

# Solar Energy for Evaporative Treatment of Liquid Effluents

## Roundtable on Zero Liquid Discharge Systems

Textiles India 2017, Gandhinagar, Gujarat

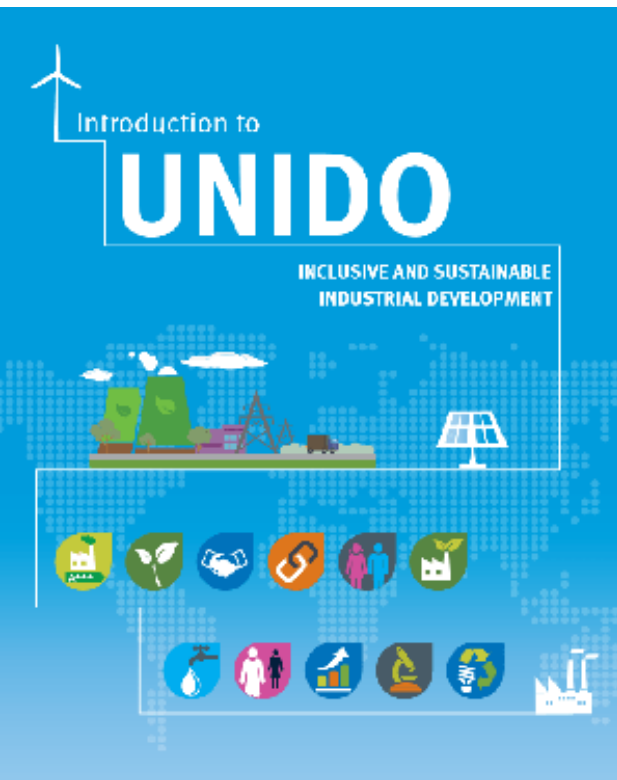
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# Introduction to UNIDO



- UNIDO was established on 17 November 1966, with a mission to “accelerate industrial development in developing countries
- UNIDO assisted countries in meeting their development goals by furthering industrial development, creating employment and income to overcome poverty.
- UNIDO helps developing countries produce goods they can trade in the global market and provides assistance in accessing training, technology and investment, to make them competitive in the global market.
- UNIDO works to upgrade manufacturing technologies in India, transfer technology and expertise to Least Developed Countries, mainly in Africa and Asia, and to facilitate South-South Cooperation.

- UNIDO has a long history of cooperation with India. India, as one of the founding members of UNIDO, hosts a large and multifaceted technical cooperation portfolio.
- UNIDO's projects in India have placed special emphasis on SME development, partnerships with the private sector, and research.
- With energy and environment in focus in recent years, UNIDO–India Cooperation fosters sustainable development through implementing energy and environment-related projects, as well as through technology development and productivity-enhancing activities
- The UNIDO Regional Office in New Delhi covers seven countries including Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal and Sri Lanka.



UNIDO's mandate is fully recognized in SDG-9, which calls to “Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation”.

The relevance of ISID, however, applies in greater or lesser extent to all SDGs.

- The UNIDO Country Programme in India is one of the largest and most diversified portfolios out of UNIDO's interventions in all its member states. The Country Programme (2013-2017) for India comprises 48 projects with a total budget of approx. US\$ 170.3 million.
- The newly formed IC-ISID was officially launched in August 2015, merging the former UNIDO Centre for South-South Industrial Cooperation and the International Centre for the Advancement of Manufacturing Technology. The Centre will contribute substantially to India's role in South-South Cooperation, transfer of technology and best practices and expertise sharing within the country, in the region and globally.
- This makes UNIDO an important player in addressing industrial development issues on a much larger scale.





# Development of a Zero Liquid Solar Effluent Treatment System

# Zero liquid solar effluent treatment system

- ✓ Developed under the MNRE-GEF-UNIDO Project “Promoting business models for increasing penetration and scaling up of solar energy”.
- ✓ The system uses multi-effect dehumidification (MED) technology, where almost all the water in the effluent can return to the process.
- ✓ In the case that no liquid must be discharged (ZLD) after leaving the MED plant, the remaining concentrate can be completely dried using spray drying.
- ✓ UNIDO’s project will support the installation of solar assisted evaporative systems for the treatment of liquid effluents.



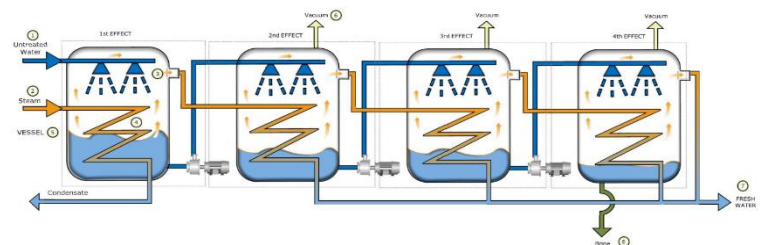
## Background

- ✓ Industries generate large quantity of highly toxic effluents during the manufacturing processes.
- ✓ Evaporative treatment is a widely used process, driven by heat transferred from steam or pressurised hot water to a solution at a lower temperature across a metallic surface.
- ✓ As the main energy requirement is in the form of heat, at a temperature range of 100–150°C Concentrating Solar Thermal (CST) systems can easily supply heat within this temperature range using either steam or pressurized hot water.
- ✓ Textile industry is one of the shortlisted industrial sectors where the project is trying to promote CSTs for process heat applications. A Multi Effect Distillation (MED) technology using solar thermal systems is applicable to the treatment of all kinds of effluent wastes.

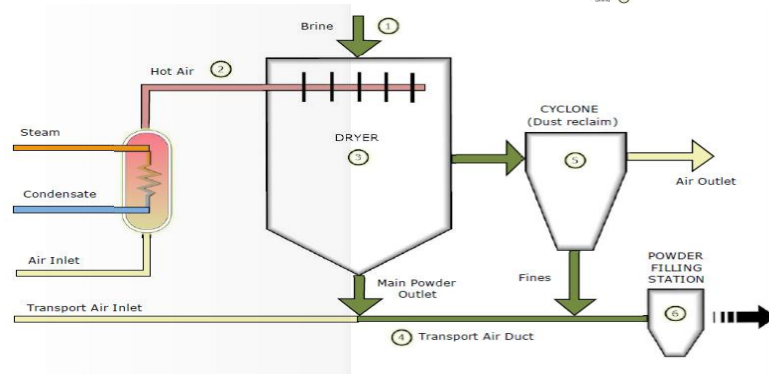


# Components: Solar ZLD system for Effluent Treatment

✓ A multiple-effect distillation (MED) system that concentrates the effluent



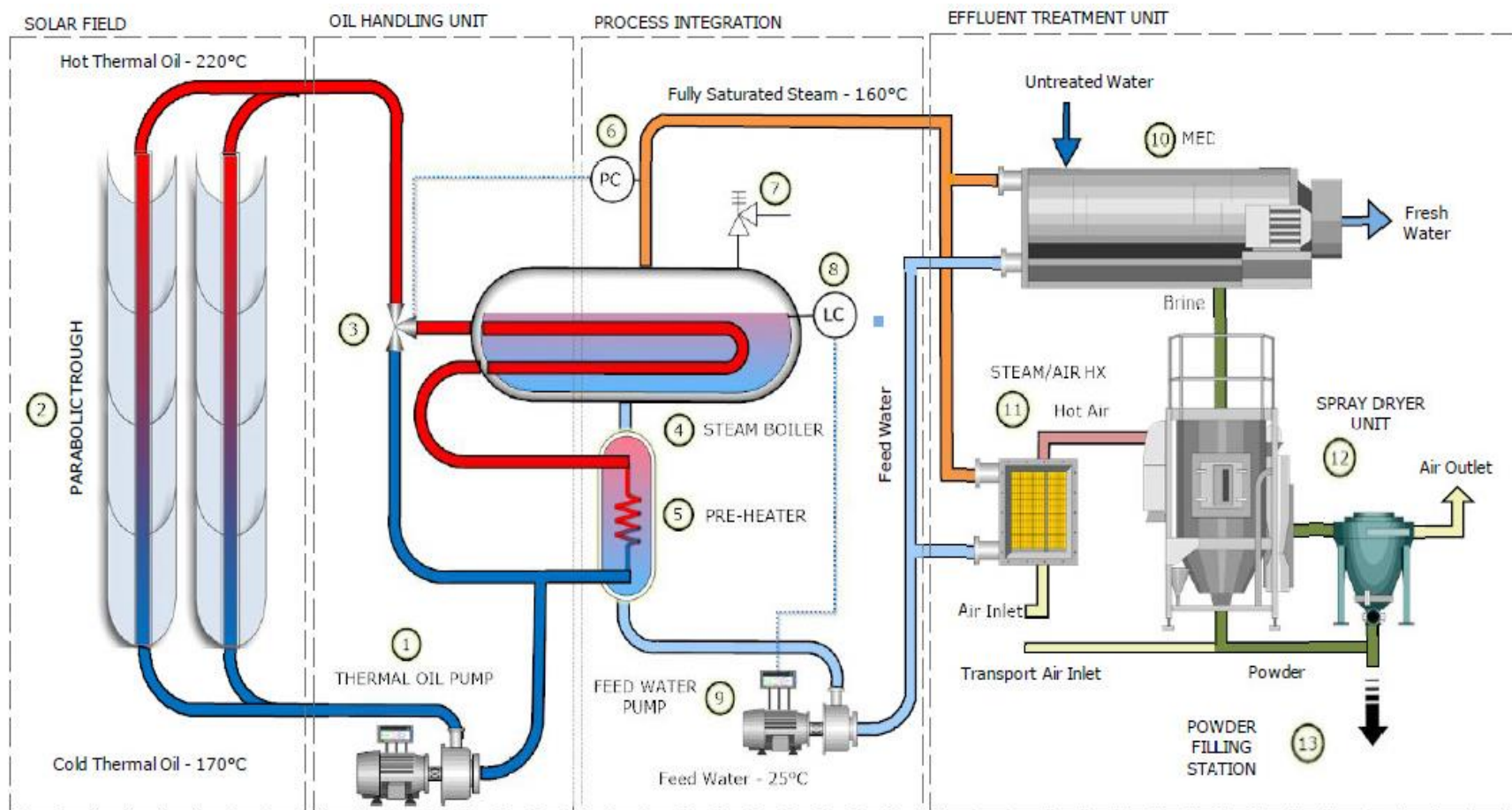
✓ A spray dryer that converts the concentrate into a dry powder



✓ The Concentrating Solar Thermal (CST) system that produces steam to drive the two previous components

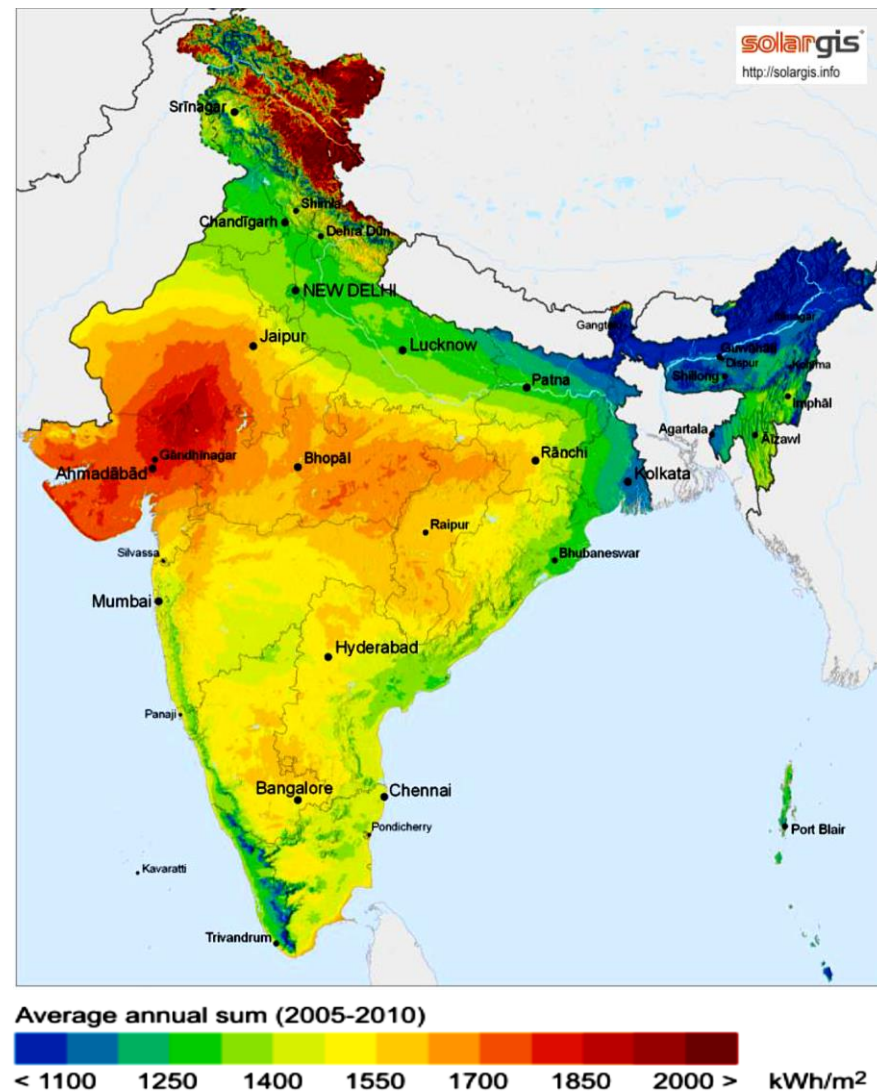


# System Integration (Schematic)



# Suitability for CST

- India has good climatic conditions to operate CS systems in direct competition to fossil fuels.
- Many potential customers in a large number of industrial sectors.
- Applications: Electricity generation, process heat and steam, cooling, water desalination, hybridisation with biomass or biogas.
- Key criteria for the economical usage of solar thermal booster is a solar radiation DNI  $>1700 \text{ kWh/m}^2$  and the availability of relatively inexpensive and flat land.



# Investment Economics

## Financial Incentives

- MNRE Subsidy
- Tax benefit due to 80% accelerated depreciation
- Additional grants under GEF supported UNIDO project

## Project Payback

- Process Heat
  - Substituting Furnace Oil, Diesel, PNG ~ 3-4 years
  - Substituting Coal, Biomass, Wood ~ 5-7 years
- Cooling ~ 7-10 years



# Financing Arrangement under UNIDO project

- ✓ The beneficiary's or project developer's contribution would be 25%.
- ✓ Subsidy of 30% would be provided by MNRE.
- ✓ Bridge loan against subsidy and at normal interest rate would be available.
- ✓ Loan for the remaining amount would be provided at an interest subvention of 5%. The funds under the UNIDO project would be used for subvention of the interest rate.
- ✓ In this manner, 75% of the project cost could be considered upfront for the provision of loan, including the bridge loan for short period till the completion and successful demonstration of the system.
- ✓ Both the loan and MNRE subsidy would be bundled in form a financial package by IREDA. Therefore, a single project application would be required from the beneficiary for loan, subsidy and interest subvention under this scheme.

# Benefits of the Scheme

## Soft Loan for the Project

- ✓ Soft loan for 45% of the Project Cost under UNIDO Interest Subvention of 5%.

## Single Window for Multiple Funding

- ✓ Application for MNRE Subsidy, Soft Loan under UNIDO Subvention Scheme and Bridge Loan against MNRE Subsidy to be filed at a single window i.e. IREDA.

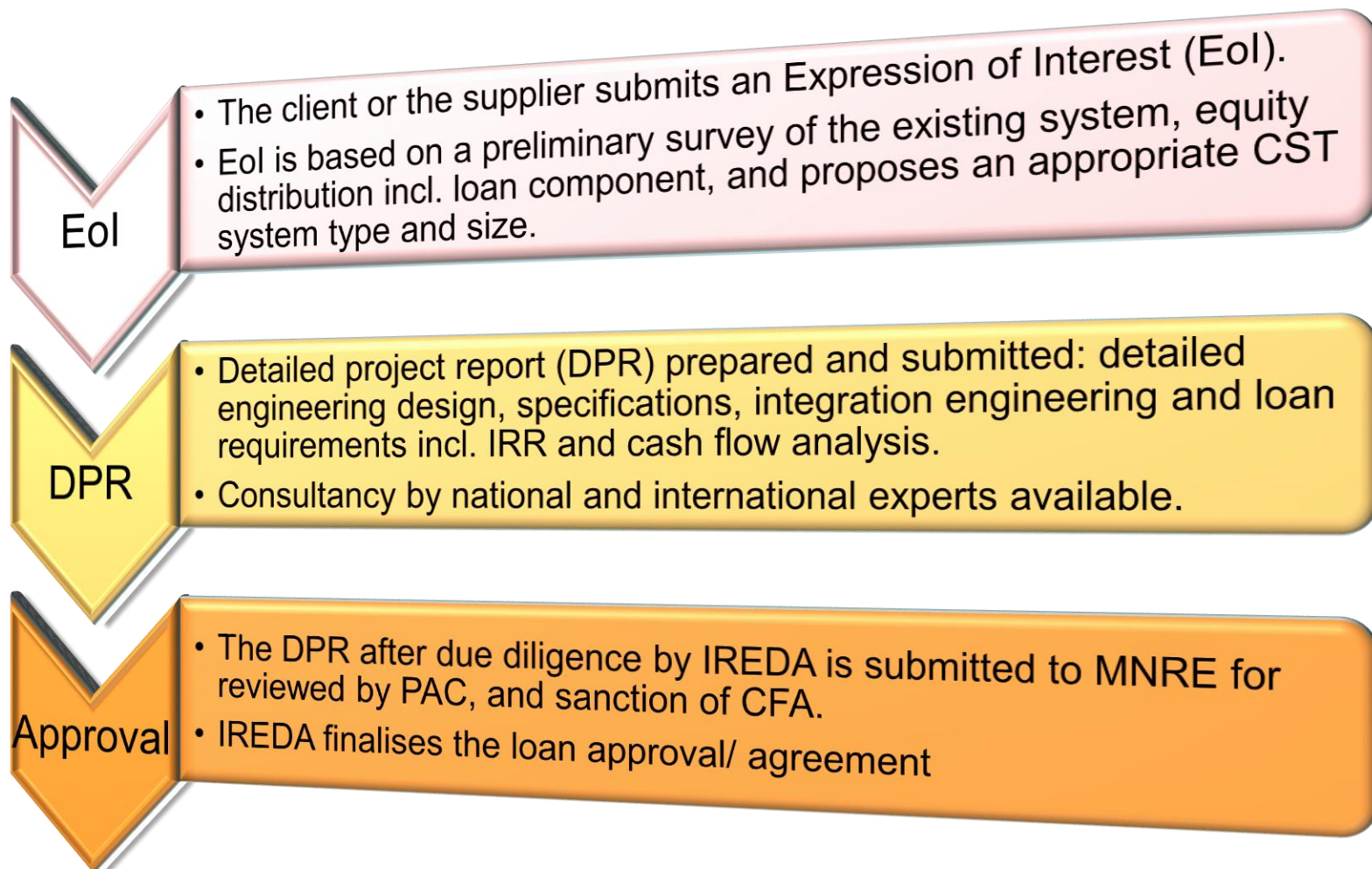
## Simpler Processing and Documentation

- ✓ Composite loan application form for Soft Loan and Bridge Loan.

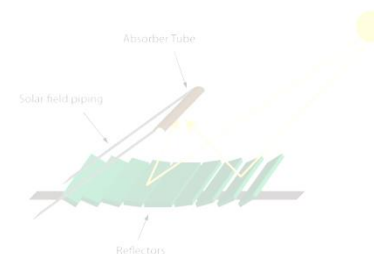
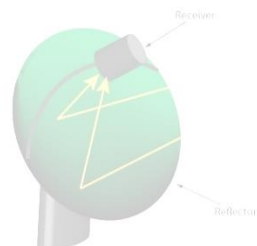
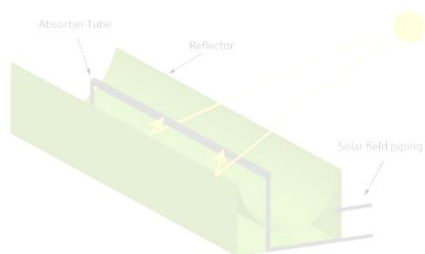
## Increased Availability of Finance and Faster Disbursal of subsidy

- ✓ Effective method for lowering capital cost of project by providing faster incentives and reducing the burden of lack of working capital.

# Technical Due-diligence of Projects







Thank you ...

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