the installation of demonstration projects with the objective of reaching 45000 m2 of CST collector.
- UNIDO is developing a financial package in partnership with IREDA to provide a short-term bridge loan against subsidy at normal interest rates at the beginning of the project and the remaining project cost (45-50 per cent) in the form of loan at sub-vented rates (reducing normal interest rate by 5% by using funds from UNIDO). In this manner, 75 per cent of the project cost can be considered upfront for the provision of loan. UNIDO also has funds (500,000 USD) to provide financial support to manufacturers of CST components for enhancing existing facilities and establishing new facilities.
- While 1 square meter area of reflector provides 3.5-4 kg steam per day, the final output depends on the radiation and climatic condition at the site.

- The investment payback usually depends on the cost of the substituted fuel. If more expensive fuels (furnace oil, diesel or piped natural gas) are being substituted, payback periods could range from 3-4 years. If cheaper fuels are being substituted, the payback period would be 5-7 years. For cooling application, the payback is longer as these applications are seasonal.
- There is also a lack of financial assistance for Research and Development (R & D) in CST technologies. Steps are required in improving performance and ensuring durability of various components especially reflectors and receivers. Under the MNRE-GEF-UNIDO project there is a possibility to work on R & D in CST technologies however the final approval would be based on the technical competence of the submitted proposal.

State 1: Uttarakhand

Location:	Haridwar
State Nodal Agency:	Uttarakhand Renewable Energy Development Agency (UREDA)
Site Visits:	11 January 2016

Site visit conducted in Uttarakhand was the first ever visit conducted as part of the state-level series of awareness generation workshops being held under the MNRE-GEF-UNIDO project. The site visit in many ways sets the tone for the site visits that would be held across the country as a part of this series. The site visit included CST installations for industries and educational institutes exemplifying process heating and cooking applications respectively by CST technologies.

Site 1: TTK Prestige, Roorkee – Compound Parabolic Collectors

TTK Prestige has installed CST system on their rooftop at their manufacturing facility in Roorkee. TTK Prestige, known for manufacturing cooking vessels use large quantity of diesel for their process heating needs. The company has opted to install 60 Compound Parabolic Collectors (CPC); a type of CST technology; covering a total area of around 200 m2. The system provides hot water at temperature of around 95°C for the company's washing plant of cooker. After the installation, diesel consumption has reduced by almost 30 %. The physical configuration of a CPC collector is a combination of reflector with evacuated tube collector tube. It is a combination of both concentrators and it works on cloudy/diffused radiation days also. Even in low radiation it could heat generate pressurized hot water above 100°C.

Site 2: Indian Institute of Technology, Roorkee – Scheffler Dishes

IIT Roorkee adopted the solar thermal technology to meet its thermal energy requirement for cooking purposes. The roof-top installation includes 61 collectors based on the dish type parabolic solar concentrator technology covering a cumulative collector area of 976 m2 provided by Taylormade Solutions The single axis automatic sun tracking installation covers 9 hostel messes and meets the cooking requirements of about 5000 students leading savings of 234 tons annually. The CST system provides equivalent heat to 5,000 cylinders of 14.2 kg LPG annually. The system was commissioned in Oct 2015 with 20 years contract. All the solar systems are put into operation at around 8.00 A.M. and the steam required for cooking is achieved at around 10.00 A.M. The steam is generated at 10 bar pressure. On cloudy days, there is an automatic switching system to LPG based backup.

Workshop: 12 January

Workshop on Concentrating Solar thermal Technologies for Industries, Haridwar

Uttarakhand workshop, the first awareness generation workshop organized under the series initiated by MNRE-GEF-UNIDO CST project, was a full-day workshop organized on January 12, 2016 in Haridwar, Uttarakhand on with the aim of promoting innovative solar technologies. The workshop was organized in two sessions. The first session focused on CST technologies for the industrial sector and the second session concentrated upon solar-wind Hybrid & solar roof top technologies. The workshop was chaired by Mr. Ashish Joshi, Director, UREDA.

The first session's panelists included (L-R) Dr. Anil Misra, National Project Manager (NPM), UNIDO; Representation from UREDA; Mr Ashish Joshi, Director, UREDA; Dr. R P Goswami, Director, MNRE and Mr. H K Garg, President, State Industrial Development Corporation of Uttarakhand Limited (SIDCUL).

The second session focused on Solar Rooftop and SolarWind Hybrid Systems. The panelists in the session included (L-R) Mr A KTyagi, Chief Project Officer, UREDA; Professor Arun Kumar, IIT Roorkee; Mr Ishant Choudhry, Project Engineer, UREDA; Mr J P Singh, Former Director, MNRE; Mr Pankaj Mishra, DGM, Visa Power Tech and Mr Alex Daniel, XZERES.

Key Takeaways

The main message that came out from the Uttarakhand workshop was that the state is looking forward to a powercut-free future as the industry is facing several challenges in terms of availability of power.

- In Uttarakhand, currently 17 CST systems with a capacity of nearly 2211 m^2 have been installed in various Institutions in nine sites. Many installations are coming up as well.
- Industries are encouraged to capitalize this opportunity by availing benefits being offered by the Government and the multilateral organizations.
- Incentives being offered to CST are time-bound therefore to facilitate adoption of these technologies it is important to make industry more aware about the incentives given for these technologies and its applications across the industrial sectors by the industrial sector.
- While there is a strong interest amongst stakeholders (institutes, industry, schools etc.) to deploy CST technologies, there is a need to provide more information on technology solutions and their cost effectiveness.
- Given the climate change challenge, deployment of renewables has now become a matter of survival. To control emissions, 40 per cent energy will be met by renewable sources in 2030.
- There is a huge potential in the state for options like solar cold storage. Market volume needs to be increased. Given the incentives available, the use of solar cookers and solar gadgets needs to gain momentum across the country.

Outcomes

- SIDCUL with the help of CII committed to readying a pipeline of projects within three months given the potential to deploy CST applications in the state and the support being provided by UNIDO, MNRE and the state Government.
- In Uttarakhand, in the next two to four years there will be huge opportunities in terms of availability of funding options. The central government will provide all support required for any innovative projects that educational and/or industrial institutes would like to invest in. Some minimal contribution to the extent of 10 to 15 per cent will need to be provided by the state.
- CST should not be limited to cooking only. The steam generated can be used for several industrial applications.

State 2: Himachal Pradesh

Location:	Baddi
State Nodal Agency:	Himachal Pradesh Energy Development Agency (HIMURJA)
Site Visits:	21 January 2016

The 2nd workshop was organized in Baddi, Himachal Pradesh on January 21, 2016. The workshop was chaired by Mr. Lalit Jain, Chief Executive Officer (CEO), Baddi Barotiwala Nalagarh Development Authority (BBNDA) and was moderated by Dr. Anil Misra, National Project Manager, UNIDO. Members at the dais included (from L to R) Mr. Rajiv Agarwal, Chairman, CII Himachal Pradesh State Council; Mr Lalit Jain, CEO, BBNDA; Dr. R.P. Goswami, Director-CST, MNRE and Dr. Anil Misra, NPM, UNIDO.

Key Takeaways

- Mr Lalit Jain CEO, BBNDA, emphasized on usage of solar energy for Industries.
- He further shared that BBNDA is ready to assist Ministry in encouraging CST technologies in Baddi Barotiwala and Nalagarh area and added that BBNDA would be happy to partner with MNRE in implementing the programme in the area and assured his full support.

- He further reiterated that Ministry should choose BBNDA as nodal agency for implementing solar technology schemes of the Ministry in Baddi area. He further added that access to funds for small or big industrial units play a vital role in their successful transition towards renewable energy. He urged the Ministry to provide a platform to the interested individuals and parties to avail direct benefits of solar power.
- MNRE should prepare some innovative and affordable financial model so that industries specifically small and medium units can adopt solar technology especially CST.
- Key applications that CST systems could be used for in this region include boiler feed water pre-heating; generating steam for the processes; dry air requirements and community cooking applications. Replacing the existing systems in the sites of these companies with CST solutions would result in significant fuel savings and reduction in carbon emissions.
- Fully automated CST technology solutions which require minimal maintenance, have a long life of over 15 years and offer potential savings are being provided by technology solution providers. These providers are listed on the MNRE website. These systems are ideally suitable for Indian conditions where installation space is always a constraint and require minimal operator intervention and maintenance.

Outcomes

- CII & BBNDA can collaborate in setting up a common platform for industries interested in installing CST systems in Baddi and neighboring areas.
- MNRE extended all support to CII and BBNDA for the setting up of a Taskforce for CST technology projects implementation in the area.

GEDA

State 3: Gujarat

Location:	Ahmedabad
State Nodal Agency:	Gujarat Energy Development Agency (GEDA)
Site Visits:	25 February 2016

A day prior to the workshop, two site visits were organized such that the participants get familiar with the technology under discussion. Through these visits, participants got the opportunity to interact with technocrats and could assess the requirement in their organizations. The first site was the Gujarat State 'Jail Bhavan' where the Scheffler Dish was installed for cooking purposes. The second site was the Mother Dairy facility which showcased the Parabolic Trough CST system for process heating purposes.

Site 1: Gujarat State, 'Jail Bhavan', Ahmedabad - Fixed Focus Elliptical Dish

At the Sabarmati Central Jail, a pioneering shift has been made to install dish based solar cooking system to supply high temperature steam used for cooking the meals for 3000 jail inmates. The system includes 24 concentrators each having collector area of 16 m2. The system is used for cooking around 70 Kgs of Rice. Prior to the implementation of the CST system the establishment was using LPG as fuel for cooking. The technology was installed by Flareum Technologies and is being operated and

maintained by Taylormde Solutions. Due to implementation of the system central jail are benefitted by saving 310 LPG Cylinders / Year.

Site 2: Mother Dairy, Gandhinagar- Parabolic Trough CST system

96 solar parabolic troughs have been installed at the rooftop of the dairy covering a total area of about 615 m2. This state of the art system installed at Mother Dairy Gandhinagar consists of eight solar boilers connected in parallel feeding into the common steam grid. The common steam line is integrated with the main steam line thereby directly supporting the thermal load of the dairy. Thermax has provided the parabolic trough collectors with automatic east to west tracking. It is estimated that 657 tons of steams would be produced annual leading to natural gas savings of approximately 53000 SCM per annum. The project received financial support from both MNRE and UNIDO. The CST installation at the Mother Diary, Gandhinagar would lead to CO2 emission reduction of 61 tons/ annum.

Workshop: 26 February 2016

Workshop on Concentrating Solar Thermal Technologies for Industries, Ahmedabad

The third workshop was organized in Ahmedabad, Gujarat on February 26, 2016. The workshop was chaired by Mr I M Bhavsar, Chairman, GEDA and was moderated by Dr Anil Misra, National Project Manager UNIDO. The members at the dais included (from L to R) Dr Anil Misra, NPM, UNIDO; Mr Harish Mehta, Director, Suzlon Energy; Mr Mark Draeck, Project Manager/Industrial Development Officer, UNIDO; Mr I M Bhavsar, Chairman, GEDA; Mr Piyush Shah, Chairman, CII Gujarat State Council and Mr S J Ruparel, Senior Project Executive, GEDA.

Key Takeaways

- A suggestion emerged that an acceptable tax relief scheme be defined by Central and State Governments for solar energy users to encourage the adoption of CST technologies.
- The participants also suggested that CST technology be marketed aggressively and it was further suggested that all energy intensive consumer industries should adopt solar energy compulsorily.
- It was clarified that to consider deploying CST technologies, policy makers may consider imposing Renewable Purchase Obligation (RPO) in the solar thermal segment as well as it can lead to further reduction of payback period. Currently, the RPO is restricted to electricity generation, therefore production of heat from solar energy does not add to an RPO. It was suggested that some kind of memorandum needs to be submitted to include solar thermal as part of an RPO.
- It is to be noted that cost effectiveness of application of CST technology for generation of electricity depends on the scale of power production. For example, on a small scale, for generation of electricity, CST technologies will not be viable.

Outcomes

- As a key action point, UNIDO shared that they will be collectively communicating these message to the appropriate government agencies to adopt these measures.
- UNIDO will bring together relevant stakeholder groups in order to collaborate to share the industries response towards adoption of CST technologies

State 4: Karnataka

Location:	Bengaluru
State Nodal Agency:	Karnataka Renewable Energy Development Ltd. (KREDL)
Site Visits:	17 March 2016

The site visit held on 17 March aimed at showcasing the different applications that are feasible with CST technologies. It also allowed the participants to directly interact with the technology providers and solicit requisite information that would be enable them to decide how CST technologies can facilitate heating/ cooling requirements for their industrial facilities. The site visit showcased the fixed focus elliptical dish systems at two sites namely Bosche Ltd. and State Bank of India.

Site 1: Bosch Ltd., Hosur- Fixed Focus Elliptical Dish

Bosch limited is an automotive component manufacturer with plants in many parts of the country. Their Adugodi Plant in Bangalore has implemented a 288 m2 CST project. This roof top CST system consists of 18 concentrators each with a collector area of 16 m2 and was commissioned in December 2009. The technology was supplied by M/s. Unisun Technologies (Pvt.) Ltd. The system is used for cooking food. Traditionally two Diesel fired boiler were being used, for generation of steam, required for cooking purposes. The CST system is integrated with this existing process. The system has benefited the company in terms of saving around 1800 liter of diesel per annum leading to monetary savings of Rs. 10 Lakh per year on the cost of purchasing diesel which is offset due to use of solar thermal energy.

Site 2: State Bank of India Fixed Focus Elliptical Dish

The head office of State Bank of India in Bangalore has installed 2 fixed focus elliptical dish CST systems. Each of these dishes is 16 m2 and has been installed and commissioned in 2016 by Unisun Technologies Pvt. Ltd. The system provides steam for cooking at the kitchen that serves 250 meals for SBI Staff. Steam from CST system supplements for the LPG fuel, and the process involves a manual shift to steam from the dishes when the required pressure is obtained.

Workshop: 18 March 2016

Workshop on Concentrating Solar Thermal Technologies for Industries, Bengaluru

The workshop organized in Bengaluru, Karnataka on March 18, 2016 was the fourth workshop of the series. The members at the dais included (from L to R) Dr R.P. Goswami, Director-CST, MNRE ; Dr Anil Misra, NPM-UNIDO; Smt Vidya Rani, Assistant General Manager, KREDL and Mr G K Moinuddin, Karnataka State Head, CII.

Key Takeaways

- Karnataka is rich in solar resources and solar energy has huge potential to complement the conventional sources of energy in a large way. Assessment on Solar potential in Karnataka estimates the energy potential as 20 GW. However, considering different factors like availability of waste lands, evacuation infrastructure etc. the moderated potential may be around 10 GW. Application of CST.
- The Government of Karnataka has come up with several initiatives to promote Solar in the state. These include programmes to promote roof top generation; boosting R& D and innovations, doing

skill development in the sector; encouraging decentralization generation & distribution of energy where access to grid is difficult etc. All these initiatives would translate Karnataka in to an investor friendly state and as well as to encourage public private participation in the sector.

- Proper operation & maintenance for CST technologies is the key for the long life of the system which can extend up to 25-30 years. The reflectors may have to be replaced during this period.

Outcomes

- State government to collectively take forward the ideas generated toward implementing CST projects with the state machinery.
- Assistant General Manager, KREDL urged the workshop participants from the industry to adopt the CST technology and assured all possible assistance.

State 5: Madhya Pradesh

Location:	Bhopal
State Nodal Agency:	Madhya Pradesh Urja Vikas Nigam (MPUVN)
Site Visits:	21 March 2016

A group of almost 25 people joined the two site visits that were organized prior to the CST workshop. Participants joined the site visit planned for demonstration of CST technologies in two locations in Bhopal namely the Rajiv Gandhi Proudyogiki Vishwavidyalaya (RGPV) in Bhopal and Anant Spinning Mills in Mandideep Industrial Area. Rajiv Gandhi Proudyogiki Vishwavidyalaya site showcased the innovative CST technology for power application while Anant Spinning Mills site showcased the dish technology.

Site 1: Rajiv Gandhi Proudyogiki Vishwavidyalaya (RGPV), Bhopal

Cross Linear-Concentrated Solar Power (CL-CSP) concept has been invented and conceptualized by Prof Yutaka Tamaura of Tokyo Institute of Technology and director of Solar Flame Corporation, a Tokyo Tech Venture. CL-CSP, with a temperature range of 300-800˚C is amalgamation of two existing solar thermal technologies i.e. Solar Tower and Linear Fresnel System. This system is situated between point and linear focusing concentration. In CL-CSP, the objective is to achieve 600˚C temperature by concentrating solar to the receiver. They have the patent of the concept. The construction of the plant is being done with help of Tokyo Engineering Corporation, Japan and MNRE. RGPV is the first venue in the world where Japan has installed CL-CSP plant to achieve its final findings. The system promises to achieve high enough temperature which is good enough for Power Cycle Optimization of a Mega Scale CSP Plant.

In the first phase of the project, 30 kW CL-CSP system has been installed at the RGPV campus. The second phase of the project is looking at scaling it up to 1 MW. Some of the features of the technology include its cost effectiveness, ease of installation, high optical and thermal efficiency, and adaptability for high temperature requirement.

Site 2: Anant Spinning Mill, Mandideep

A CST system using 4 nos. of fixed focus elliptical dishes of 16 m2 each collector area have been installed in 2015 at the roof of the girl's hostel of Anant spinning Mills factory. This dish system with Aluminum reflectors is used for steam cooking purpose. These dishes have automatic tracking as well as manual with three tracking controllers installed. The steam is used for cooking through 2 vessels at their kitchen. The performance of this 64 sq. meter CST system is satisfactory. The average fuel savings of LPG is 12.5 kg per day leading to financial savings of Rs. 812 /day, considering the average cost of LPG is Rs 65/ kg. The beneficiary is using the system in its full capacity and is satisfied with system performance, as the food is cooked throughout the day for around 400 person/ session.

Workshop: 22 March 2016

Workshop on Concentrating Solar thermal Technologies for Industries, Bhopal

The 5th workshop on CST technologies was organized on 22 March 2016 at Bhopal, Madhya Pradesh with an objective to create awareness and showcase the potential and viability of CST technologies

for various process heat applications across industrial sectors in India. The panelists of the workshop included Dr. Anil Misra, NPM, UNIDO; and (from L to R) Mr. Manu Shrivastava, Principal Secretary, Department of New and Renewable Energy & Managing Director, MPUVN ; Dr. R P Goswami, Director, MNRE and Mr. C P Sharma, Chairman, CII Madhya Pradesh State Council.

Key Takeaways

- Madhya Pradesh being well conversant in Solar PV technology and with such a vibrant industrial sector should also take a lead in the CST space. MPUVN will explore and evaluate how the state can work together with MNRE and UNIDO so that it the uptake of CST technologies in the region can be increased.
- This is especially important as there is considerable industrial activity in the state (Bhopal, Indore, Gwalior, etc) and solar technologies could be of great interest to various industries.
- Stakeholders raised the issue that furnishing of a security against loan taken for installation of technologies is a bigger hurdle than arranging for the financing. It was decided that UNIDO along with IREDA would evaluate how this hurdle could be addressed
- As a step in this direction, installation of projects on ground will be able to demonstrate more effectively to consumers the benefits of using these technologies.

Outcomes

- MPUVN invited UNIDO for a follow up meeting to collaborate on scaling up CST in the country. He furthermore asserted that EOIs should be collected for further scale up.

State 6: Tamil Nadu

Location:	Coimbatore
State Nodal Agency:	Tamil Nadu Energy Development Agency (TEDA)
Site Visits:	1 June 2016

Two site visits were organized on 01 June 2016, a day prior to the Tamil Nadu - state-level workshop. Both the sites showcased the PSC technology provided by Green Energy India Pvt. The site visit covered two sites with CST installations in or near Coimbatore namely PSG Hospitals and Danavarshini Exports.

Site 1: PSG Hospitals, Coimbatore

PSG Hospitals , a 1000 bedded high-tech hospital providing comprehensive health care, was established in 1989 by well-known PSG and Sons Charities. The hospital management wanted to opt for CST technologies for their laundry unit which has to sterilize, wash and dry 3000kg of linen every day for its staff and inpatients. Hot water requirements were being met using 2 coil type water tube boilers for supplying steam to its driers, washers and calendaring machines. The boilers were consuming 200 litres of diesel every day before installing the solar thermal system. Based on a detailed energy audit, Greenera Energy India Private Limited proposed implementation of CST system along with condensate recovery system. They installed 50 m2 of PTC system was hybridized with automatic diesel burners and produces steam at 150˚C temperature and 3.5 bar pressure. The implementation has brought down the diesel consumption to 80litre/day and 440 units of electricity/day (Consumption from the

hybridised heaters). This is equivalent to a savings of 70-80 litre of diesel per day. Additionally 2000 litre of water is saved per day through condensate recovery system.

Site 2: Danavarshini Exports, Tiruppur

Danavarshini Exports is a leading garment exporter in Tiruppur. The facility chose to go for CST technologies for purpose of steam generation which would be used for steam ironing (garment pressing). Since the steam is to be directly applied to the garments, the facility had mandated requirement for very high quality of steam with dryness fraction above 0.95 as even a single drop of water can stain the garment. The facility was earlier using stand-alone electric steamers for this purpose and they consume 35 units of electricity. The facility has installed 50 square meter of parabolic trough concentrators hybridized with diesel burners. As CST systems have the structure of water tube boilers, achieving 0.95 dryness fraction is a challenge. The manufacturer has developed special steam separator system to achieve high dryness fraction. Apart from this line separators are deployed every 15 m to maintain the dryness fraction. The system saves 140 units of electricity per day (diesel equivalent of 15l).

Workshop: 2 June 2016

Workshop on Concentrating Solar thermal Technologies for Industries, Coimbatore

On 2 June 2016 at Coimbatore, Tamil Nadu hosted the 6th Workshop on CST technologies for various process heat applications across industrial sectors in India with an objective to create awareness and showcase the potential and viability of this technology. The panelists on the dais included (from L to R) Hon'ble Dr. P Rajkumar, Mayor of the Coimbatore City; Dr Anil Misra, National Project Manager, UNIDO; Mr. V. Lakshminarayanasamy, President, Southern India Engineering Manufacturers' Association (SIEMA), Dr. R. P. Goswami, Director, MNRE; Ms. Nethra J. S. Kumar, Chairperson, CII Coimbatore Zone and Mr. A. Balakrishnan, GM TEDA.

Key Takeaways

- While CST technologies are well established in steam generation, it would be important to evaluate the use of CST in the generation and distribution of power which is a commodity in short supply in Tamil Nadu particularly in Coimbatore. With a strong solar resource, India has the potential to take the lead in this growing market in the long term. Establishing CST projects and exporting our expertise to develop the CST industry will lead to increased employment and investment opportunities globally.
- Deliberations during the workshop clearly indicated that with the presence of more than 50,000 MSME units in Coimbatore and with most of them using boilers and furnaces in their processes, particularly those engaged in making castings, steel bars, chemicals and processing of textiles, CST presents a great opportunity to rely on renewable energy and drastically reduce their energy costs in the long run.
- The inputs received on CST were immense food for thought the industry members who appreciated the fact that eventually implementing this technology in their respective units and harnessing the associated benefits from this renewable resource would not only help in energy savings but also make true business sense.
- It has been estimated that by bringing in a reduction in the usage of conventional energy resources in the domestic and industrial sectors with the installation of solar thermal equipment and solar PV systems, Coimbatore can potentially become self sustainable TEDA has been recognized as the third best State Nodal Agency in the country for maximum number of CST installations in Tamil Nadu.

Outcomes

- The key action point for Tamil Nadu thus was pointed out to be the rapid adoption of the technology which UNIDO would facilitate through consultants empaneled for preparation of DPRs.

State 7: Maharashtra

Location:	Pune
State Nodal Agency:	Maharashtra Energy Development Agency (MEDA)
Site Visits:	23 June 2016

- Two site visits were organized prior to the CST workshop such that the participants get familiar with the technology under discussion.
- Participants got the opportunity to interact with technocrats and could assess the requirement in their organisations vis-à-vis the processes there.
- A few participants joined the site visit planned for demonstration of CST technologies in two locations in Pune namely the Mahindra & Mahindra manufacturing facility and Thermax Demo Site in Shive, near Pune.
- The Mahindra & Mahindra site showcased the Arun Dish and the Scheffler Dish while the Thermax demonstration was of the Parabolic Trough collector

Site 1: Mahindra & Mahindra

The Mahindra and Mahindra facility at Chakan in Pune district is a greenfield spread across over 700 acres and houses two different types of CST technologies. One ARUN dish has been installed at the site to generate pressurized hot water to run 4 washing machines for degreasing operation The automatically dual axis tracking technology provided by Clique Solar delivers pressurised hot

water at 120°C for 7 hours daily reducing their electricity consumption by over 2,70,000 units (Kwh) annually which translates into an equivalent savings of around INR 21,60,000 The ARUN dish raises the temperature of water from 90°C to 120 °C. The input water to ARUN is at 90°C as a result of the waste heat recovery The facility has also installed 70 Scheffler dishes manufactured by Thermax Ltd. This assembly of 70 dishes with total aperture area of 1120 m2 is utilized for a cooling solution in the paint shop and in LPG vaporizers for process requirements This VAM machine is of 160 TR capacity and is used in the paint shop for cooling paint utilized for vehicle bodies. The system for LPG gasifiers has a backup heater which kicks in during non-sunny hours.

Site 2: Thermax CST Demo Site, Shive

In Shive village, 45 kms from Pune, lies India's first Solar-Biomass Hybrid Plant. This demonstration project is being implemented in public-private partnership between Department of Science & Technology, inhabitants of Shive Village and Thermax This first of its kind installation in the country has been designed to provide the Shive Village with 200 kW power.

The plant consists of the solar field and biomass boiler that generates electricity. The solar field consists of the solar parabolic trough technology because of its negligible maintenance and suitability for rural conditions.

Workshop: 24 June 2016

Workshop on Concentrating Solar thermal Technologies for Industries, Pune

The 7th in the series of half day workshops was organized on 24th June 2016 at Pune, Maharashtra. The panelists included (from L to R) Dr Anil Misra, NPM, UNIDO; Mr Nitin Gadre, Director General, MEDA; Mr Tarun Kapoor, Joint Secretary; MNRE; Dr. R. P. Goswami, Director MNRE and Mr Shishir Joshipura, State Chairman, Maharashtra, CII and Managing Director, SKF Industries.

Key Takeaways

- During the course of the discussion, Dr. R P Goswami from MNRE shared that it wants to create a pool of experts and are willing to provide funding to train engineers (proposal needs to be submitted) or to strengthen institutions.
- The Ministry can also look at introducing a competition for innovative business models to make these systems financially and economically attractive for the end users.
- UNIDO has an ongoing project which is evaluating innovative ideas for these projects. Introduction of a renewable solar thermal obligation was suggested by stakeholders as this policy will help to grow the solar thermal market in the country and is being evaluated by MNRE.
- However, while MNRE supports this suggestion, it may not come as a separate obligation and maybe part of the RPO where just production of electricity should not be counted as RPO but even the use of heat directly should count towards the RPO.
- The thought that while it is possible to generate electricity from solar thermal projects and supply it to the grid, the challenge is that the cost at which power would be generated would be high, also emerged.
- The feed in tariff declared by the regulator for solar thermal is Rs 11 vis-à-vis Rs 5.70 for solar PV and the discoms may not be willing to buy large quantities at this price.
- Large scale projects will happen only through tendering and MNRE has plans to tender out some quantities separately for solar thermal shortly.

Outcomes

- MEDA has been playing a key role and this region has been a leader in solar thermal installations and technology solutions and will promote it more vigorously.
- There is a need to do much more and this area needs to lead by example for concrete outcomes in terms of projects on ground, MNRE along with MEDA and relevant industry associations will take the project implementation phase ahead.

WBREDA
Department of Power and N.E.S. Govt. of West Bengal

State 8: West Bengal

Location:	Kolkata
State Nodal Agency:	West Bengal Renewable Energy Development Agency (WBREDA)

Workshop: 15 July 2016

Workshop on Concentrating Solar thermal Technologies for Industries, Kolkata

The eight in a series of half day workshops on CST technologies was organized on 15th July 2016 at Kolkata, West Bengal. The panelists on the dais included (from L to R) Dr. Anil Misra, National Project Manager, UNIDO; Ms. Ayumi Fujino, UNIDO Representative & Regional Director of South Asia; Mr Tarun Kapoor, Joint Secretary, MNRE; Mr S Kishore, Principle Secretary, Department of Power and New Energy Sources, Government of West Bengal; Dr. R. P. Goswami, Director, MNRE and Mr Aloke Mookherjea, Chairman, CII Eastern Region Innovation Task Force & Chairman, Howden Solyvent India Ltd.

Key Takeaways

- During the course of the discussion, the tea industry got special focus. CST technologies provide a suitable solution for heating requirements of the tea processing. Joint Secretary, Ministry of New & Renewable Energy suggested that if the tea industry can work out large volumes based on standard designs, there is scope to bring down the price of solar thermal quite drastically by 25-30 per cent.
- It was observed that in West Bengal, districts like Purulia maybe a potential area for CST installation as the Direct Normal Irradiance (DNI) is high in comparison to the rest of the districts.
- The state government therefore has shared that it intends to encourage pilot scale projects to promote CST technologies as a starting point.

Outcome

- As an action point, it was suggested that local industry associations including the All India Tea Producers association along with national industry associations could conceptualize seminars and conferences to popularize the technology as well as bring out proposals to install and implement the same.

State 9: Uttar Pradesh

Location:	Lucknow
State Nodal Agency:	Uttar Pradesh New Energy Development Agency (UPNEDA)

Workshop: 22 July 2016

Workshop on Concentrating Solar thermal Technologies for Industries, Lucknow

The ninth workshop organized on 22nd July2016 at Lucknow included panelists (from L-R) Mr. Manish Goel, President, Indian Industries Association; Ms Sangeeta Singh, Director, UPNEDA; Mr Partha Sarathi Sen Sharma, Secretary, Department of Additional Sources of Energy, Govt. of Uttar Pradesh; Dr. R. P. Goswami, Director, MNRE; Mr. Atul Mehra, Chairman, CII Uttar Pradesh State Council and Dr Anil Misra, NPM, UNIDO.

Key Takeaways

- UP has the third largest number of MSMEs in the country after Tamil Nadu and Gujarat. Most of them use boilers and furnaces particularly those engaged in manufacturing chemicals making steel

parts, processing of textiles, etc. CST applications for the industrial sector with a special focus on the MSME sector is a great opportunity to scale up renewables penetration in the state.

- CST technology is no longer in its demonstration phase and is a cost effective investment for industries to reduce their reliance on fossil fuels.
- UPNEDA suggested that research in the storage of energy could be done to increase reliability of the renewable options.
- Industrial sector should take a pro-active approach not only for fuel and financial savings but also carbon mitigation. A small industry which has sufficient shadow free space can adopt any CST solution and with the installation of a 100 sq. m dish, the savings in term of electricity are 70,000 units per year and the carbon reduction is about 1500 Mt CO2 annually.

State 10: Rajasthan

Location:	Jaipur
State Nodal Agency:	Rajasthan Renewable Energy Corporation Ltd. (RRECL)
Site Visits:	28 July 2016

Site visit in Jaipur consisted of two sites. These sites showcased how CST can be installed in hospitals educational institutes. Participants visited two locations in Jaipur namely the Soni-Manipal Hospital and Malaviya National Institute of Technology, Jaipur. These sites showcase paraboloid dish and Scheffler dish respectively.

Site 1: Soni - Manipal Hospital, Jaipur

Hot water used for laundry and washing purposes at the Soni-Manipal hospital is being produced using CST system installed at its rooftop. The installation consists of a total of 13 automated dual axis tracking solar paraboloid dishes developed by Quadsun covering a total distance of 57 m2 . The CST system offers efficient mirrors and receivers designed to maximize conversion of sunlight to heat and leading to average savings of 43 litres of high-speed diesel daily.

Site 2: Malaviya National Institute of Technology (MNIT), Jaipur

MNIT Jaipur, an educational institute, adopted CST technology in the campus for cooking purposes. The system provides steam for cooking dal, rice, vegetables, and hot water for doing dishes. The rooftop installation consists of six Scheffler dishes, each having a reflector area of 16 sq. m and a concentration ratio above 60. A steam storage tank of 400 litre is connected through insulated pipes with the cooking pots, which are placed downstairs in the mess. According to the

hostel management, the system is saving around 20 kg of LPG per day, leading to 5,000 kg annual savings, thereby cutting the greenhouse gas (GHG) emissions by 1.085 tonnes/year.

Workshop: 29 July 2016

Workshop on Concentrating Solar thermal Technologies for Industries, Jaipur

The Jaipur workshop organized on 29th July 2016 served as the tenth workshop in the awareness generation series. The panelists on the dais included (from L to R) Mr. A.K Jain, Managing Director, Rajasthan Electronics; Dr. Anil Misra, NPM, UNIDO; Mr. S G Vyas, Past Chairman, CII Rajasthan and Managing Director, Jagjanani Textiles; and Instruments Ltd.; Mr. B. K Dosi, Managing Director, RRECL and Dr. R. P. Goswami, Director, MNRE.

Key Takeaways

- Large scope exists for adoption of CST technology on a commercial basis in medium sized industries in Rajasthan. Business models like the Public Private Partnership (PPP) model for scaling up adoption could be considered as this model maybe viable if it is economically rewarded.

  It was suggested that Solar Heat Obligation (SHO) should be made a part of the Perform Achieve Trade (PAT) scheme. Under-achievers can comply purchasing Energy Savings Certificates and additional incentive be given those meeting SHO.

- Industrial application of solar thermal could also be regulated such as 10% of the energy need for industries with more than 10,000 lt annual fuel oil utilization for process heat should be met using solar thermal and all new process heat plants set up must meet 10% by solar thermal.

Outcome

- As a key action point, it was suggested that industries such as textiles, handicrafts and export oriented organizations can adopt CST technologies in Rajasthan owing to the high DNI available in the state. RRECL and CII are to collaborate and build a pipeline of such organizations where CST technology can be implemented during the course of the GEF-UNIDO-MNRE project lifecycle.

State 11: Telangana

Location:	Hyderabad
State Nodal Agency:	Telangana New and Renewable Energy Development Corporation Ltd. (TNREDCL)
Site Visits:	14 September 2016

Three sites namely Devnar Blind School, Honeywell Technologies and Almond House in Hyderabad were visited as a part of this visit. While Devnar Blind School included installed CST for cooking purposes, the other two installations were industrial applications. Both the sites showcased the Parabolic Trough Technologies but by different manufacturers. Participants got the opportunity to interact with technocrats and could assess the requirement in their organisations vis-à-vis the processes there.

Site 1: Devnar School For Blind

New Parabolic Trough based CST systems has been installed in Devnar School for meeting heating needs of cooking for residential students. Conventionally the school has the LPG system that cooks 100 Kg of rice for lunch and dinner along with 20 Kg of Dal catering to close to 500 students. The installed Parabolic Trough Concentrators (PTC) system compliments the existing LPG system.The CST system consists of two (PTC) each of 18 m2 gross area supplied by Oorja Energy Engineering Services Pvt Ltd., Hyderabad. The receiver tubes used are tested and certified by DLR (German Space Agency). Thermal fluid is used to capture heat from the solar field. A double jacketed vessel was specifically

fabricated that acts as solar boiler as well as steam accumulator. The system has been designed in this manner as the total cooking time is not more than 3 hours during the day but heat is being captured for 8 hours in a day (8AM-4PM). All the heat captured is used to convert water to steam that is stored in the accumulator until required for cooking.

Site 2: Honeywell technology Solutions

The American Conglomerate, Honeywell Technologies has installed CST technologies in their Hyderabad facility for cooling purposes. Their state-of-the-art facility in Hyderabad consists of two operational standby 120 TR compression chillers pair. The solar solution provided includes 128 indigenously developed Parabolic Troughs in a closed loop configuration providing solar heat in the form of pressurized hot water at 165˚C. The polished solar grade aluminum reflectors developed by Thermax reliably and efficiently channel solar radiation at a high concentration and temperature to the double effect VAM chillers which further generates chilled water at 9.55 ˚C. This 820 m2 solar thermal cooling installation is the largest of it's kind in India and depending on solar radiation and demand requirements can lead to savings worth of 4 lac rupees per year.

Site 3: Almond House

Almond House, a popular sweets-confectionary brand with several stores in Hyderabad, opted to install CST for the purpose of processing milk that would be used in preparation of the sweets. The PTC system installed at Almond House covers a total area of 255 m2 and has been supplied by Oorja

Energy Engineering Services Pvt. Ltd. Steam generated from this system is used to process milk in to Khova which is an important ingredient in many sweets.

Workshop: 15 September

Workshop on Concentrating Solar thermal Technologies for Industries, Hyderabad

The Hyderabad workshop was organized on 15 September 2016. This was the final workshop conducted under the series initiated by MNRE-GEF-UNIDO CST project. The panelists on the dais included (from L to R) Mr. G V S Prasad, General Manager, TNREDCL; Dr. Anil Misra, NPM, UNIDO; Dr. R. P. Goswami, Director, MNRE and Mr. Mahesh Desai, Convenor, CII Telangana MSME and Exim Panel.

Key Takeaways

- With the state of Telangana coming out with a new Industrial Policy and subsequent measures to promote ease of doing business, there has been increased interest by companies to invest in the state and this has created the need to look at alternative sources of power and energy.
- Telangana is a solar-rich state and has a few notable CST installations already in place. In particular the state has an average solar insolation of nearly 5.5 kwh per m2 which is available for over 300 day in a year.
- Industrial sectors with a special focus on MSME present a great opportunity to see penetration of renewable technologies in the industrial sector T-owards this end help from the Government and UNIDO particularly for the MSME units will be useful in deploying CST solutions.
- The industry in Telangana has requested the state government to consider setting off the units saved in the industry with the installation of CST technology solutions in the regular power bill. However, there are questions around how to measure the units saved when steam power is used and some formula needs to be developed.

Outcome

- TNREDCL offered to shoulder the responsibilities to promote these technologies and liaison with the industries, beneficiaries, IREDA, MNRE and other stakeholders towards this end.

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