Project Overview

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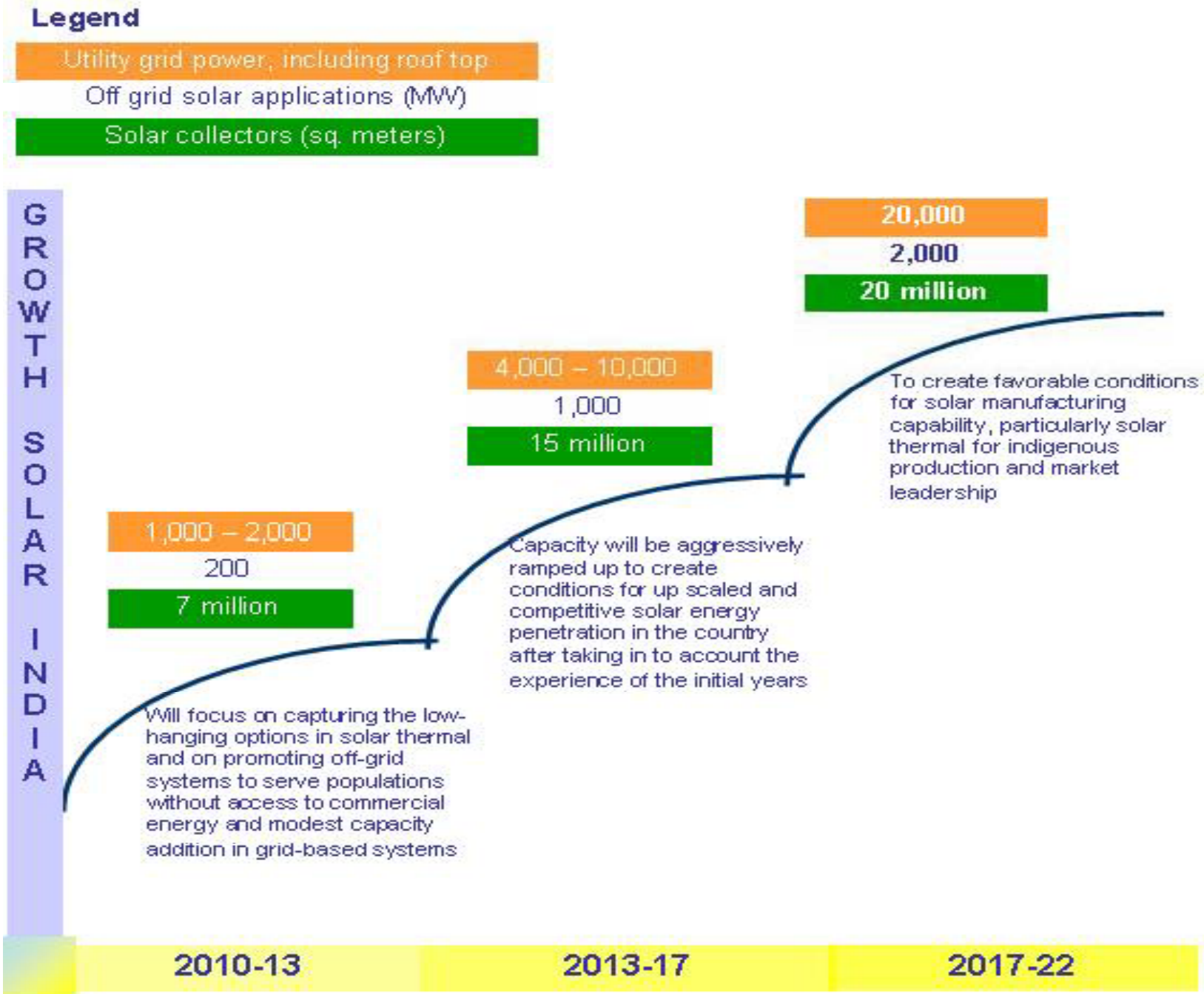
- **Introduction**
- **IIT Bombay initiative**
- **Experiences**
- **Summary**

Power Generation:

attractive application of solar thermal energy


Legend
Utility grid power, including roof top
Off grid solar applications (MW)
Solar collectors (sq. meters)
GROWTH SOLAR INDIA
1,000 – 2,000
200
7 million
Will focus on capturing the low-hanging options in solar thermal and on promoting off-grid systems to serve populations without access to commercial energy and modest capacity addition in grid-based systems
4,000 – 10,000
1,000
15 million
Capacity will be aggressively ramped up to create conditions for up scaled and competitive solar energy penetration in the country after taking in to account the experience of the initial years
20,000
2,000
20 million
To create favorable conditions for solar manufacturing capability, particularly solar thermal for indigenous production and market leadership
2010-13
2013-17
2017-22

Low Temperature System

Flat-plate collector, Solar Chimney, Solar Pond

Low efficiency and hence high cost

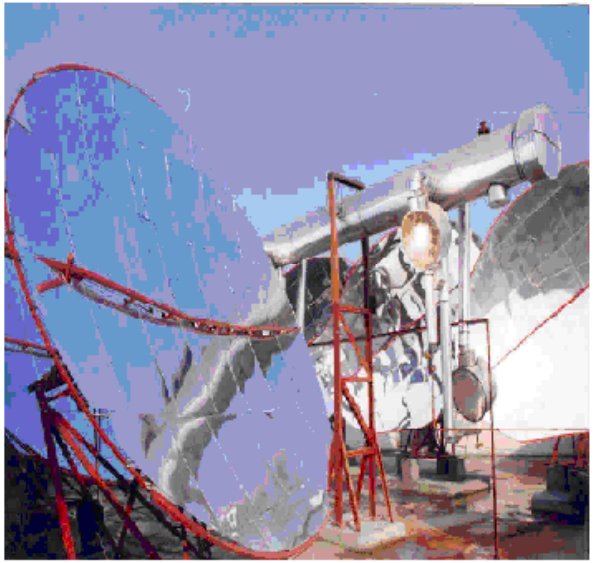
Medium Temperature System

Cylindrical Parabolic Concentrator (Trough Concentrator)

Linear Fresnel Reflector

High Temperature System

Paraboloid Dish



Scheffler Dish

Arun Dish

Heliostats

Plant in operation

Technology	Capacity (MW)
Trough	2983
Tower	465
Fresnel reflector	46
Dish Stirling	2.5

Now operational : 3651 MW

Under construction : 2464 MW

Announced : 10 GW

Global CSP Prediction:

25 GW by 2020

IIT Bombay initiative

. Install and operate megawatt scale plant
(medium temperature route)

. Develop a national test facility

. Software package

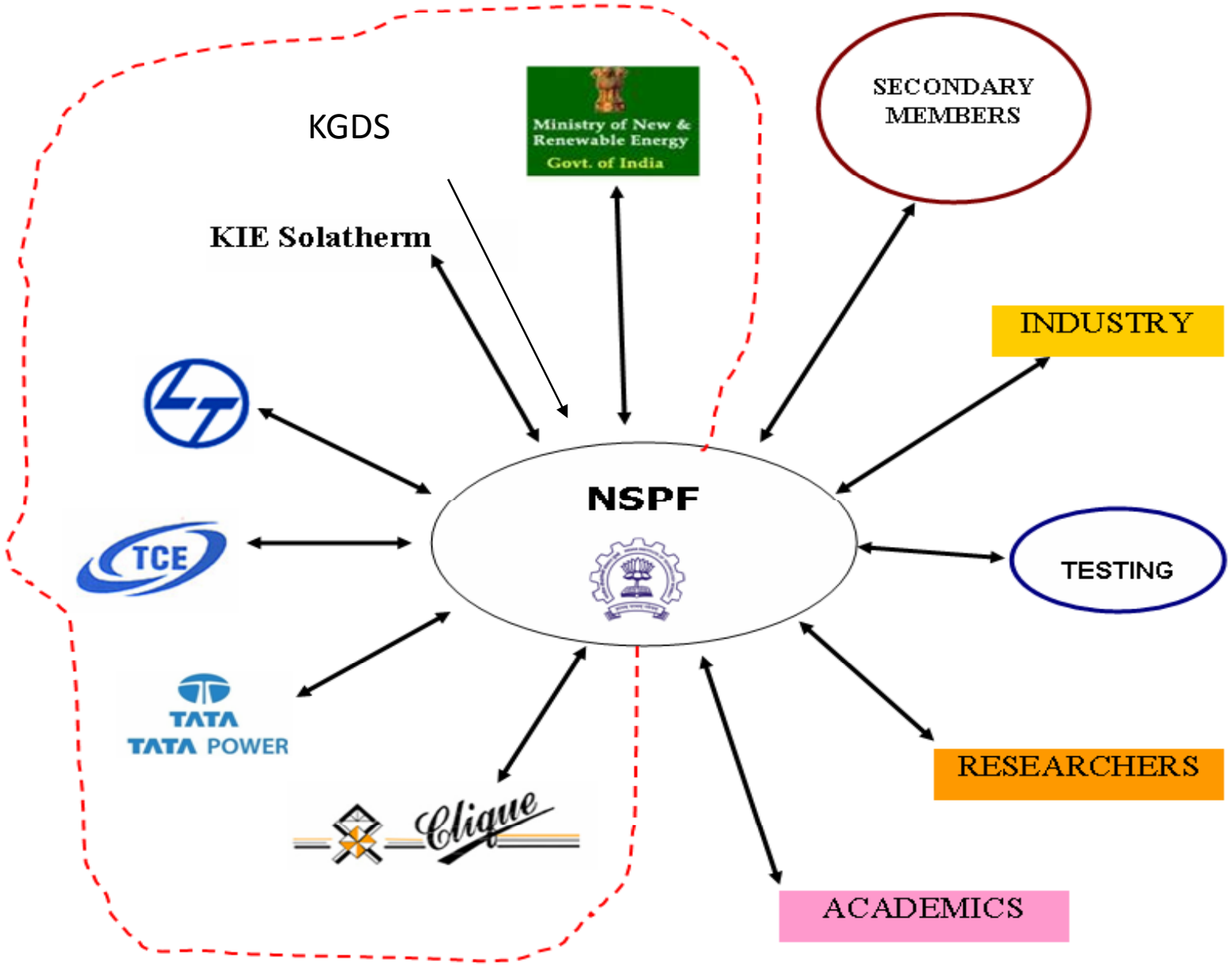
Objective: Galvanise technology development and create knowledge base

Project Objectives

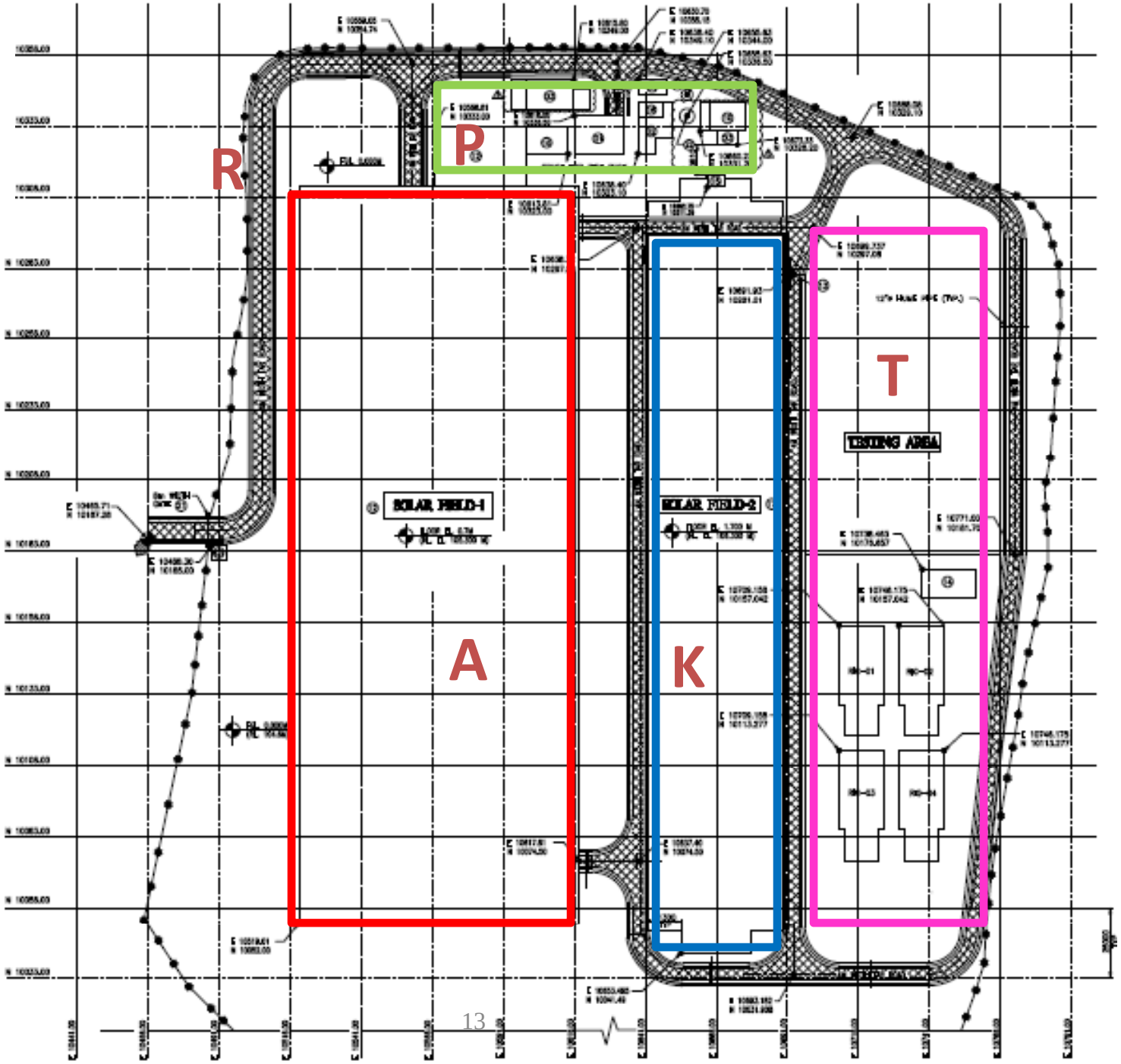
- **1 MWe Solar Thermal Power Plant**
  - Installation of 1 MWe plant.
  - Generation of Electricity for supply to the grid.

- **National Test Facility**
  - Development of facility for component testing and characterization.
- **Development of Simulation Package**
  - Simulation software for scale-up.

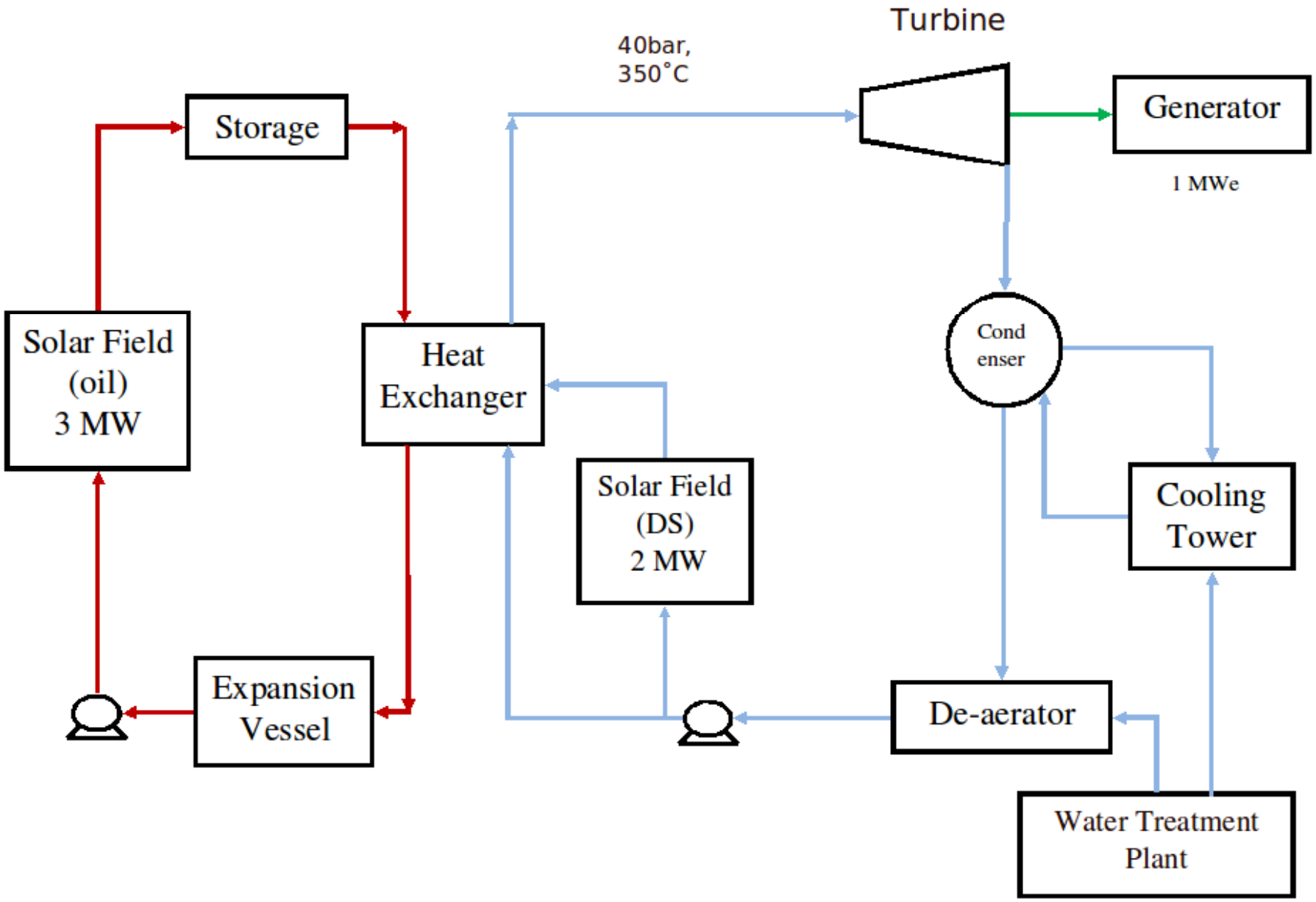
Consortium: Functioning Mode



PLOT PLAN



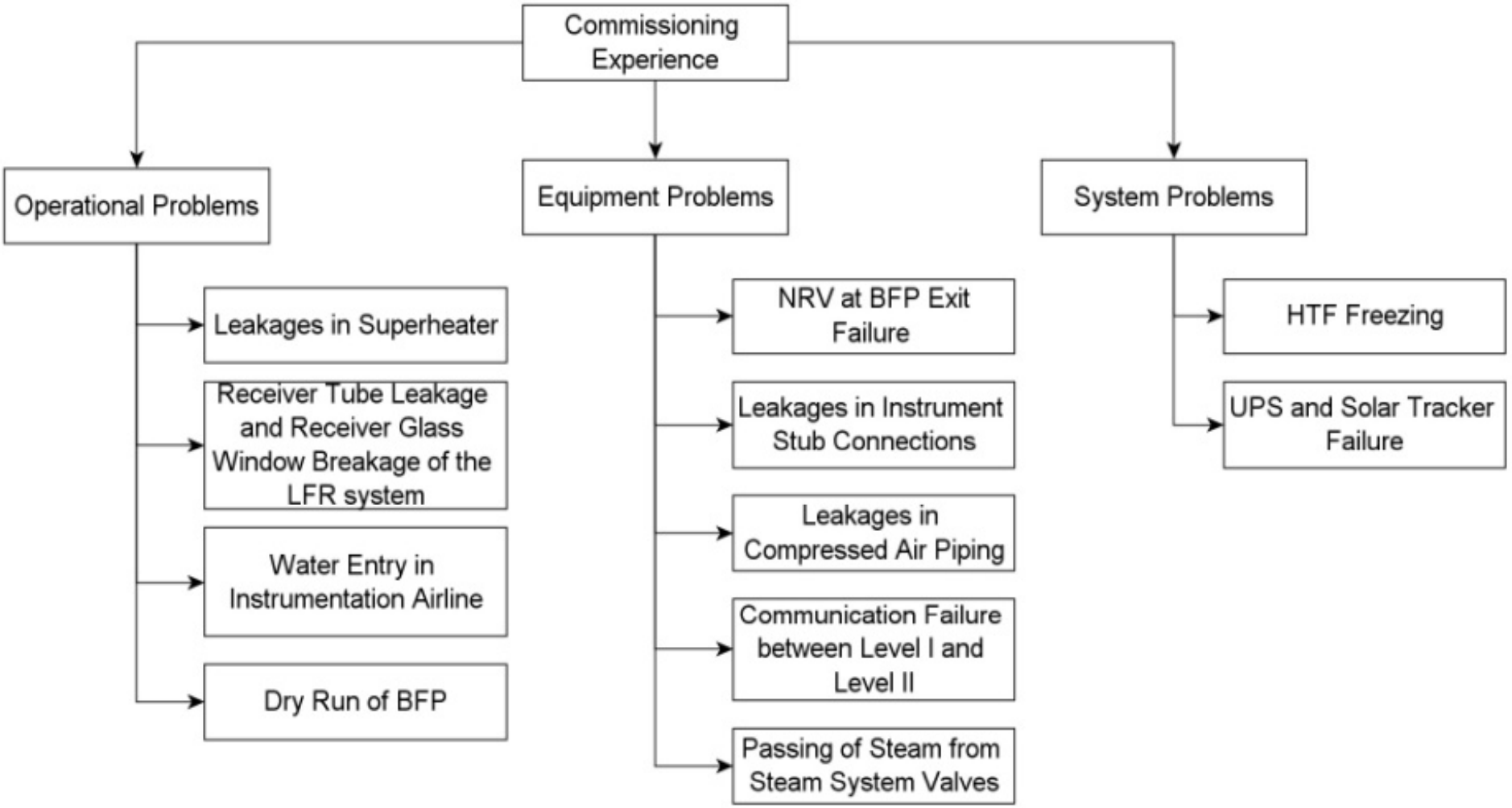
Simplified Process Flow Diagram



Plant: conceptualisation, design, installation and operation

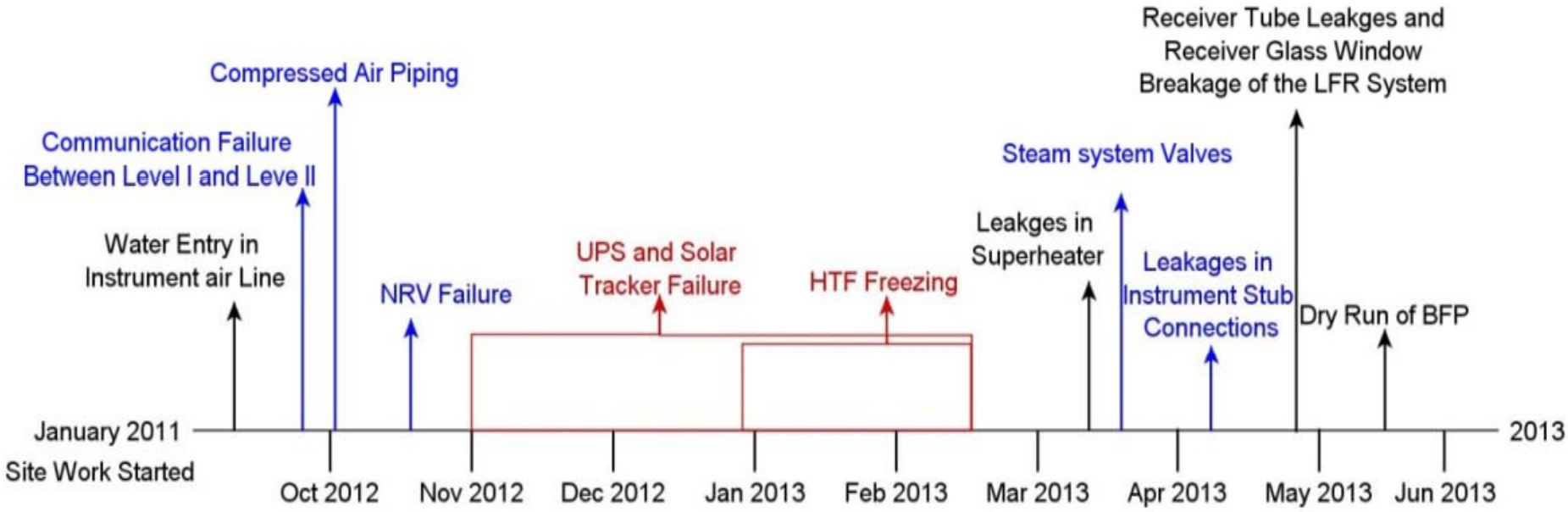
Plant

Commissioning Experience



Classification of commissioning experience

Commissioning problems in chronological order



Solar Thermal Simulator

- **Unique Features:**
  - **Simulation of user defined plant configurations**
  - **Design point as well as off-design simulations**
  - **Cost analysis**

Main User-Interface

Testing

Test Rig

Dish Concentrator

Test Building

Summary

Unique Features

Plant:

1. **Conceptualisation, design, engineering and control: Indigenous, no black box approach**
2. **Grid-connected**
3. **Two solar technologies (PTC and LFR)**
4. **Two working fluid (Therminol VP1 and water)**
5. **Buffer oil storage (about 30 minutes)**
6. **No auxiliary source**

Challenges: operation and control

Unique Features

- **Test facility: one of the largest**
  Test loop integration
  with the plant
- **Simulation and optimisation package:**
  validation and scale-up
- **Consortium mode**
- **Documentation and experiences in open domain (planned)**
- **Human capacity building**

Research and Development

- **Scope: Beyond the current power plant**
- **Goal: Facilitate Cost effective solar thermal power generation**

Example Areas: Storage, coatings, controls, tracking, collector materials, weight, cost, test indigenous PTC designs

Thank you