

Evolution of Solar Thermal Process Heating in India

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The background of the central section is a close-up, slightly blurred image of the Indian national flag (Tiranga) waving. The saffron, white, and green horizontal stripes are prominent, with the Ashoka Chakra visible in the center of the white band.

**"It shall be the duty of every citizen of India
to protect and improve the natural environment
including forests, lakes, rivers and wild life
and to have compassion for living creatures."**

ARTICLE 51-A (G), Constitution of India

UNIDO in India

➤ Technical cooperation services since 1966

- ❖ Assisting countries in meeting their development goals by furthering industrial development, creating employment and income to overcome poverty.
- ❖ Help developing countries produce goods they can trade in the global market; provides assistance in accessing training, technology and investment to make them competitive in the global market.
- ❖ UNIDO works to upgrade manufacturing technologies in India, and to facilitate South-South Cooperation.

➤ 2013-2017 Country Programme (24 projects; USD 87 million)

- ❖ Green industrial development
- ❖ Inclusive economic development
- ❖ South-South industrial cooperation

➤ 2018-2020 Country Programming Framework (draft)

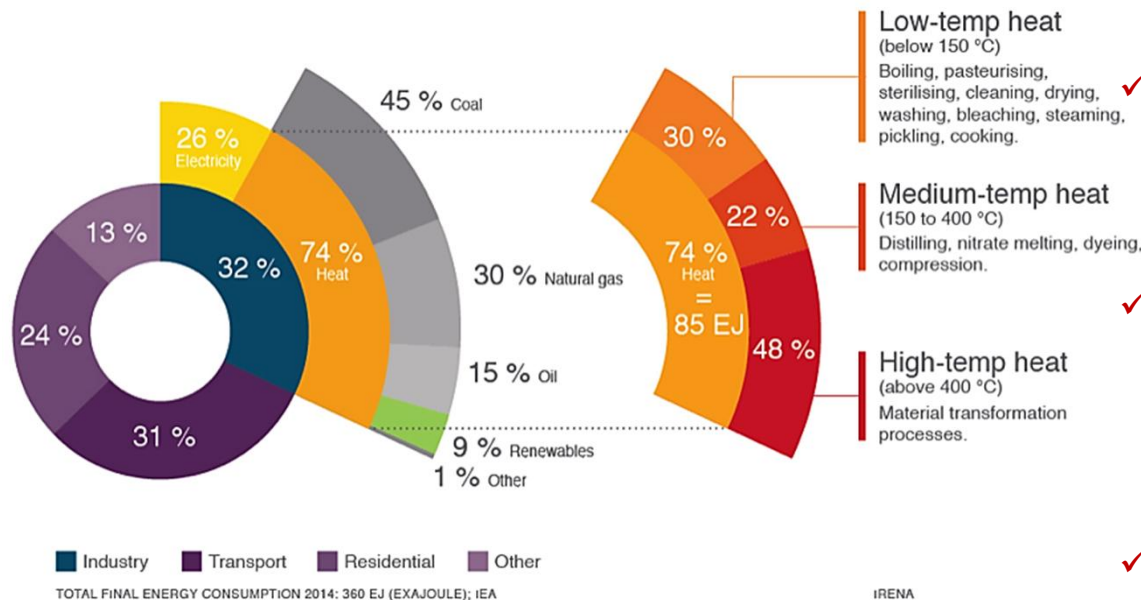
- ❖ Productive and resilient MSMEs
- ❖ Solutions for climate, resources and environment
- ❖ Inclusive and responsible value chains and business
- ❖ Strategic policy for industrial transformation



Industrial Process Heat: India's Prospective

Process heating

Direct or Indirect application of Heat in a process through a heat transfer mechanism

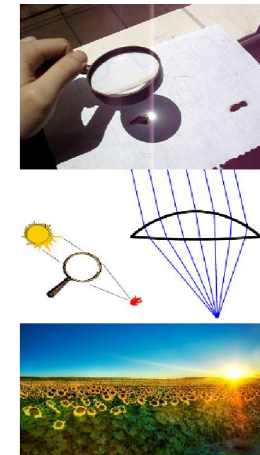
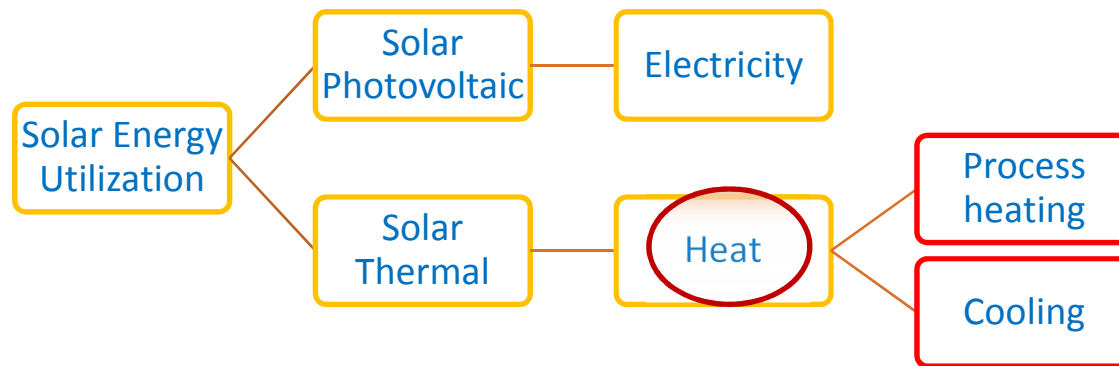


- ✓ Industrial energy consumption is responsible for 32% of India's total energy consumption.
- ✓ A small part of energy demand is met by electricity, rest by coal, biomass, oil products and gas, indicating that a large amount of energy in the industrial sectors is used to provide thermal energy/heat.
- ✓ Industrial heat is characterized by a wide diversity with respect to temperature levels, pressures and production processes to meet the many different industrial process demands.
- ✓ Energy demand of the Industrial sector accounted for 42% of the imported crude oil in 2014-15 (189.43 mil. tonnes), out of which around 30 mil. tonnes provided thermal energy at temperatures below 250 °C.
- ✓ Solar technologies can produce a range of temperatures, between 50°C and 400°C, which can be used in a variety of these thermal applications.

Why Solar? (Save Energy, Save Environment, Save Nation)



Emerging Concentrating Solar Thermal Technologies (CSTs)

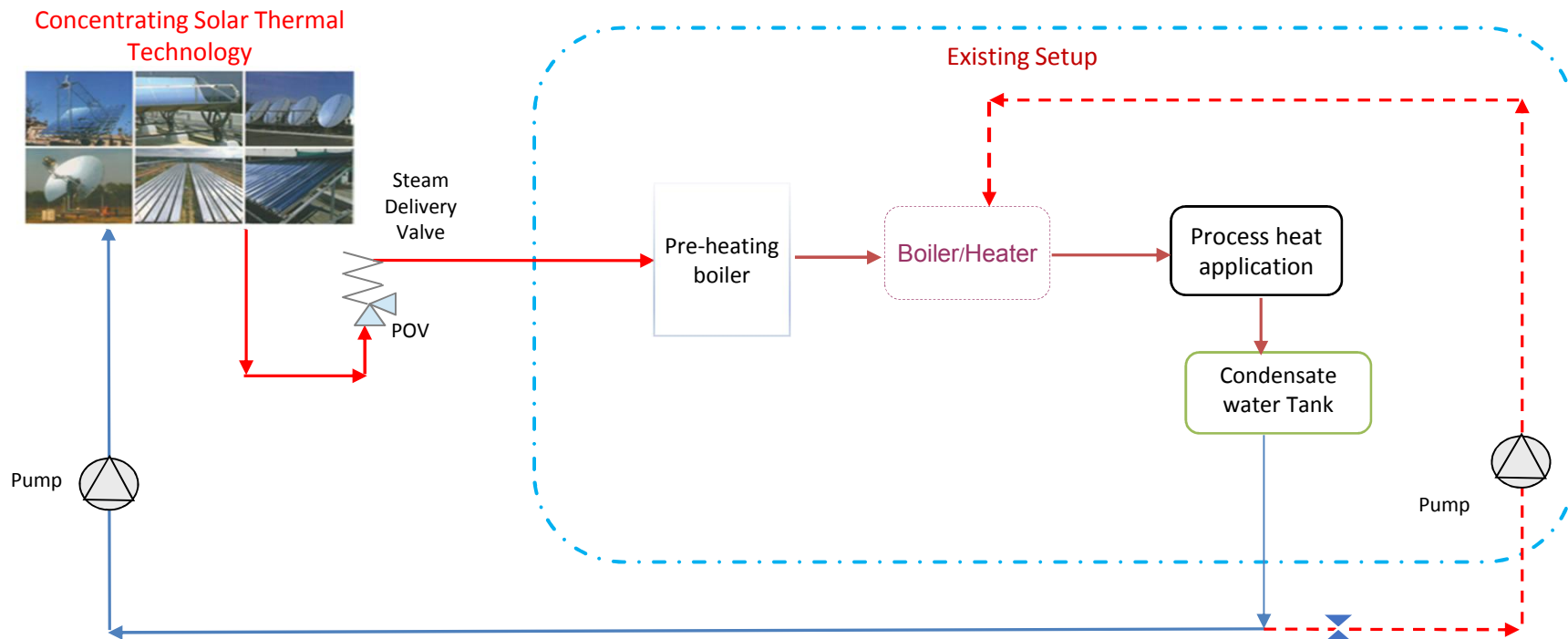


- CSTs can concentrate solar radiation using mirrors/lenses to produce low to medium temperatures heat for various applications (up to 400 °C).
- Most of these devices need automatic tracking so as to focus sun rays on to a receiver all the time.



Easy Integration of CSTs with Existing System

- Steam or pressurized hot water is used to increase the temperature in a process vessel/boiler.
- If the steam is used for energy generation, the thermal efficiency of the overall system can increase.





Chitle Dairy, Sangli
(338 m²; Milk Pasteurization)



Paraboloid Dishes at Synthokem
Pharmaceutical, Hyderabad
(540 m²; Process Heating)



Non- imaging Collectors at
Neel Metal, Gurgaon
(612 m²; Process Heating)



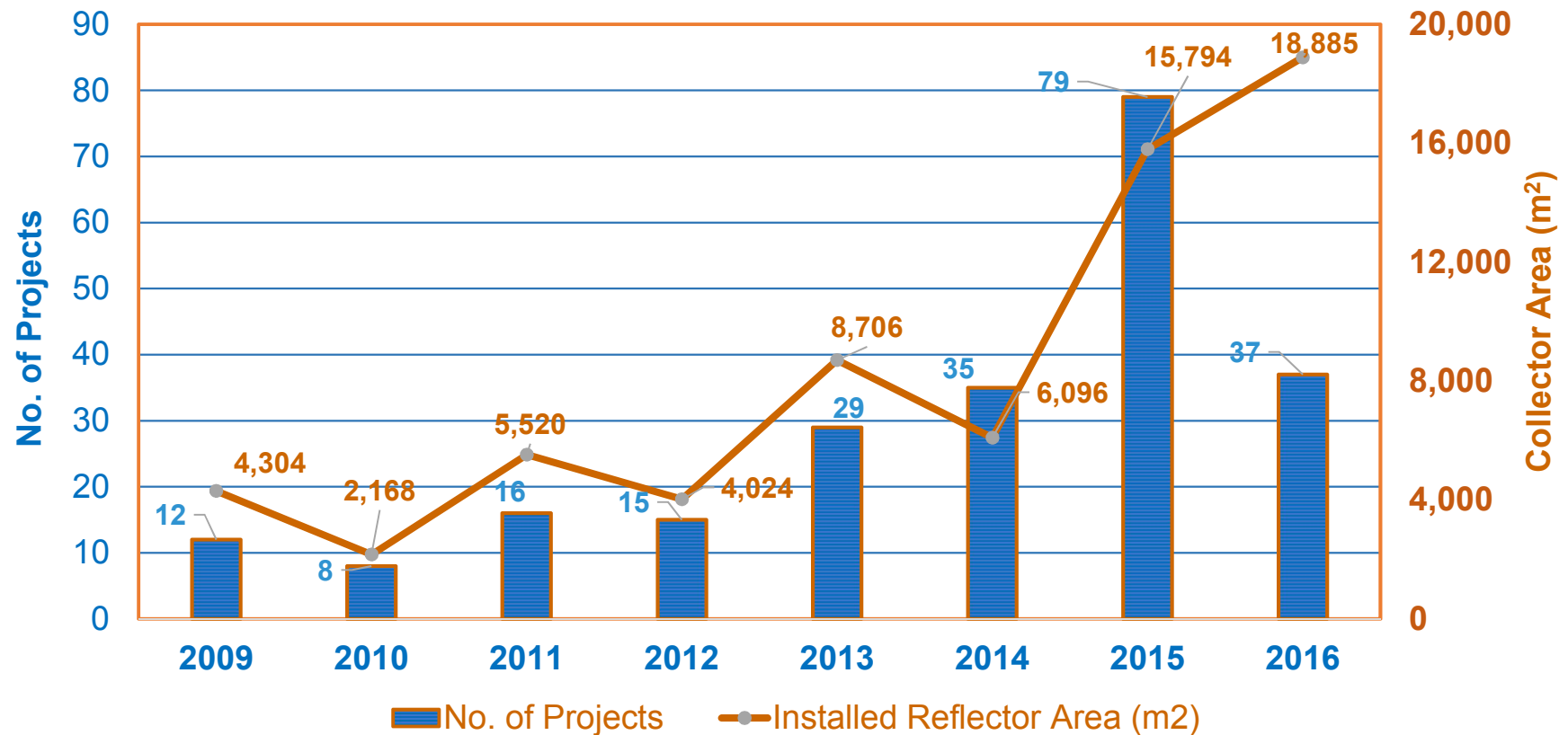
Parabolic Trough Collectors
at Siddhartha Surgical, Vadodara
(263 m²; Process Heating)



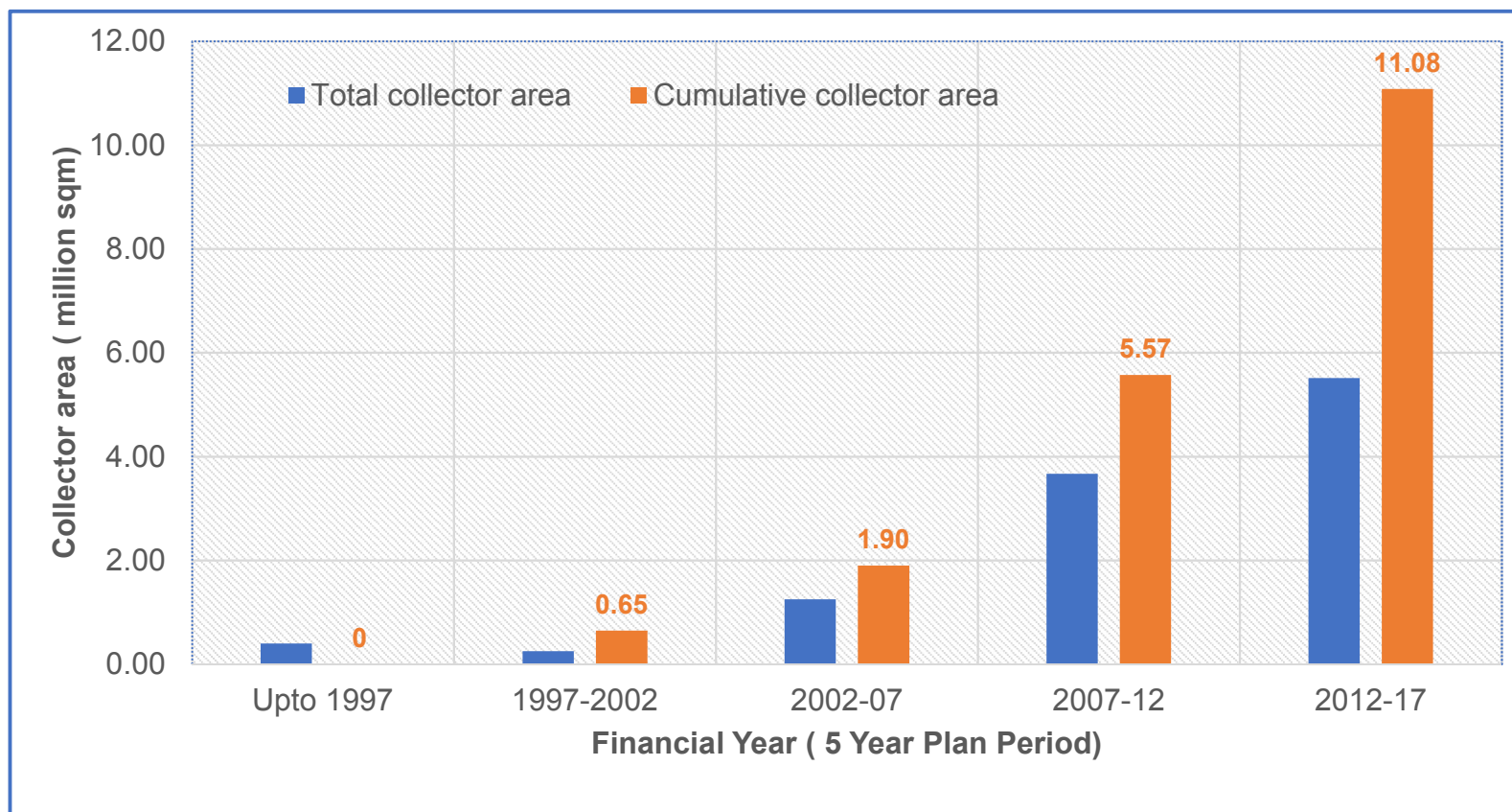
Parabolic Trough Collectors at
Honeywell Technology Solutions,
Hyderabad
(820 m²; Cooling)

Accelerating growth of CST projects in India

No. of installed projects = 271 (Collector area = 78,290 m²; Power = 52 MW)



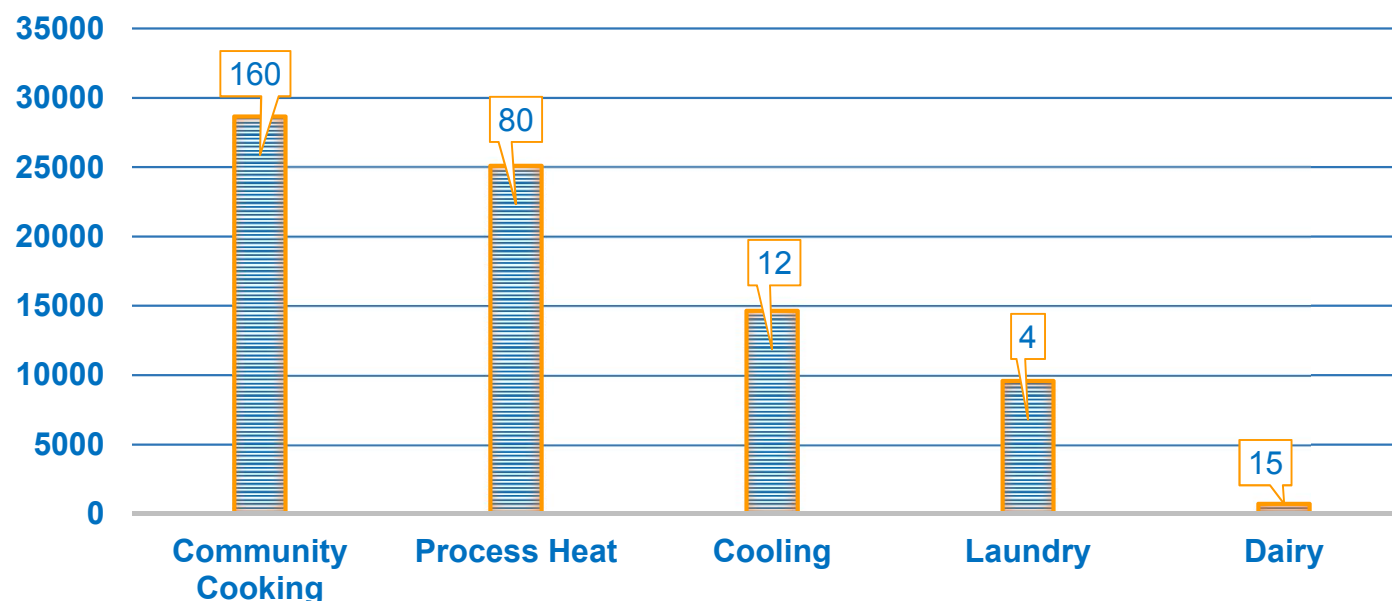
Installation of Solar Water Heating Systems



Potential Sectors for CST Deployment

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	PoP, Steel re-rolling, Cement, Mining
7	Food processing (including Dairy & Sugar)	14	Other industries including tertiary using steam/cooling

Achievements



Financial Incentives

- Central financial assistance (capital subsidy from MNRE)
- Subsidized loan from IREDA under GEF supported UNIDO project and
- Tax benefit due to 80% accelerated depreciation

Project Payback

Process Heat: Substituting Furnace Oil, Diesel, PNG ~ 3-4 years

Substituting Coal, Biomass, Wood ~ 5-7 years

Cooling: 7-10 years



UNIDO's role in promoting CSTs

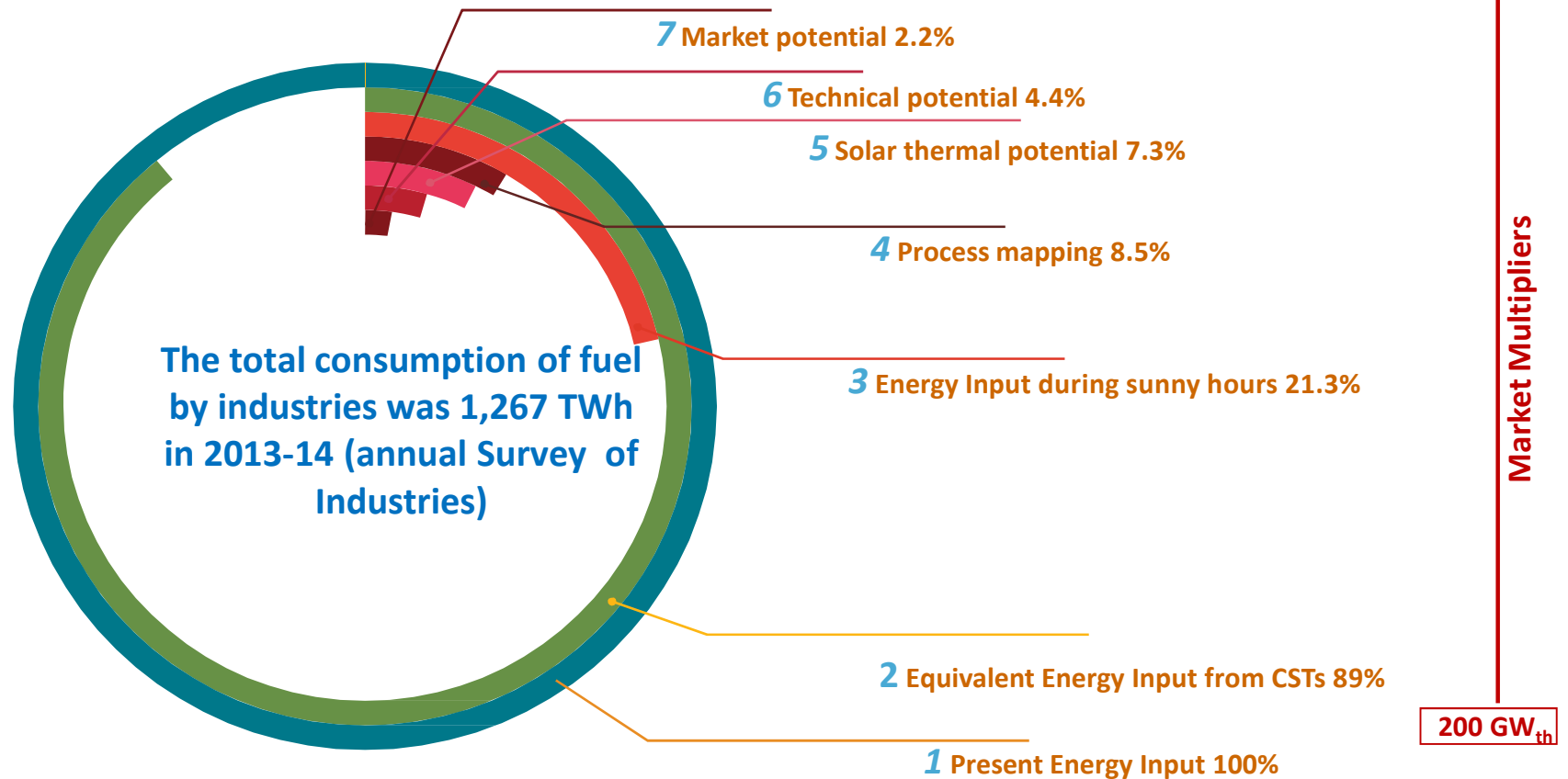
- ✓ The project assists in the commercialization of concentrating solar technologies by innovating the technical and financial support.
- ✓ It compliments MNRE's support programme by helping remove barriers to promotion of CSTs.

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.

The Market Potential of CSTs in India

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



Conclusions

- JNNSM with suitable policies/scheme and targets in place. Government committed for time bound achievements.
- Suitable solar technologies are now available for process heat applications from low to mid temperature range (up to 400 °C).
- CSTs have already proven technological maturity and financial viability in a few industrial sectors, penetration of CSTs in many more sectors is required.
- Win-win situation for users as CSTs save fossil fuels as well as make them green by reducing their carbon footprint.



Thank You!

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