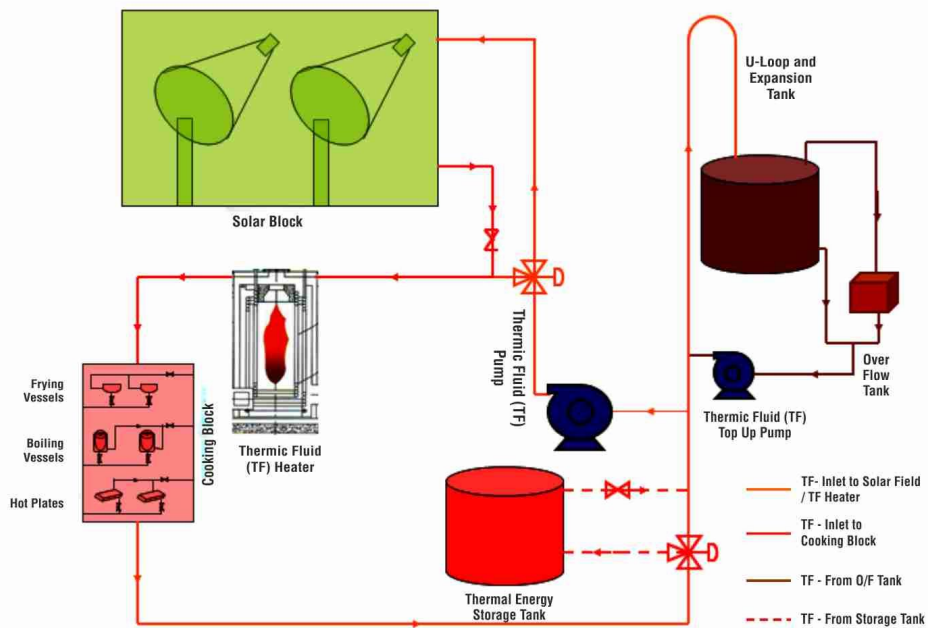


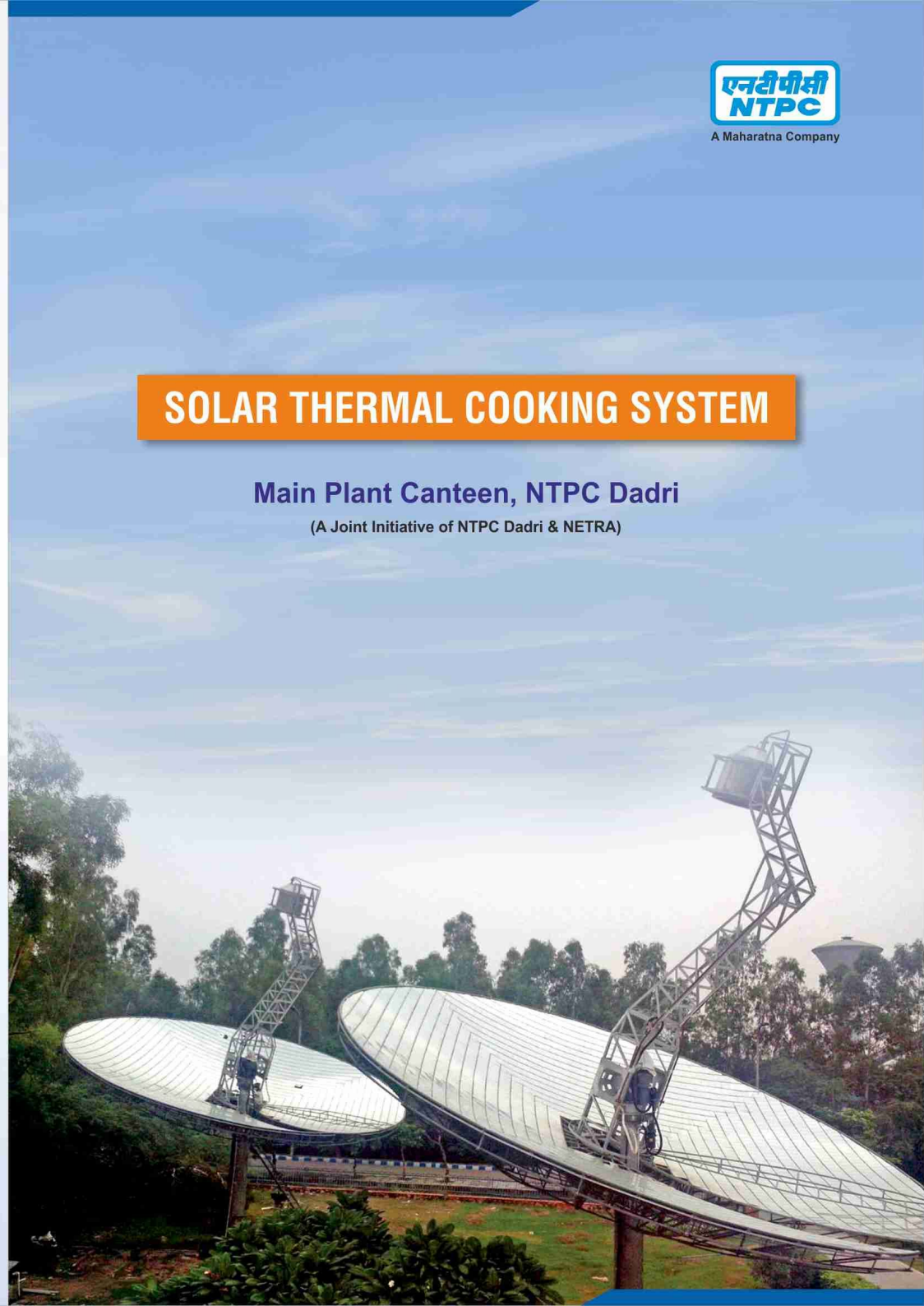
**SCHEMATIC – SOLAR THERMAL COOKING SYSTEM AT NTPC DADRI**



**SOLAR THERMAL COOKING SYSTEM**

**Main Plant Canteen, NTPC Dadri**

(A Joint Initiative of NTPC Dadri & NETRA)



# Solar Thermal Cooking System

## INTRODUCTION

Solar Thermal Cooking System (STCS) is an innovative low carbon, all weather cooking solution which is capable of cooking in all 3 modes i.e boiling, frying and baking based cooking. It is installed at Main Plant Canteen of NTPC Dadri.

This STCS is a 'proof of concept' plant. Once various technology elements of STCS are proved and its efficacy is established, same can be replicated in other canteens of NTPC power station, with or without scale up.

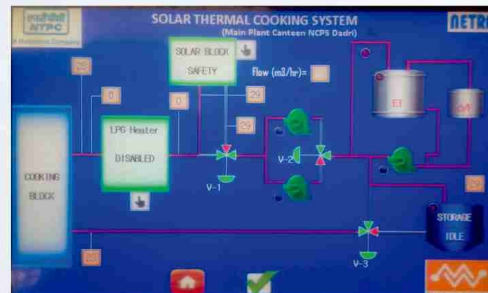
## SALIENT FEATURES

- Capable of cooking in all 3 modes which requires different temperature regimes – boiling (approx.100°C), frying (approx.170°C) and baking (approx. 240°C).
- Quick startup – requires almost half of the time compared to solar cooking system based on steam.
- Thermal energy Storage – stores additional solar energy in day time and makes it available for cooking during no / low solar period as well as quick startup in morning.
- No chemicals required - as steam generation is not involved
- All weather cooking solution - integrated with LPG fired Thermic Fluid Heater for non / lean solar period operation.



## SYSTEM DESCRIPTION

- STCS comprises of two distinct blocks – Solar Block and Cooking Block.
- Solar Block – It comprises of 2 nos of high optical efficiency, point focus, two axis tracking solar parabolic concentrators, Inverted U-Loop, 2x100% Thermic Fluid Pumps, 1x100% Over Flow Pump, Expansion Tank, Storage Tank, Over Flow Tank and associated pipe work.
- Cooking Block – It comprises of 2 nos each of Boiling, Frying and Baking Vessel and 1x100% LPG fired Thermic Fluid Heater.
- STCS is controlled thru a PLC and is envisaged to operate automatically. If required, STCS can also be taken in manual mode.



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Boiling Vessel



Frying Vessel



Baking Plate

## OPERATION OF STCS

- Solar Mode: When the Solar energy is equal to or more than the energy required for cooking, STCS will work on Solar Energy Only. Invariably, it shall be in the day time.
- Thermic Fluid Heater (TFH) Mode: During no solar period, 'Solar Loop' is cut off and STCS operates only on TFH.
- Dual Mode: During lean solar period, when the cumulative of direct and stored solar energy is less than the energy required for cooking, TFH shall 'cut in' automatically. Once the desired temperature of thermic fluid is achieved, TFH shall 'cut off' in auto.

## THERMAL ENERGY STORAGE

There can be a time mismatch between the availability of solar resource and cooking period, particularly in industrial environment where canteen operates on 24 hour basis. Therefore, STCS has been designed with Thermal Energy Storage.

In the event of higher solar resource or lower cooking need, excess solar energy is utilized to heat additional quantum of thermic fluid which is stored in an insulated Storage Tank. This stored heat can be utilized for cooking during lean / no solar period.

## SOLAR DISH DETAILS

Type	Paraboloid
Thermal Capacity	60 kW @ 1000 W/m <sup>2</sup> DNI
Aperture area	90 m <sup>2</sup>
Tracking	2-Axis, Automatic
Focus	Point Focus
Receiver	Cavity Type
Process Fluid	Thermic Fluid (Food Grade)
Control	Micro processor
Aerial space	10 M x 10 M x 12 M
Foot-print	1 M x 1 M
Foundation	4 M x 4 M

