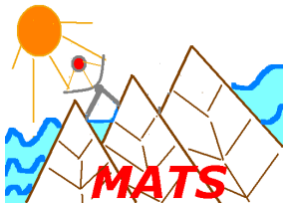
NEW TRENDS FOR SUSTAINABLE ENERGY
ICNTSE 1-3 Oct. 2016, Pharos University, Alex

Multipurpose Applications by Thermodynamic Solar
MATS Project

Prof. Radwan H. Abdel Hamid (ASRT/HU Team Work)

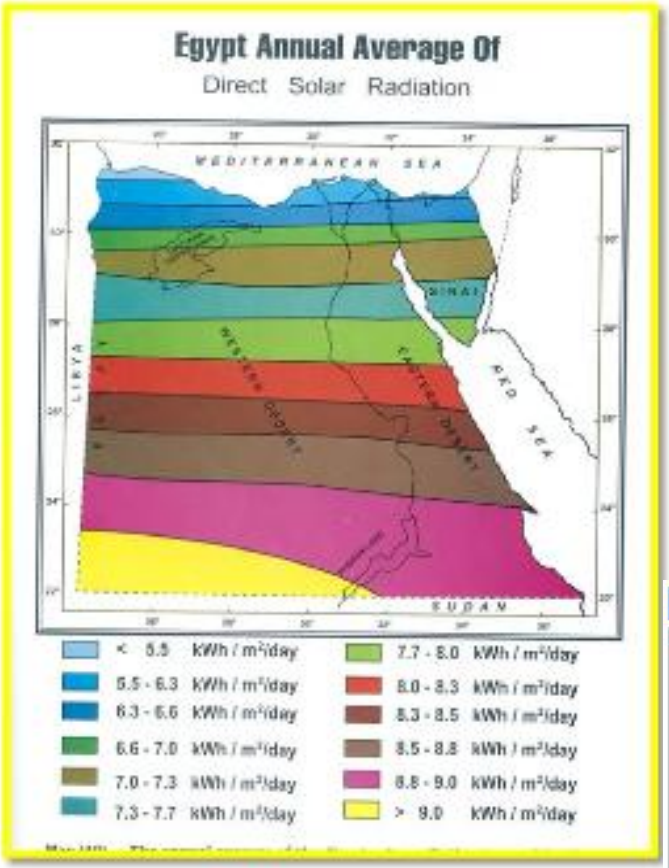
Introduction: Exchanging the RE Projects Experience

- Briefing of RE Strategy in Egypt
- Some EU-Egypt Research and Innovation Cooperation
- Exploring New Frontiers in Renewable Energy Research and Innovation in Egypt

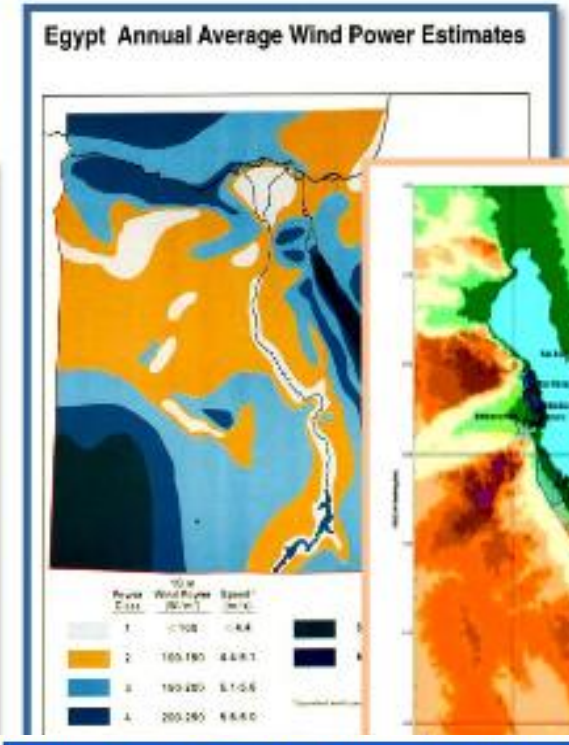


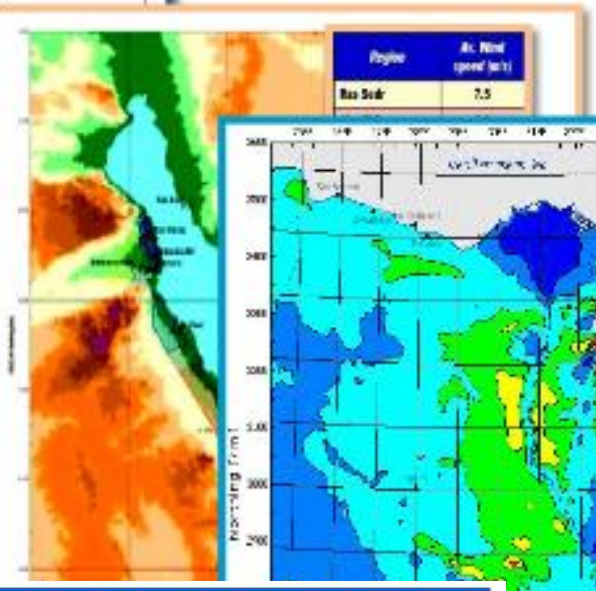
Natural RE Assessment

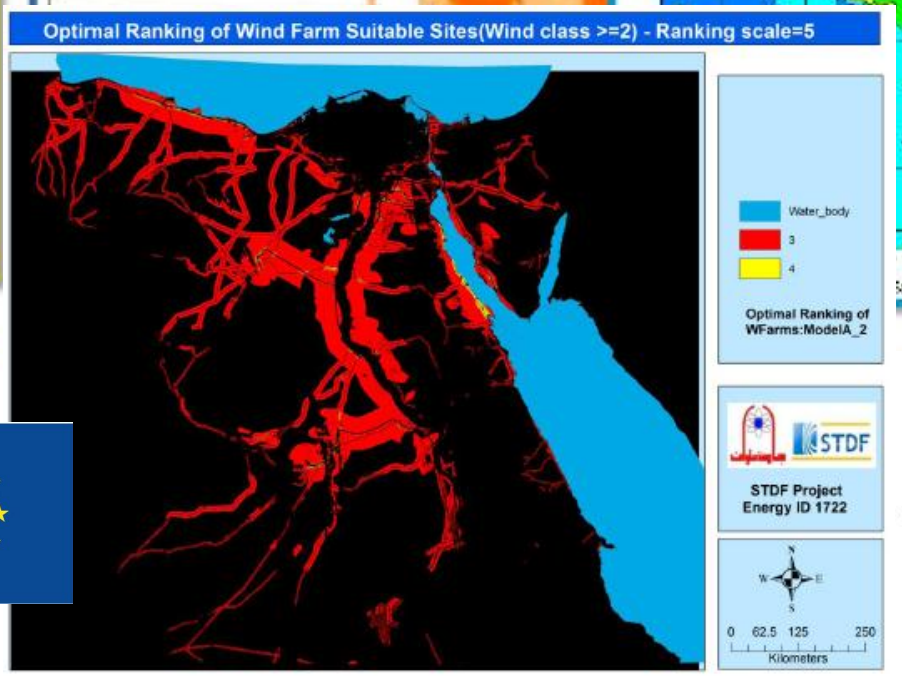
(Source: NREA)



Solar



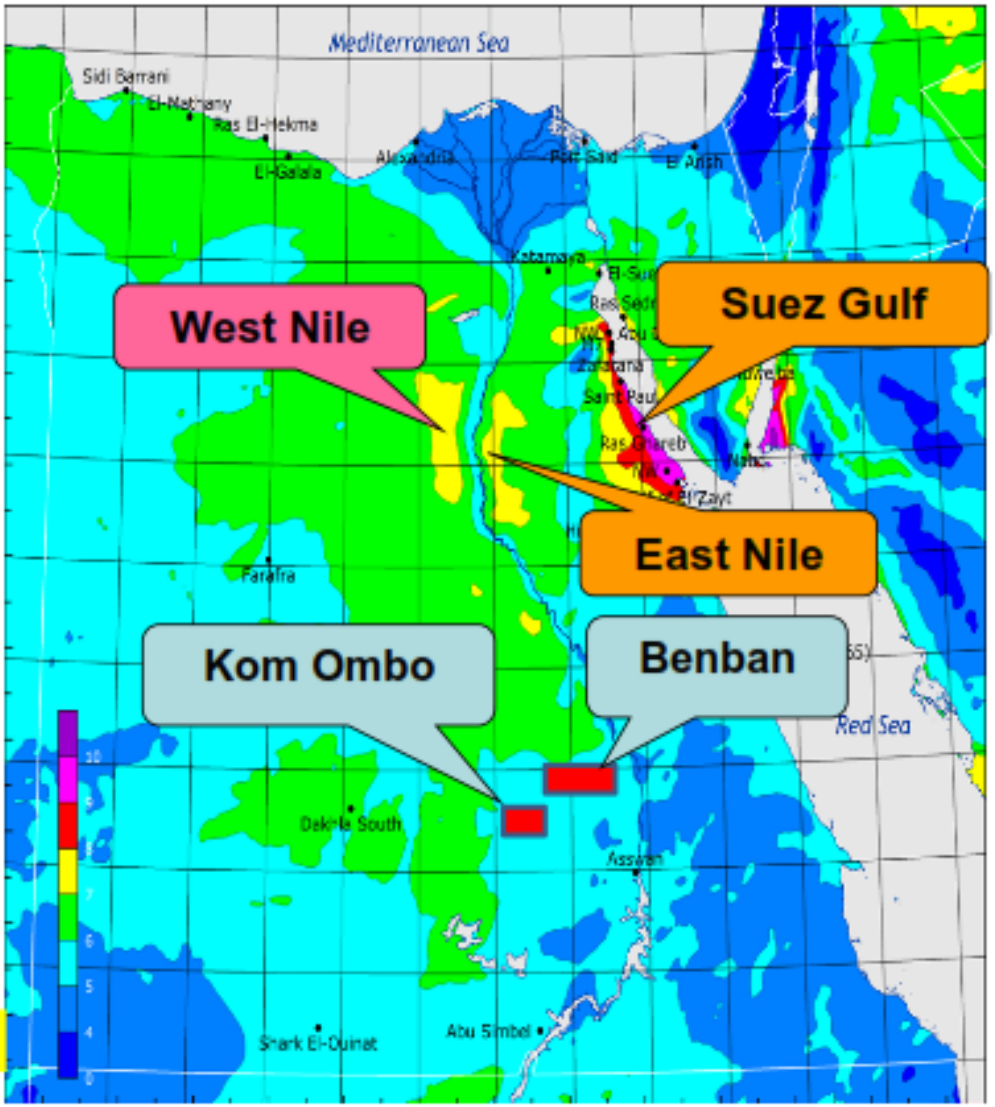




RE Strategy (Source: NREA)

Areas			
Zone		Areas (km^2)	Capacity MW
Suez Gulf (wind)		1220	3550
East Nile	Wind	841	5800
	Solar	1290	34900
West Nile	Wind	3636	25350
	Solar	606	17400
Benban (Solar)		37	1800
Kom Ombo (Solar)		7	260
TOTAL		7637	≈90,000

Yellow shaded cells represent the available areas as a whole



Introduction: Some Joint Funded Projects Running in Cooperation with EU

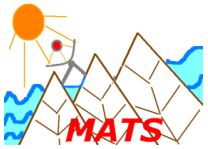
1- Multipurpose Applications by Thermodynamic Solar (MATS) FP7 Project 2011-2015 (*FP7)*

2- EURO-MEDITERRANEAN COOPERATION ON RESEARCH & TRAINING IN SUN BASED RENEWABLE ENERGIES (*FP7)*

3- Small scale Thermal Solar district Units for Mediterranean Communities (STSmed) Ref. I-A/2.3/174 (ENPI)

4- First Egyptian Renewable Energy Cluster Inititivee (ERECI) RDI Project

5- GIS Wind Farms Siting Atlas of Egypt with MCDS



MATS Project

MATS = " **M**ultipurpose **A**pplications by **T**hermodynamic **S**olar "

it is a **EU / 7th Framework Programme (7FP)** collaborative project

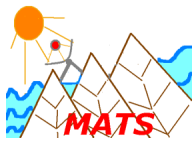
Theme: "**Demonstration of innovative multi-purpose solar power plant**" (ENERGY.2010.2.9-1)

EU Grant agreement no: 268219

Starting date: **July 2011** End date: **July 2017**

Total costs: **21,960,135 Euro** EC funding: **12,515,552 Euro**

+ co-funding by Egyptian Government (2,400,000 Euro) and partners



MATS Consortium

1- ENEA (Italy)

2- KT Kinetics Technology, KT (Italy)

3- Academy of Scientific Research and Technology, ASRT (Egypt)

4- New & Renewable Energy Authority, NREA ,Egypt

5- Delft Environment (Egypt)

6- Fraunhofer Institute (ISE) (Germany)

7- University of Cranfield (UK)

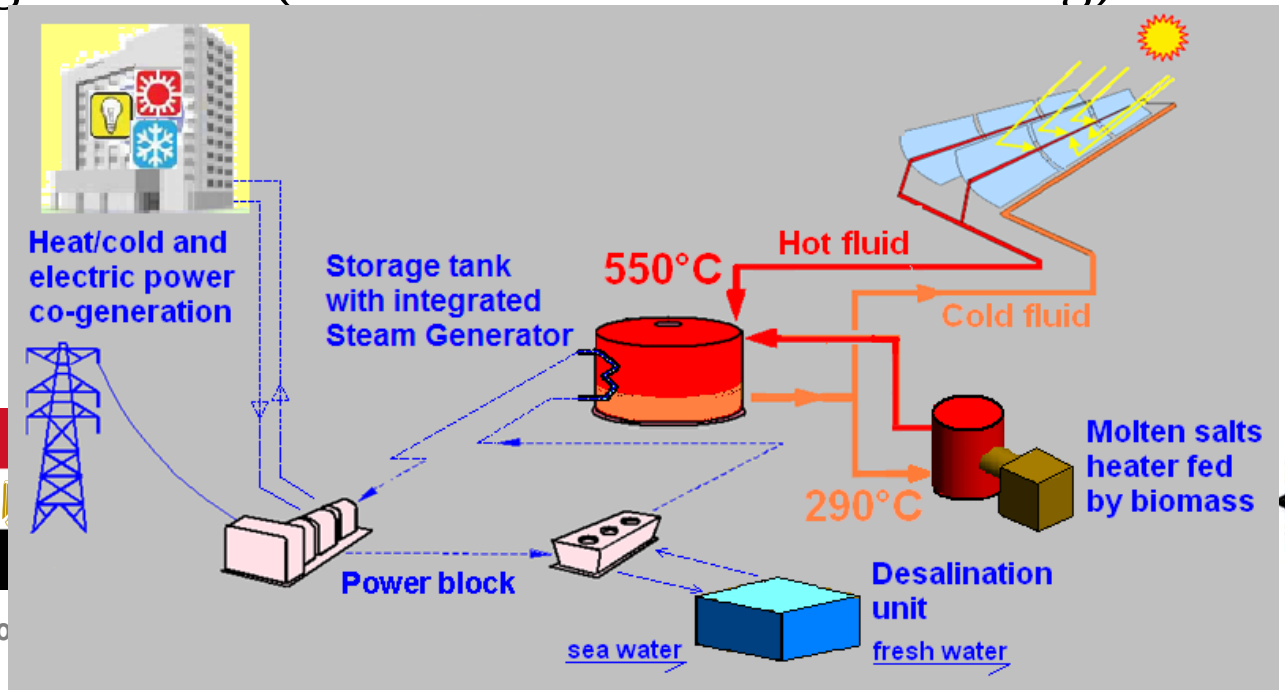
8- Orascom Construction Industries, OCI (Egypt)

9 - CEA (France)

10 - Archimede Solar Energy, ASE (Italy)

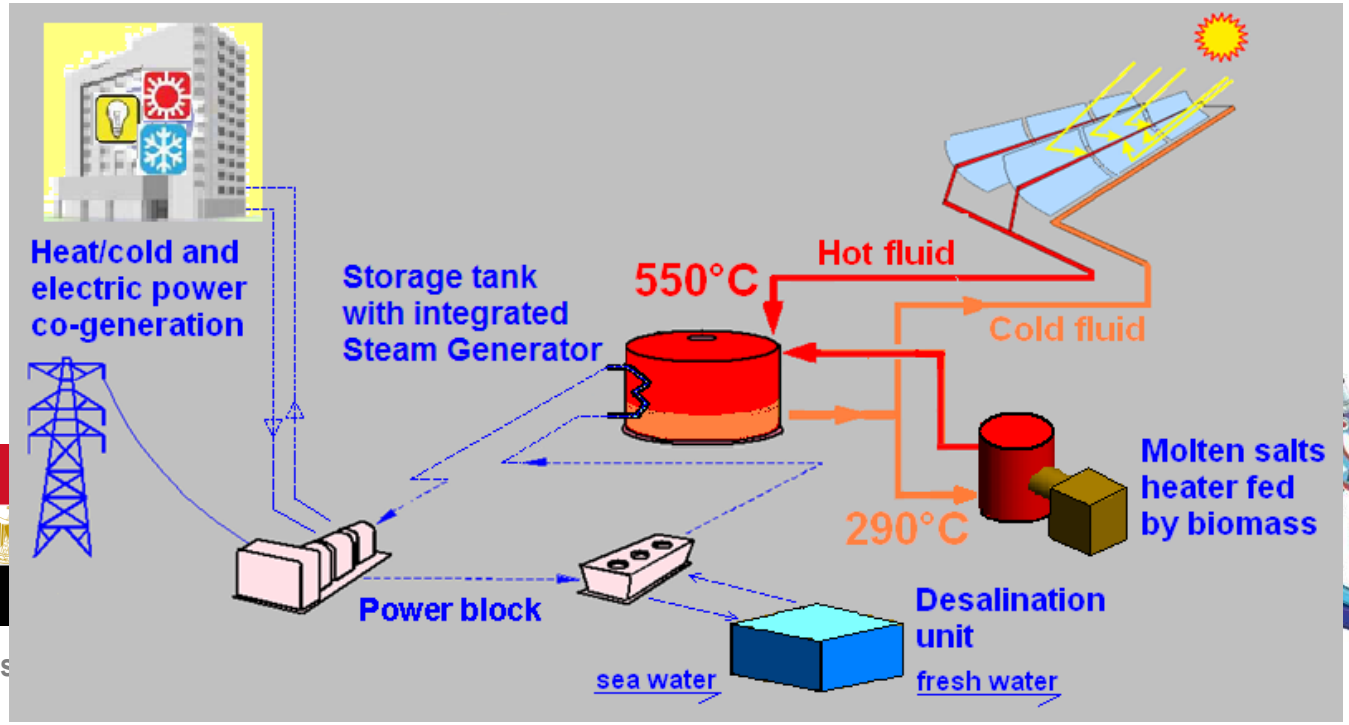
MATS concept

- Applying ENEA's direct molten salts in troughs technology up to 550°C to distributed energy production
- Focusing on the innovative components and their integration:
  - Thermal Energy Storage integrated with a Steam Generator (TES-SG)
  - hybridization with a Molten Salts Heater (MSH, by NG or biomass derived gas)
  - co-generation (desalination & air conditioning)



the FLEXIBILITY of the Technology

dispatch flexibility	store the captured solar thermal power to be used when necessary, regardless the effective solar availability
source flexibility	integrate the solar power with a gas back up source to further ensure continuous and stable power production
output flexibility	produce different services like electric power, demi water, air conditioning, following seasonal/instantaneous demand

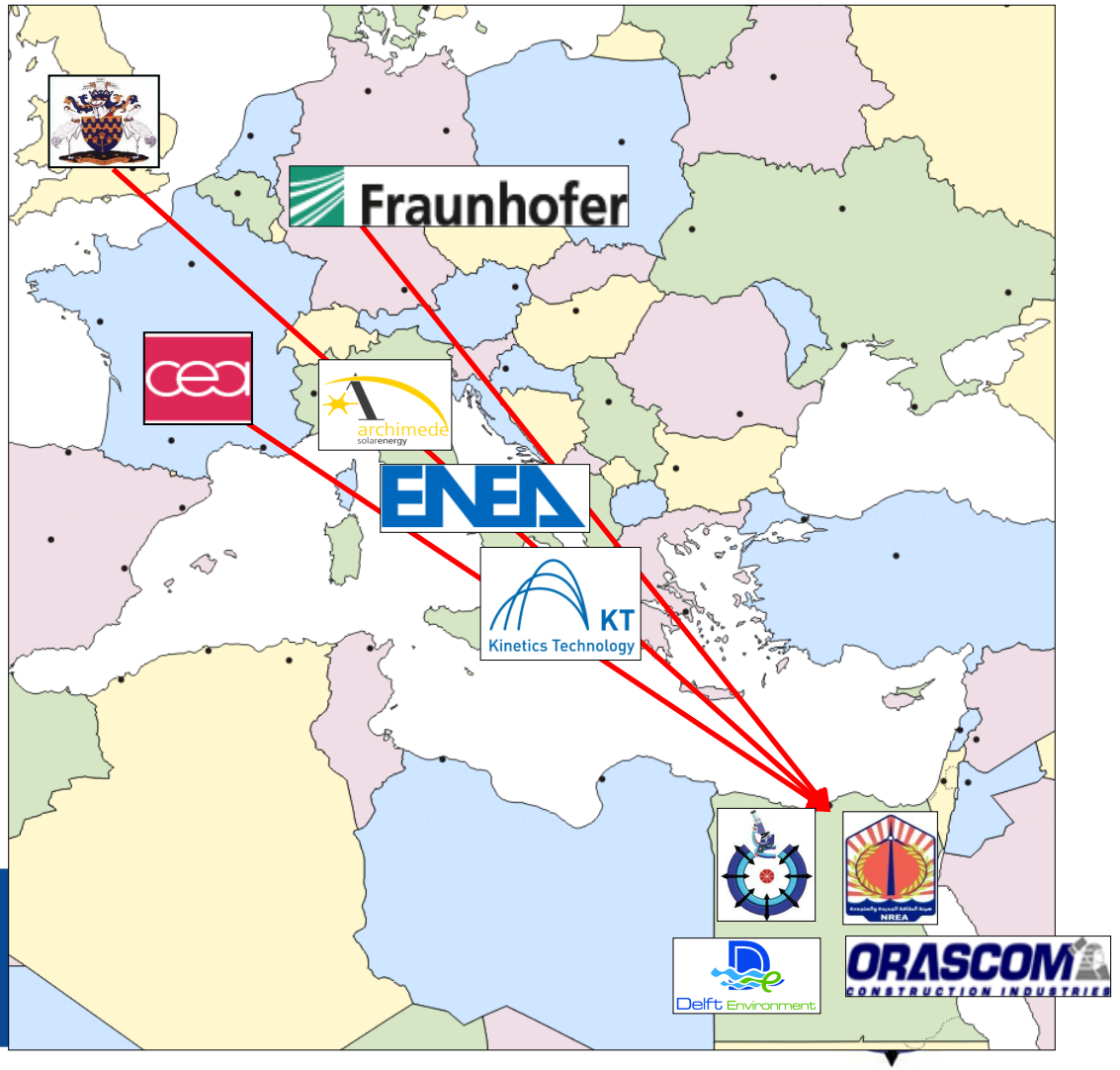


International cooperation in MATS

A demonstration in the demonstration…

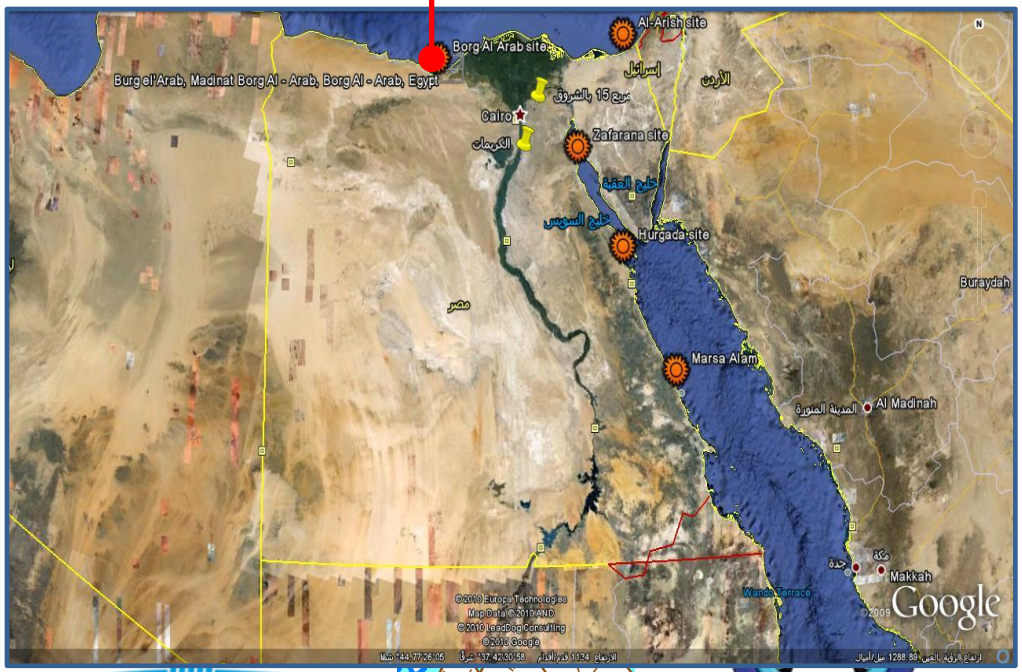
In MATS we firstly aim to demonstrate the **capability of EU organizations and industries** to:

- **fruitfully cooperate with Egyptian partners with a common objective**
- **develop, construct & manage an innovative demo plant in Egypt**
- **transfer technology**



MATS demo plant in Borg El Arab (Egypt)

The site selected for the demo plant is the City for Science and Technology (SRTA-City) in Borg El-Arab, Alexandria (Egypt)

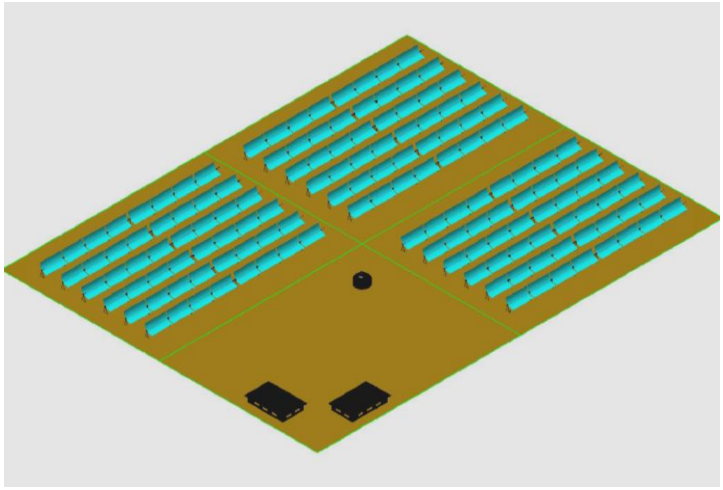


SEVENTH FRAMEWORK PROGRAMME

MATS demo plant in Borg El Arab (Egypt)

Main Plant Features:

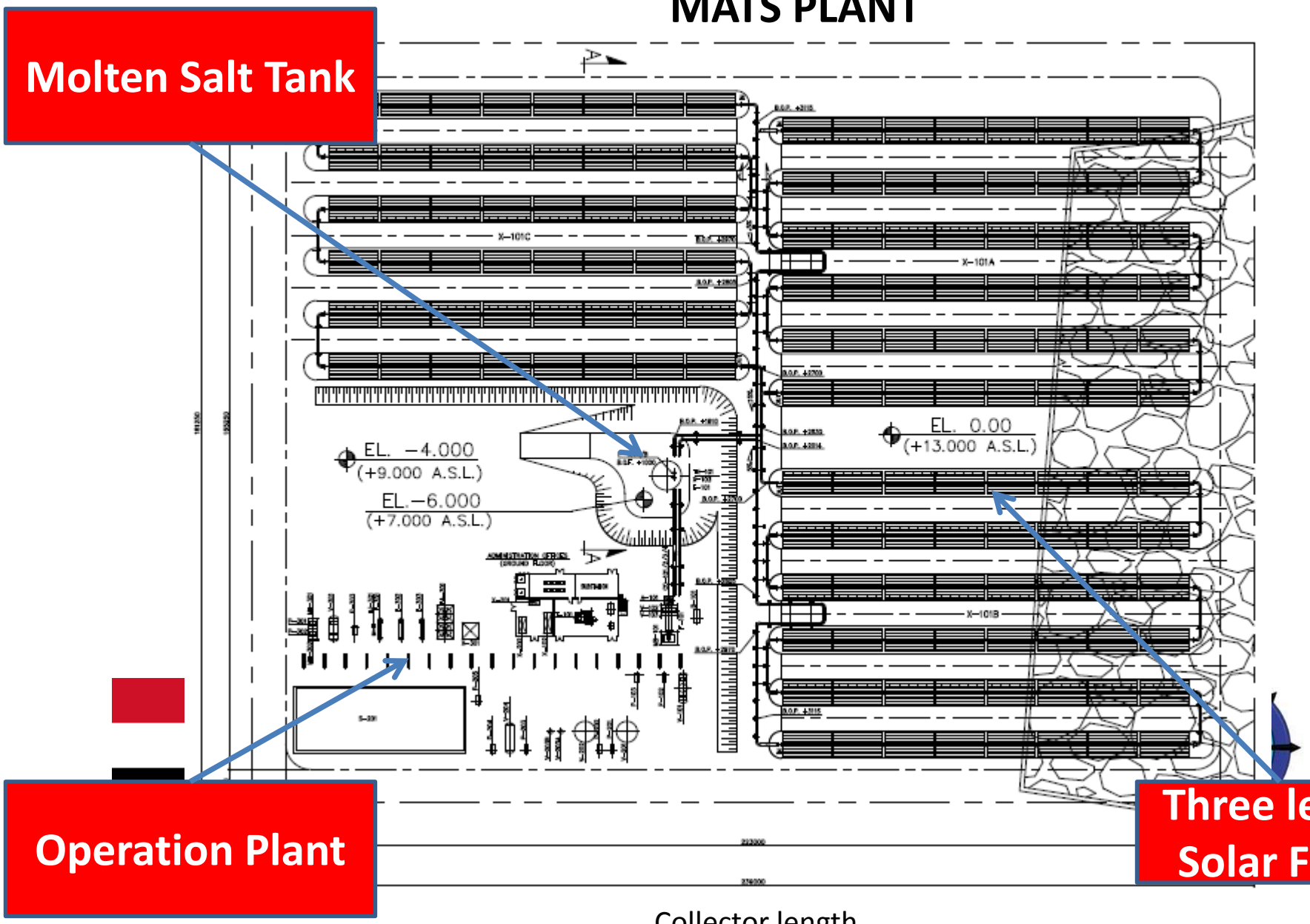
Electric Power		1.0	MWel
Outlet Thermal Power		4.0	MWth
Inlet Thermal Power		5.7	MWth
Desalting Unit	Type	MED	
	Capacity	250	m^3 per day



Plant in Borg El-Arab will represent a unique tool to:

- ❑ **get visibility with an highly advanced CSP technology**
- ❑ **demonstrate and test new solutions about the combined heat and power production from combined solar and gas sources**
- ❑ **additional duties of desalination and/or building heating/cooling can improve the economical balance of the plant**
- ❑ **After demonstration, the project can be replicated in several sites in Egypt and Middle East**

MATS PLANT



Collector length
102m
Mirror span:5.9m

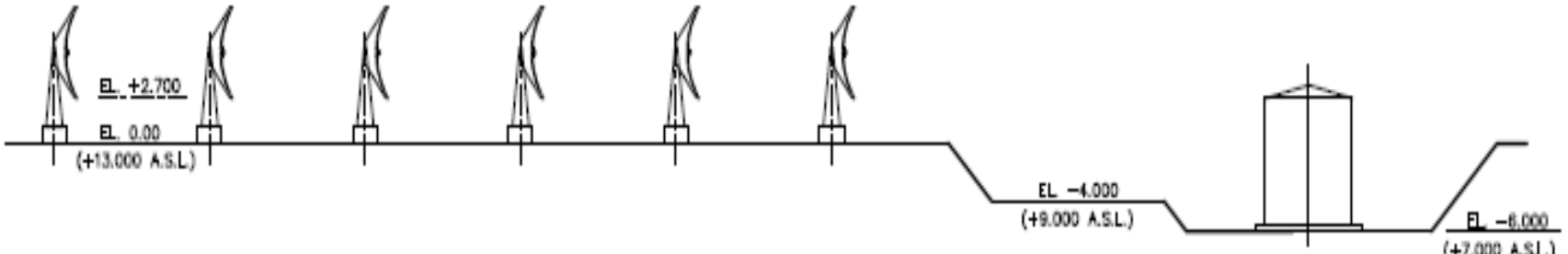
MATS PLANT

All parts of molten salt circuit must be self draing into molten salt tank (Min slope 5/1000)

3 DIFFERENT LEVELS:

- **FIRST LEVEL: + 13 m. (A.S.L.)** **(0.000 m) Solar Field**
- **SECOND LEVEL: + 9 m. (A.S.L.)** **(-4.000 m) Operation Plant**
- **THIRD LEVEL: + 7 m. (A.S.L.)** **(-6.000 m) Molten Salt Tank**

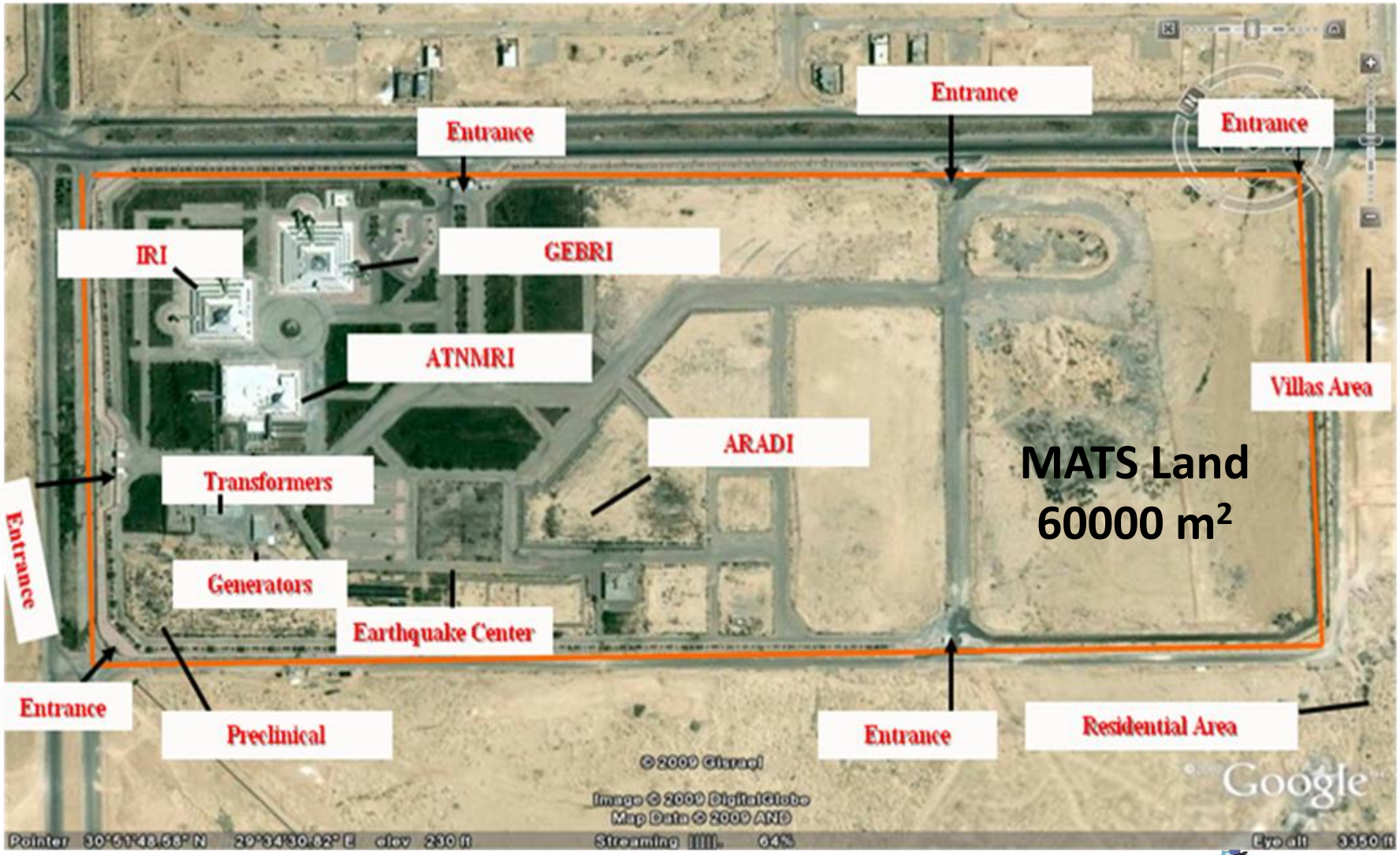
$\Delta H_{TOT} = 6$ m.



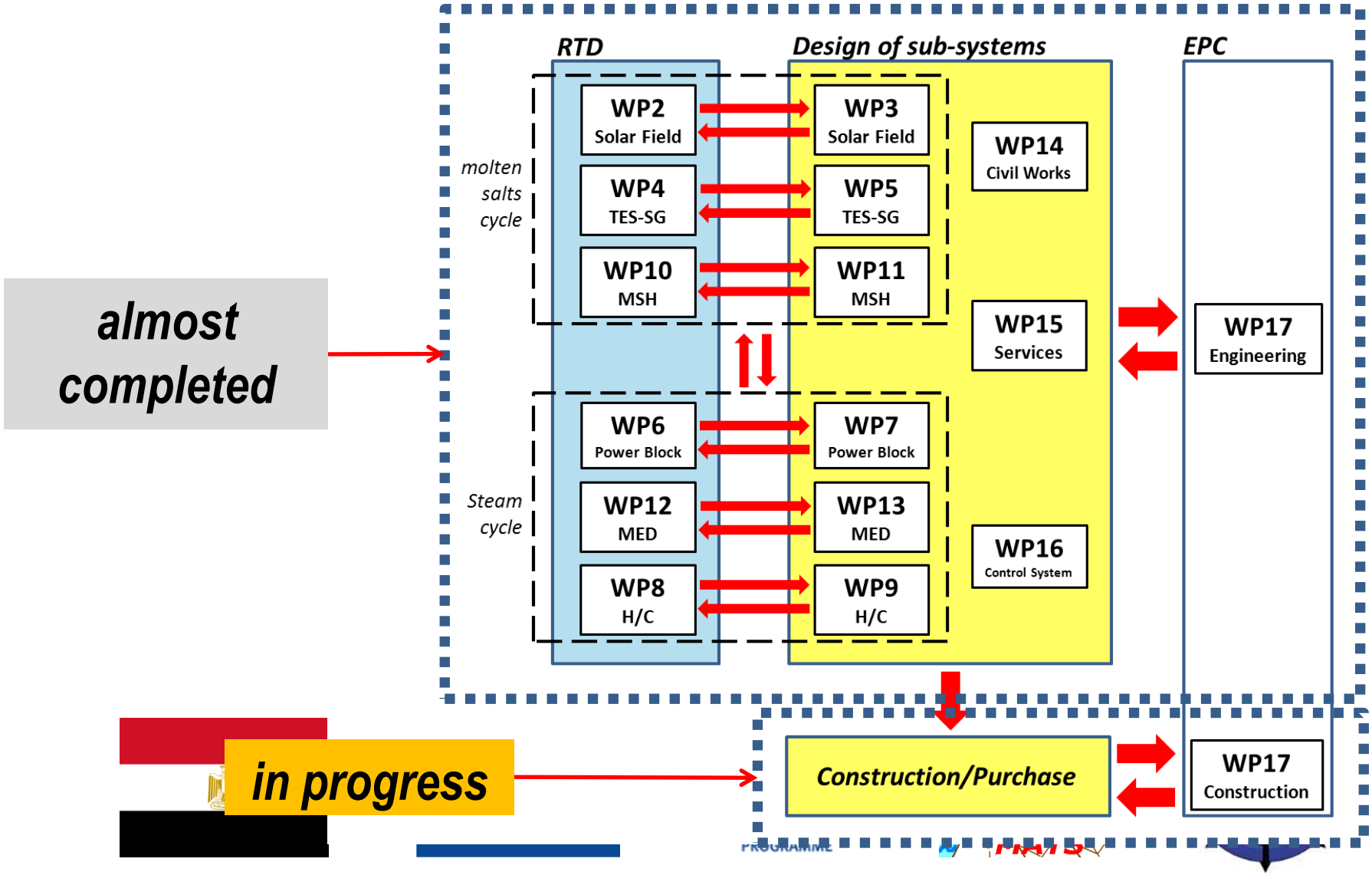
SEVENTH FRAMEWORK PROGRAMME

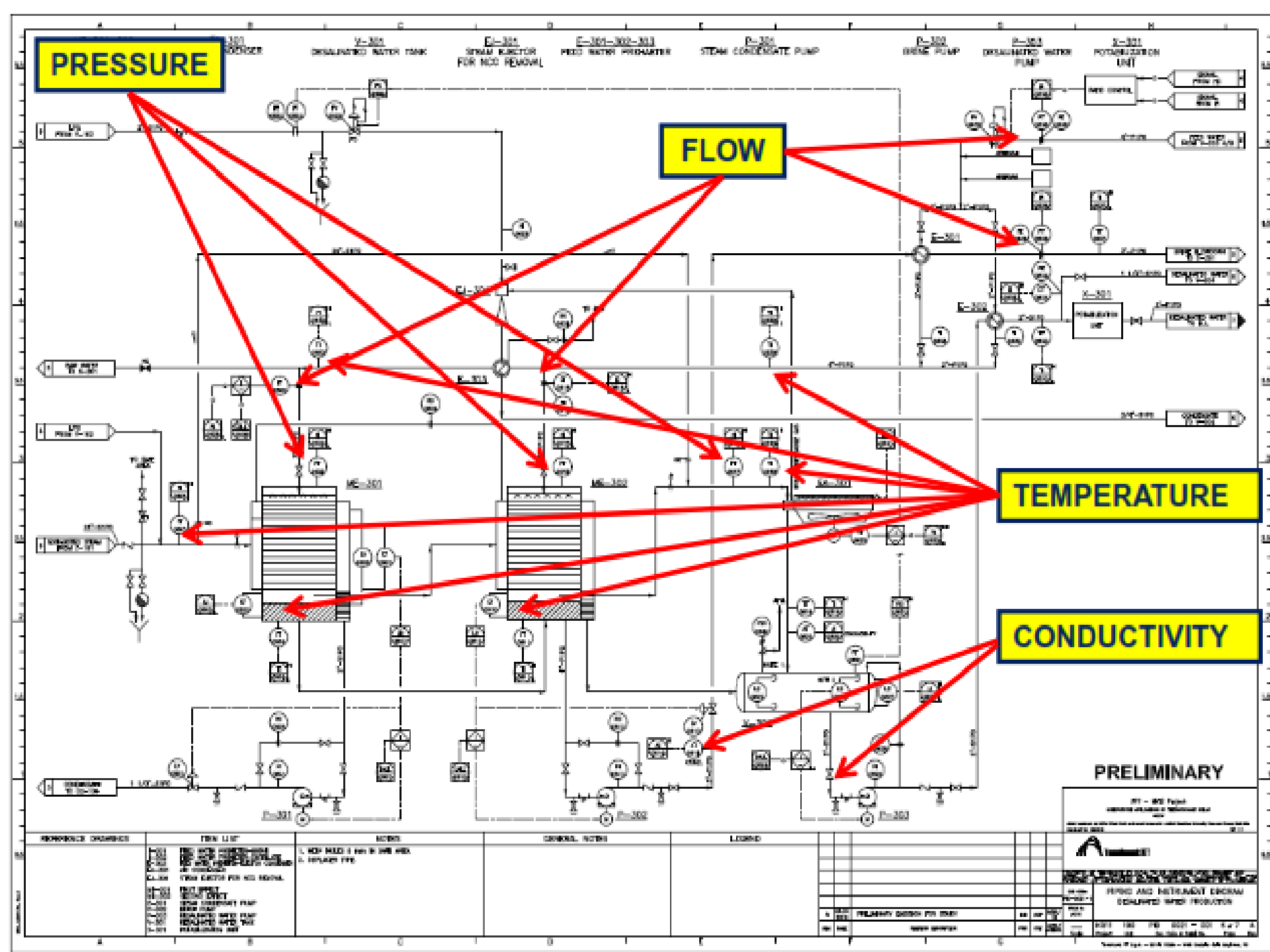
MATS

MATS PLANT: Site Selection



Project MATS: status of works

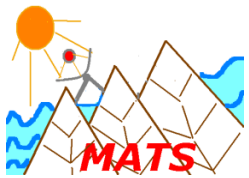



PRESSURE
FLOW
TEMPERATURE
CONDUCTIVITY
PRELIMINARY

Acknowledgments

The financial support from the European Commission within the 7th Framework Programme, through project MATS (GA No. 268219) is acknowledged.

The financial support from the Egyptian Government is acknowledged.

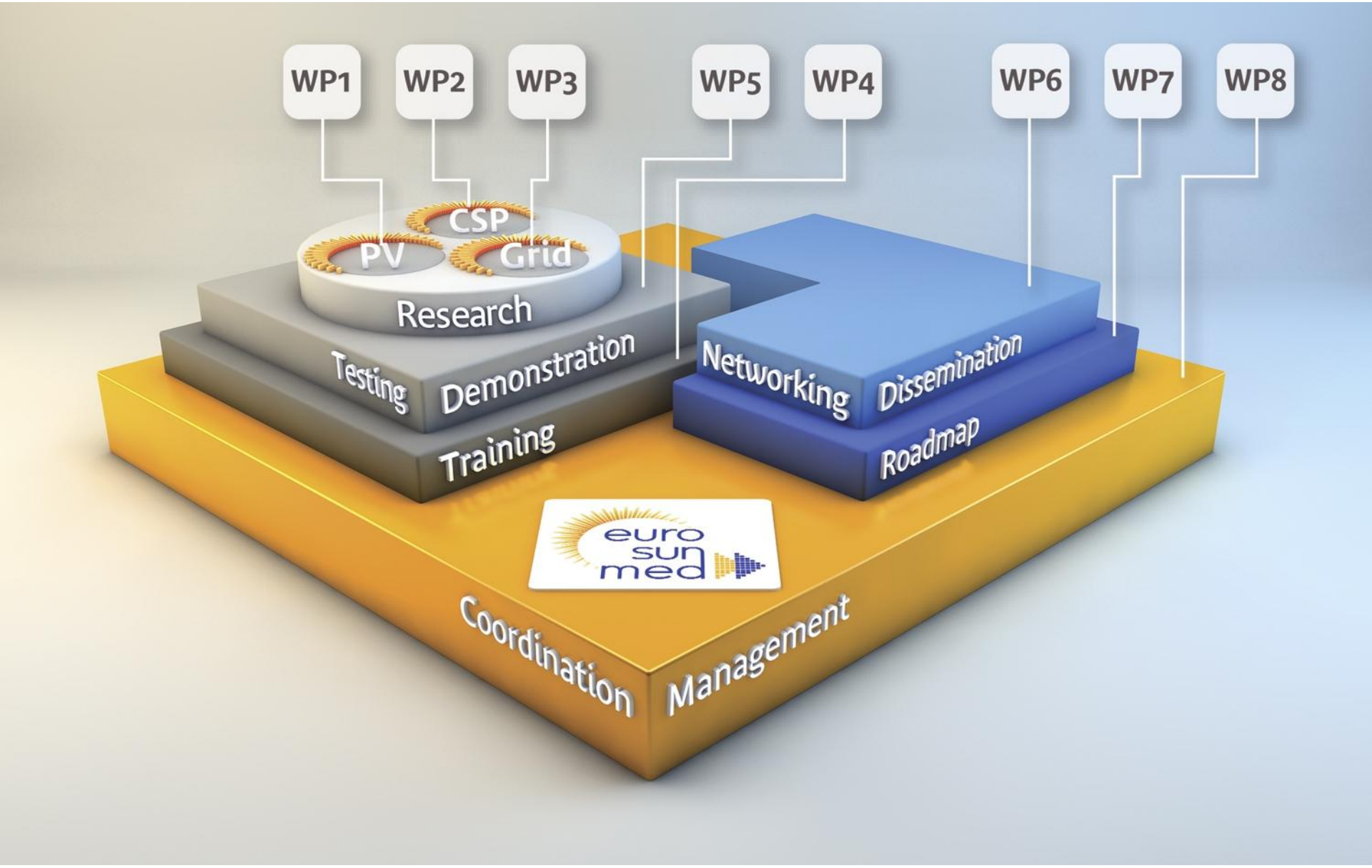


EURO-MEDITERRANEAN COOPERATION ON RESEARCH & TRAINING IN SUN BASED RENEWABLE ENERGIES

EUROSUNMED Partners

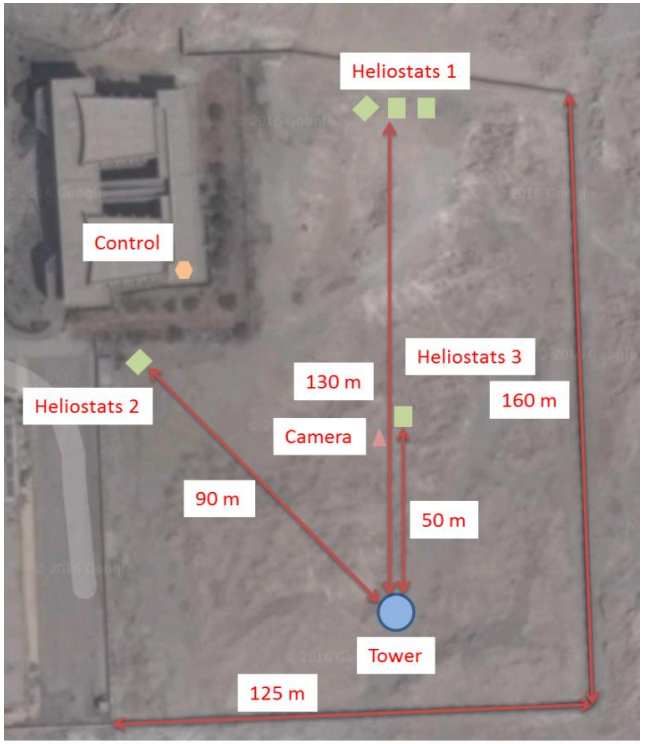
Participant no. *	Participant organisation name	Participant short name	Country
1 (Coordinator)	CNRS, Centre National de la Recherche Scientifique	CNRS	France
2	Stiftelsen Sintef	SINTEF	Norway
3	SINTEF ENERGI AS	SINTEF E	Norway
4	CENER, National Renewable Energy center	CENER	Spain
5	IK4-Tekniker	IK4	Spain
6	EUREC, European Renewable Energy Council	EUREC	Belgium
7	EMRS, European Materials Research Society	EMRS	France
8	CNESTEN, Centre National de l'Energie, des Sciences et Techniques Nucléaires	CNESTEN	Morocco
9	CNRST, Centre National pour la Recherche Scientifique et Technique	CNRST	Morocco
10	MASCIR, Moroccan Foundation for Advances Science, Innovation and Research	MASCIR	Morocco
11	Mohammed V-AgdalUniversity	UM5a	Morocco
12	Al Akhawayn University	AUI	Morocco
13	MASEN, Moroccan Agency for Solar Energy	MASEN	Morocco
14	Helwan University	HU	Egypt
15	Alexandria University	AU	Egypt
16	TURBODEN	TURBO	Italy
17	Nile Valley Engineering	NVE	Egypt

Project's Work Packages



First Heliostat Experimental Field in Egypt (Probably in Arabic Countries)

Installing the Heliostats at HU site



Heliostat and camera positions with relative distance to the tower and control room

SEVENTH FRAMEWORK PROGRAMME

Small scale Thermal Solar district Units for Mediterranean communities

Ref. I-A/2.3/174

Consorzio ARCA	ITALY	Sicily
ENEA	ITALY	Lazio
Cyprus Chamber of Commerce &Industry	CYPRUS	
The Cyprus Institute	CYPRUS	
Al Balqa Applied University	JORDAN	Irbid
Millenium Energy Industries	JORDAN	Amman
ASRT	EGYPT	Al-Ismailiyah
Elsewedy Electric	EGYPT	Al-Ismailiyah
Institute of Accelerating Sys. and App.	GREECE	Attiki
Central European of Enterprises (CEEI)	FRANCE	Provence-Alpes-Côte-d'Azur
New and Renewable Energy Authority	EGYPT	
Ministry of Energy & Mineral Resources	JORDAN	
Sicilian Region, Dept. of Prod Activities	ITALY	Sicily
CEA - Alternative Energy Atomic	FRANCE	Provence-Alpes-Côte-d'Azur

General Project Objective

Promotion and implementation of innovative technologies and know-how transfer in the field of solar energy, including that stemming from the private sector and especially from SMEs, and that may be implemented in particular in public facilities through public procurement processes.

Public medical center at Belbis, Sharkia, Egypt

Site Description

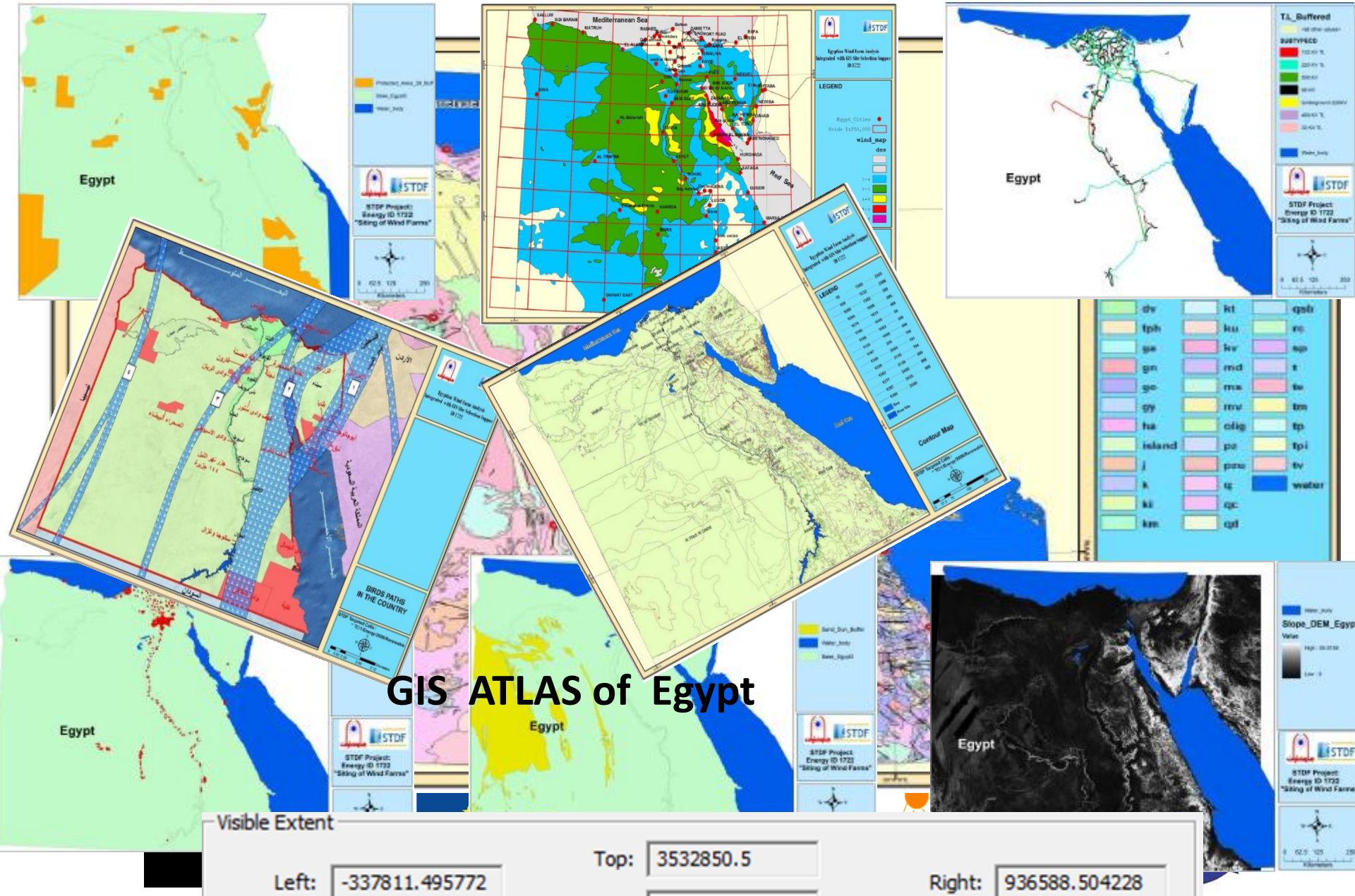
- Latitude 31° longitude 30° .
- Building area about 963 m^2.
- Air condition represents 63 % of summer electricity load.

Solar Field

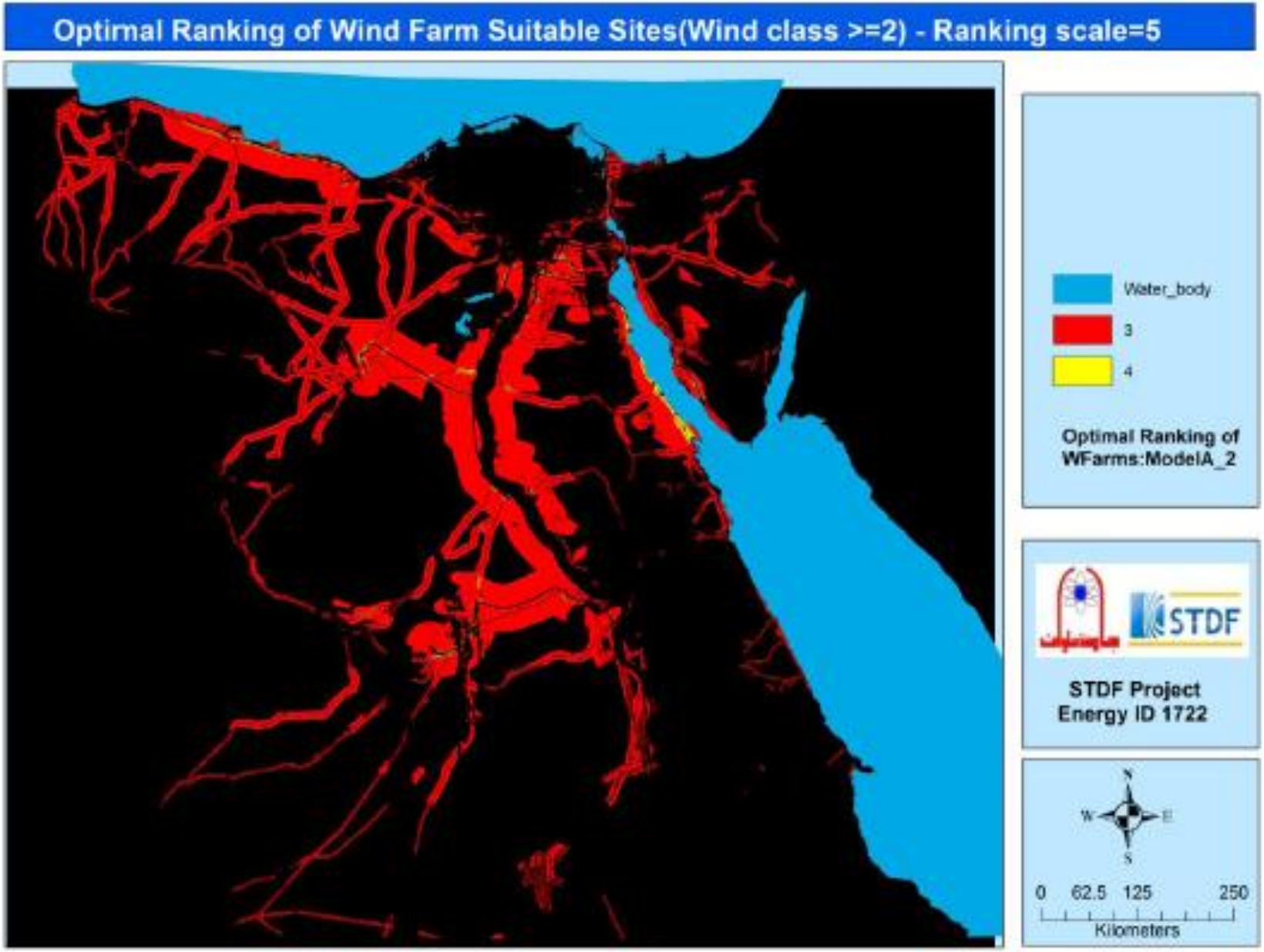
- 120 kW_{th} at 900 W/m^2 and 30 ^0C.
- PTC parabolic trough collectors 208 m^2
- NCSA of 296 m^2 (LFR).
- Considering local manufacturing potential of LFR in Egypt.

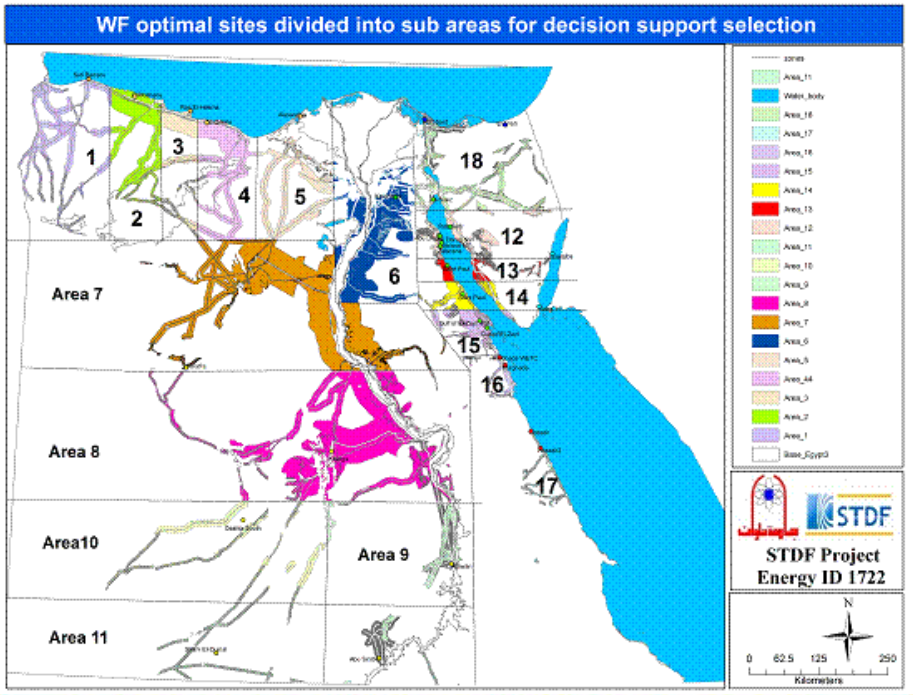
The First LFR Solar Plant in Egypt (ENPI Fund)

Huge Data Treatment (16 GIS layers: Vector and Raster Data Sets)

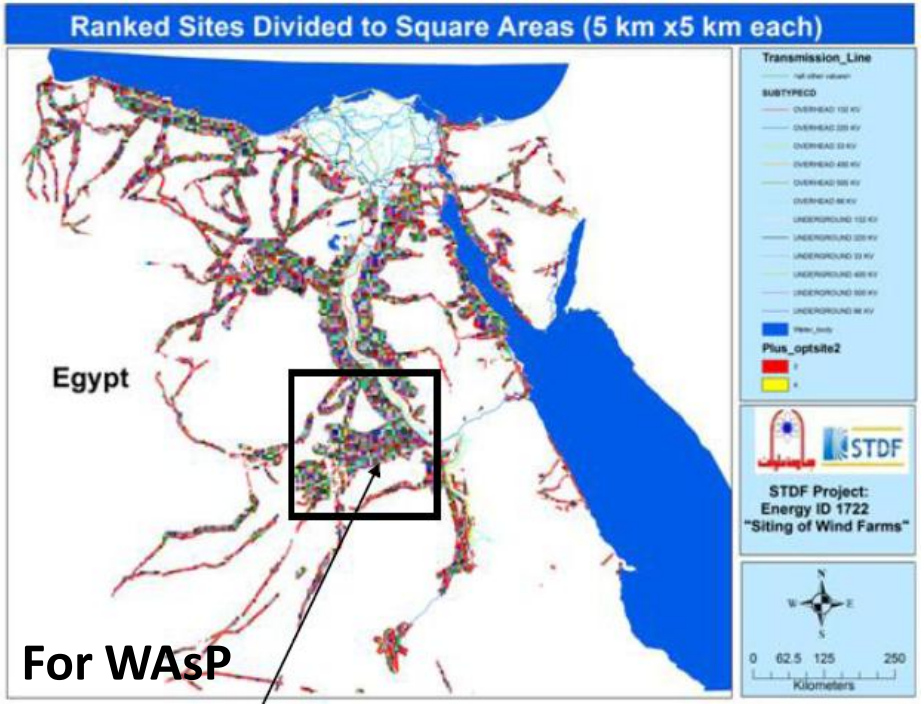


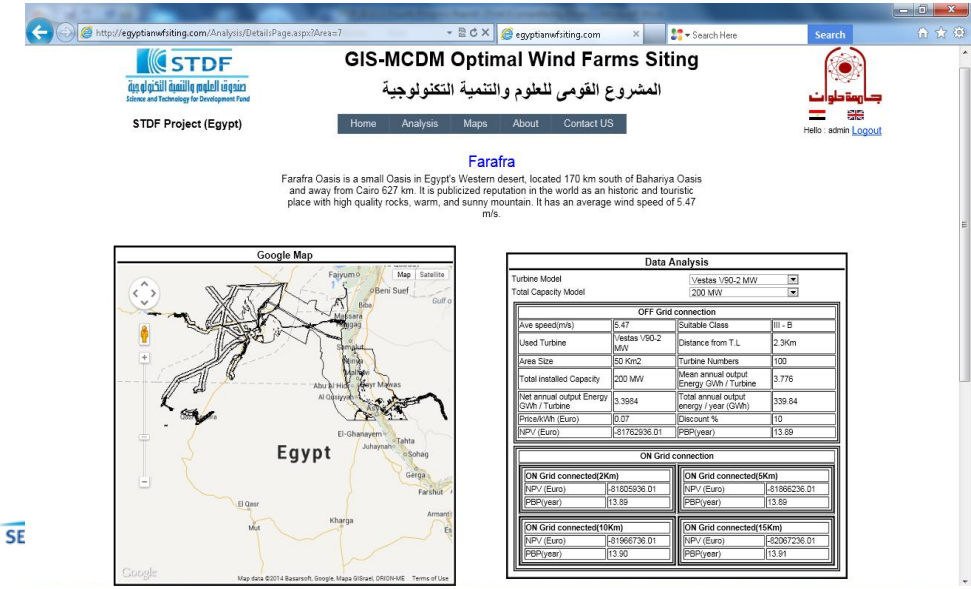
GIS ATLAS of Egypt




WF optimal sites divided into sub areas for decision support selection
Area 7
Area 8
Area10
Area 9
Area 11
STDF Project
Energy ID 1722


GIS-MCDM Optimal Wind Farms Siting
المشروع القومى للعلوم والتنمية التكنولوجية
STDF Project (Egypt)
Home
Analysis
Maps
About
Contact US
STDF Project
GIS-MCDM Optimal Wind Farms Siting


Ranked Sites Divided to Square Areas (5 km x5 km each)
Egypt
STDF Project:
Energy ID 1722
"Siting of Wind Farms"
For WAsP


GIS-MCDM Optimal Wind Farms Siting
المشروع القومى للعلوم والتنمية التكنولوجية
STDF Project (Egypt)
Home
Analysis
Maps
About
Contact US
Farafra
Farafra Oasis is a small Oasis in Egypt's Western desert, located 170 km south of Bahariya Oasis and away from Cairo 627 km. It is publicized reputation in the world as an historic and touristic place with high quality rocks, warm, and sunny mountain. It has an average wind speed of 5.47 m/s.
Google Map
Egypt
Data Analysis

Thank You

ولكم جزيل الشكر

radwanha@helwan.edu.eg

www.helwan.edu.eg