



Solar
Payback



Accelerating Deployment of Solar Heat for Industrial Process (SHIP) in India

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India's Industrial Process Heat Overview

- ❑ Industrial sector consumes 38% of total energy in India, offers hope for conserving up to 25% using renewables
- ❑ 15 million tones fuel oil/year for heat up to 250 °C alone in industries & 5,000 trillion kWh of electricity for heating,
- ❑ India has good DNI in several areas, and solar thermal systems that work at efficiencies 50-70% viable
- ❑ Target to reduce foreign exchange burden of fuel imports
- ❑ Need to accelerate Solar Heat for Industrial Process (SHIP) by addressing barriers & creating right policy framework
- ❑ Solar thermal programme by Federal government operative since 2 decades

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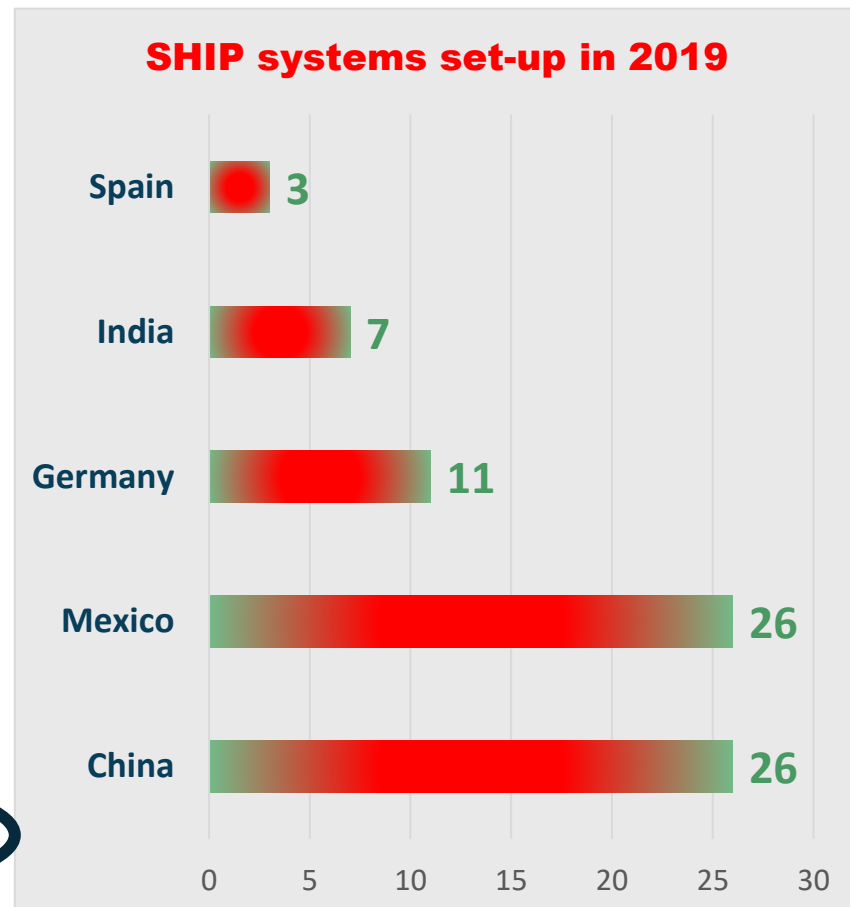
Achievements in SHIP projects

- Close to 32,000 m2 SHIP installation
- Amongst the top 5 leading countries in terms of installed capacity
- 22 manufacturers making 6 types of collectors
- **ONLY COUNTRY IN THE WORLD WITH HIGHEST STEAM COOKING SYSTEMS**
- **ONLY COUNTRY SHOWCASED SHIP APPLICATIONS IN MULTIPLE INDUSTRY SEGMENTS**

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India Amongst Top 5 Growing Countries

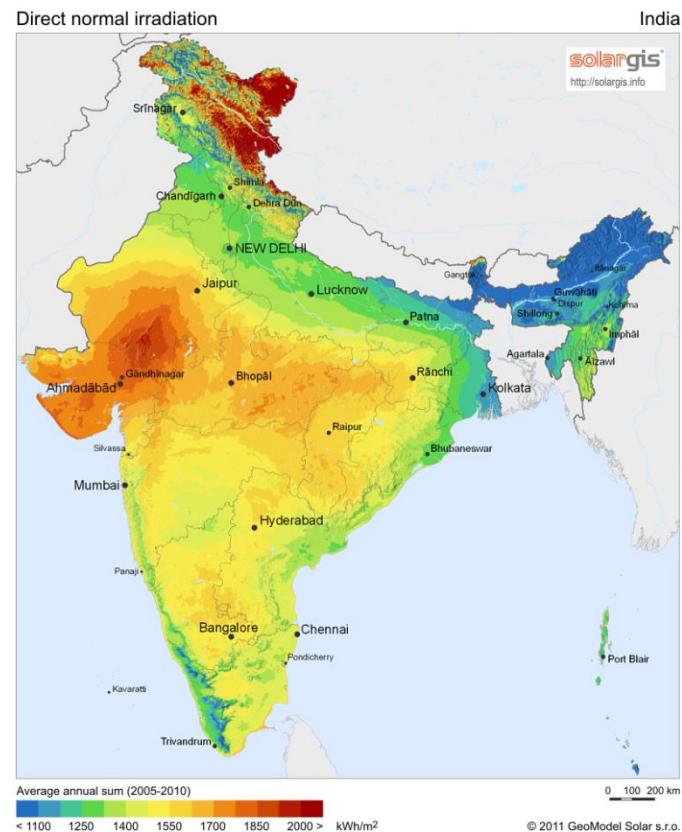
Country	SHIP systems set-up in 2019	Collector Area added in 2019 (m2)
China	26	76182
Mexico	26	4140
Germany	11	1470
India	7	3152
Spain	3	386



Increase SHIP Deployment

Direct Normal Incidence (DNI) Map

Region	Indicative avg DNI/ m ² /day (In kWh)	Fixed focus elliptical dish/ Non evacuated heat receiver PTC	Evacuated heat receiver PTC/ LFTR	Fresnel reflector/ Paraboloid based dish
		Annual Heat delivery million kCal	Annual Heat delivery million kCal	Annual Heat delivery million kCal
Leh Ladakh	6.5	0.63	0.72	0.11
Gujarat Rajasthan & western M.P.	6.0	0.62	0.70	0.10
North- West including Himalayas	4.5	0.34	0.39	0.58
North – East & eastern part of Orissa & A. P.	4.0	0.34	0.39	0.56
Southern & Central	5.0	0.49	0.54	0.78



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SHIP Technologies popular in India



**Fixed Focus Elliptical
Solar Dish (Scheffler)**

**Fresnel Reflector Based
Dish**



**Linear Fresnel Reflector
Concentrator**

**Non-Imaging
Concentrator**



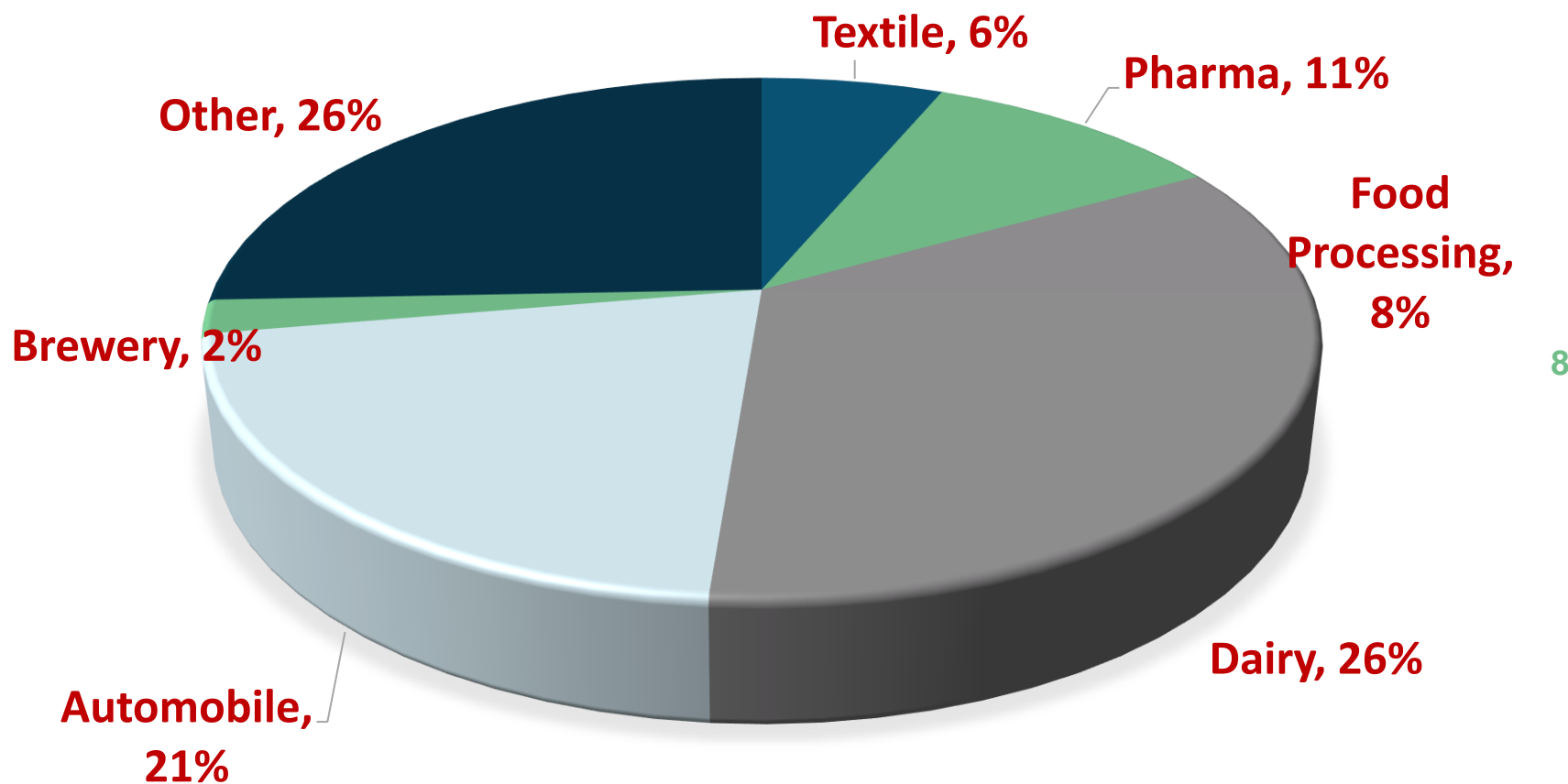
**Parabolic Trough
Concentrator**

Paraboloid Dish



Increase SHIP Deployment

Solar Payback Survey Findings on Potential Industry Segments



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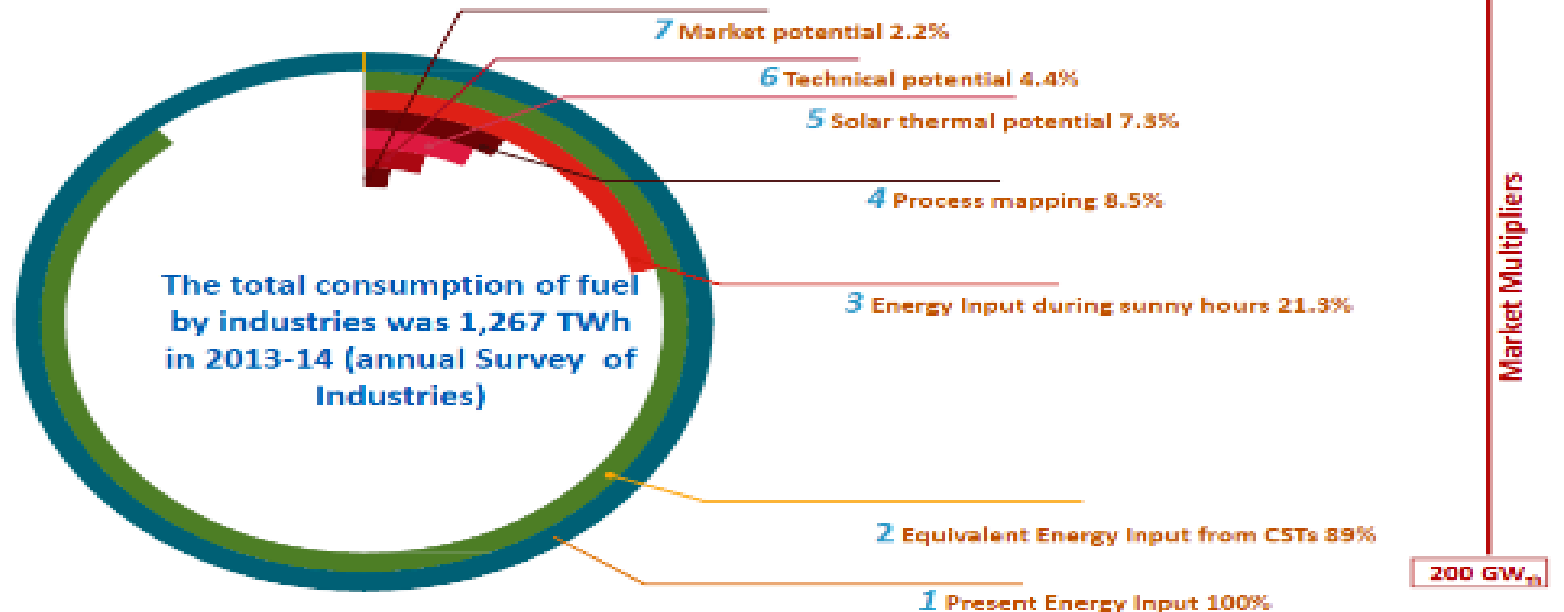
Milk Processing Can Lead by Example

- India world's largest milk processing country targeting 108 million metric tons (MMT) of processing
- Can be set example to other identified industry segments
- Every 1 million m² of concentrator dish saves 7 million litres of diesel annually operated on continuous basis
- Abates close to 18,000 tons of CO₂ annually.



UNIDO Identified Roadmap

Market Potential (Total Energy Input x Market Multipliers) = 6.45 GW_{th}



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- ❖ From technical standpoint, 2 % of the 1,267 TWh fuel consumed by industries could be replaced by SHIP systems.
- ❖ Corresponds to 6.45 GW_{th}, or 124 times the 52 MW_{th} of SHIP capacity in operation today

Best Ideas to Accelerate SHIP Market

- Include a separate programme under National Mission with a defined target
- Renewable Heat Obligation (RHO) policy be framed
- Encourage EScO model as it ensures proper life cycle operation
- Subsidy be linked to the performance equivalent of MWth or MTOE avoided. Co-relate claimed output to the DNI of that area. Penalise underperforming systems to claimed.
- Concessional loan to industries to scale up operations
- Capacity building workshops for Certified Energy Auditors

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Solar Heating Technologies for Industry



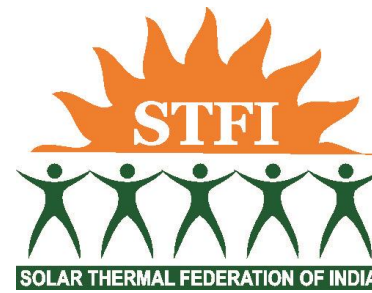
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There is more final energy consumption of heat in industry than there is electricity consumed worldwide.

Photos: Cape Brewing Company, Zehnder Group, Inventive Power, CSP-F Solar



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धन्यवाद Thank You

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