

## EU project **STAGE-STE**

Scientific and Technological Alliance for Guaranteeing the European Excellence in Concentrating Solar Thermal Energy

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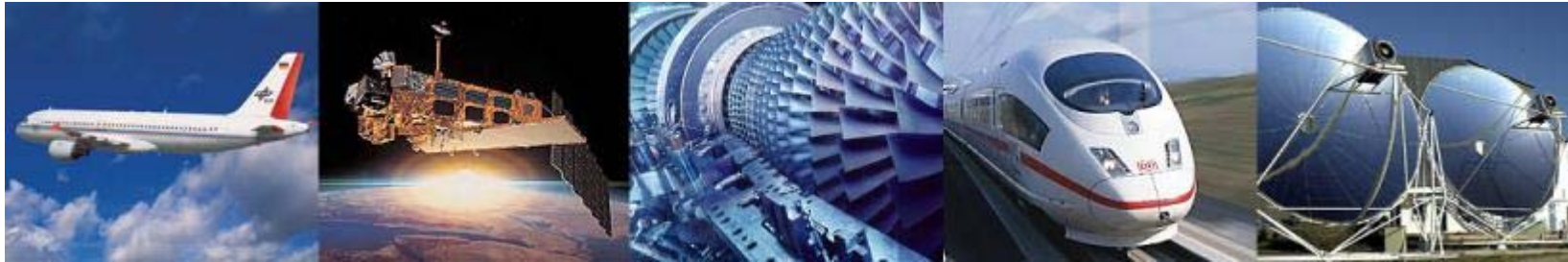


# Overview

- DLR
- European Sustainable Energy Technology Plan – SET Plan
- European Energy Rresearch Alliance – EERA
- STAGE-STE Project
  - Objectives
  - Consortium
  - Work Packages



# DLR - German Aerospace Center



- **Research Institution**
- **Space Agency**
- **Project Management Agency**

7700 employees across  
32 institutes and facilities at  
■ 16 sites.

Offices in Brussels, Paris, Washington,  
Tokyo, and Almería.

Permanent delegation at the European  
Solar Test Centre Plataforma Solar de  
Almería, Spain

## Research Areas

- Aeronautics
- Space Research and Technology
- Transport
- Energy

## Budget

- Research budget 2012: € 798 Mio.



# DLR Institute of Solar Research

Main Topic:  
Solar Thermal Power Plants  
140 Persons  
5 Departments, 4 Sites

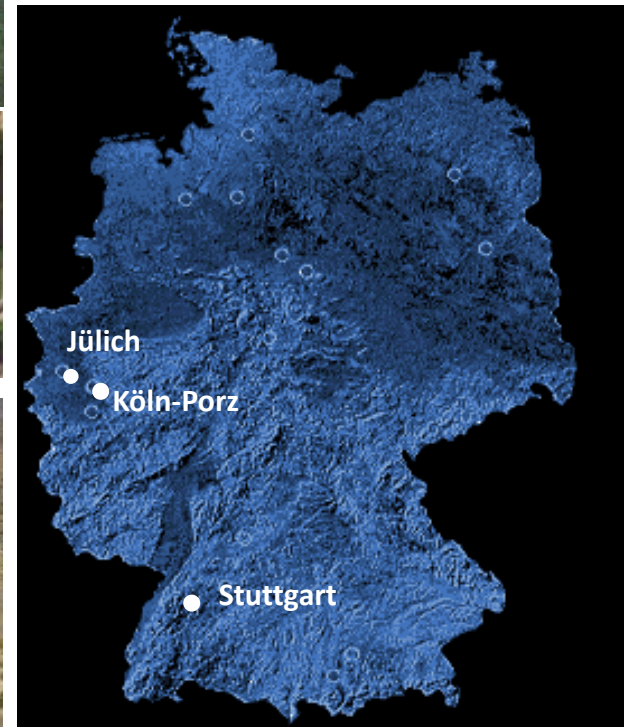
**Köln-Porz, Jülich**



**Stuttgart**



**Plataforma Solar de Almería  
(Permanent Delegation)  
and Office in Almería, Spain**

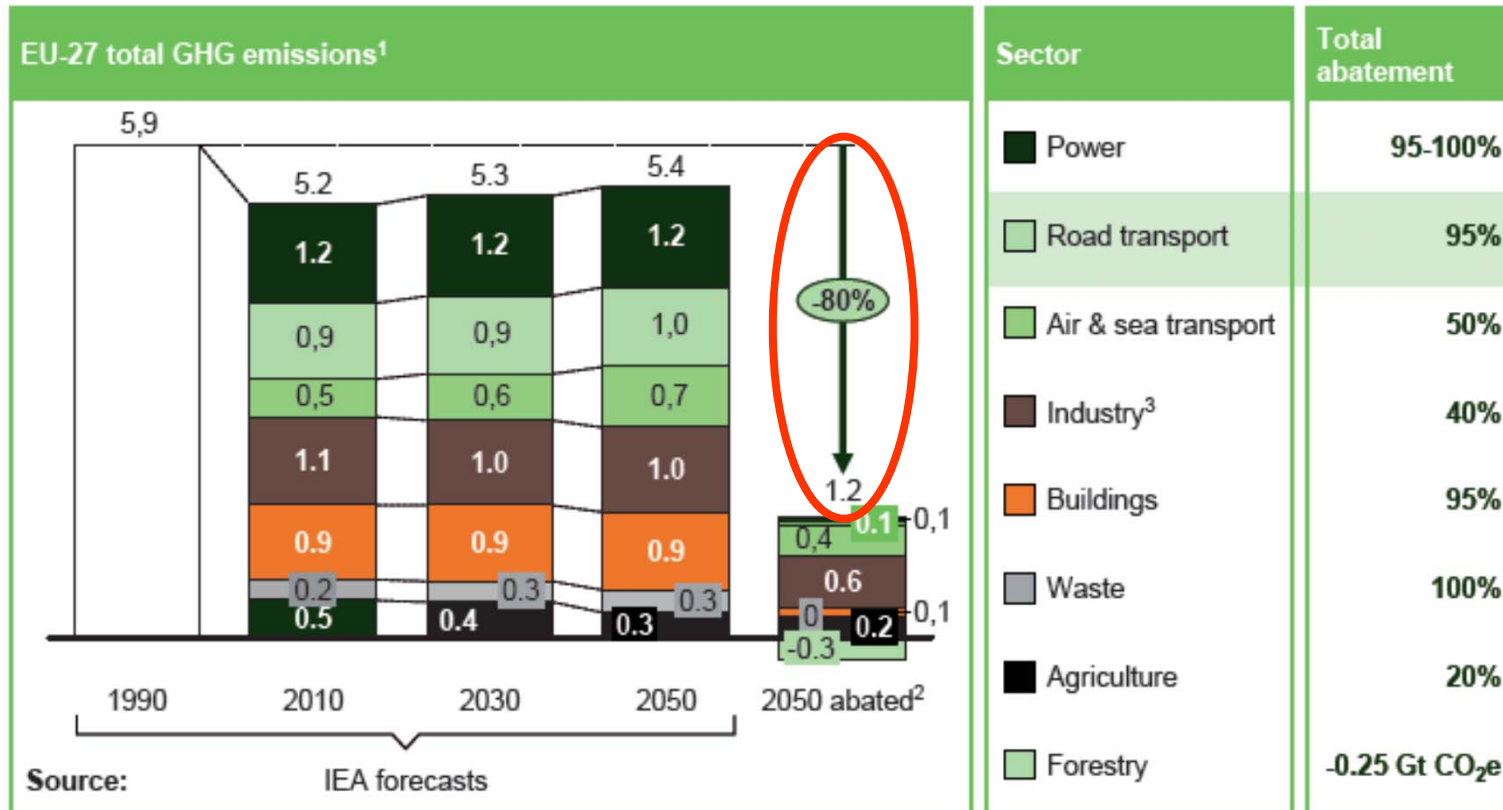


# Political Umbrella: SET-Plan (2007) European Strategic Plan for Energy Technology

- **Goals of the EU until 2020 (20/20/20)**
  - 20% higher energy efficiency
  - 20% less GHG emission
  - 20% renewable energy
- **Goal of the EU until 2050:**
  - 80% less CO<sub>2</sub> emissions than in 1990
- Actions in the field of energy efficiency, codes and standards, funding mechanisms, and the charging of carbon emissions necessary
- **Significant research effort** for the development of a new generation of CO<sub>2</sub> emission free energy technologies, like
  - Offshore-Wind
  - **Solar**
  - 2<sup>nd</sup> generation Biomass



# Development of EU GHG emissions [Gt CO<sub>2</sub>e]



1 Large efficiency improvements are already included in the baseline based on the International Energy Agency, World Energy Outlook 2009, especially for industry

2 Abatement estimates within sector based on Global GHG Cost Curve

3 CCS applied to 50% of large industry (cement, chemistry, iron and steel, petroleum and gas, not applied to other industries)

SOURCE: [www.roadmap2050.eu](http://www.roadmap2050.eu)



# European Energy Research Alliance (EERA)



- ✓ Organization composed by about 150 European Research Institutions relevant to the energy subject
- ✓ More than 2700 researchers formally involved
- ✓ 15 Research Joint Programmes, covering all the aspects of low carbon energy research. One of this JP is the EERA JP-CSP, coordinated by CIEMAT
- ✓ EERA JP-CSP is formed by 23 organizations that have defined a joint research programme comprising a total devotion of 132 persons/year per year to its development
- ✓ STAGE-STE project is now endorsing and supporting the program of work and consortium previously defined (at EERA context)



## STAGE-STE Project

**Full name:** Scientific and Technological Alliance for Guaranteeing the European Excellence in Concentrating Solar Thermal Energy

**Coordinator:** Julian Blanco Galvez (CIEMAT-PSA)

**Duration:** 48 months, starting on February 2014

**Budget:**

Current total project budget: 19.662.460 € (pending of CNIM detailed data). Previous budget figure: 19.697.440,04 €

Maximum Commission Contribution: 9.997.207 €

**Manpower devotion:** 2575,95 pm (2416,50 pm at contract signature)

**Participants:** 40

European Research Centers: 23 (practically, the whole sector)

Large European Companies of the sector: 8

International (non EU) Organizations of reference: 9





## Very wide and ambitious General Project Objectives based on three main pillars

### Pillar 1

To convert the STAGE-STE consortium into the **reference institution in Europe** with regard to **CSP/STE Research**, providing the European Commission, the Industry and all related Stake Holders the natural **“entrance door”** to the technology transfer and R&D investment in the field.

**To achieve the alignment of existing national CSP research programs**, avoiding overlaps and duplicities and also synchronizing with EU programs to better impact and results.



# Very wide and ambitious General Project Objectives based on three main pillars

## Pillar 2

To develop a wide number of coordinated and integrating activities to lay the foundations of a **long-lasting research cooperation**:

**joint** activities to foster **the use of research facilities** by the scientific and industrial community, **staff exchange, training and capacity building** activities, **knowledge transfer, international collaboration**, etc.



# Very wide and ambitious General Project Objectives based on three main pillars

## Pillar 3

To address a group of research activities **covering the whole technological spectrum** around the CSP/STE: thermal storage, materials for solar receivers and components, solar fuels, desalination, linear focusing and point focusing solar concentrating technologies.





# STAGE-STE Consortium

Participant no.	Organisation name	Country
1 (Coord.)	CIEMAT	SPAIN
2	DLR	GERMANY
3	PSI	SWITZERLAND
4	CNRS	FRANCE
5	FISE	GERMANY
6	ENEA	ITALY
7	ETHZ	SWITZERLAND
8	CEA	FRANCE
9	CYI	CYPRUS
10	LNEG	PORTUGAL
11	CTAER	SPAIN
12	CNR	ITALY
13	CENER	SPAIN
14	TECN	SPAIN
15	UEVORA	PORTUGAL
16	IMDEA	SPAIN
17	CRAN	UK
18	TKN	SPAIN
19	UNIPA	ITALY
20	CRS4	ITALY

Participant no.	Organisation name	Country
21	INESC-ID	PORTUGAL
22	IST-ID	PORTUGAL
23	SENER	SPAIN
24	CNIM	FRANCE
25	HITIT	TURKEY
26	ACCIONA	SPAIN
27	SCHOTT	GERMANY
28	ASE	ITALY
29	ESTELA	BELGIUM
30	ASNT	SPAIN
31	KSU	SAUDI ARABIA
32	UNAM	MEXICO
33	SUN	SOUTH AFRICA
34	CSERS	LYBIA
35	CSIRO	AUSTRALIA
36	FUSP	BRAZIL
37	IIECAS	CHINA
38	UDC	CHILE
39	UCAM	MOROCCO
40	FBK	ITALY



# Work Packages & Coordinators

WP 1: Consortium governance and management issues / J. Blanco (CIEMAT)

WP 2: Integrating Activities to Lay the Foundations for Long-lasting Research Cooperation / C. Papanicolas (CYI)

WP 3: Enhancement of STE Research Facilities cooperation / M. Silva (CTAER)

WP 4: Capacity Building and Training Activities / M. Proteau (CNRS-PROMES)

WP 5: Relationship with Industry & Knowledge Transfer Activities / M. Olcese (CEA)

WP 6: International Cooperation Activities / W. Platzer (FRAUNHOFER-ISE)

WP 7: Thermal Energy Storage for STE Plants / W. Gaggioli (ENEA)

WP 8: Materials for Solar Receivers and STE Components / P. Heller (DLR)

WP 9: Solar Fuels / A. Meier (PSI)

WP10: STE plus Desalination / D.C. Alarcon (CIEMAT)

WP11: Linear Focusing STE Technologies / L. Valenzuela (CIEMAT)

WP12: Point Focusing STE Technologies / M. Sanchez (CENER)



## Coordination and Support Work Packages

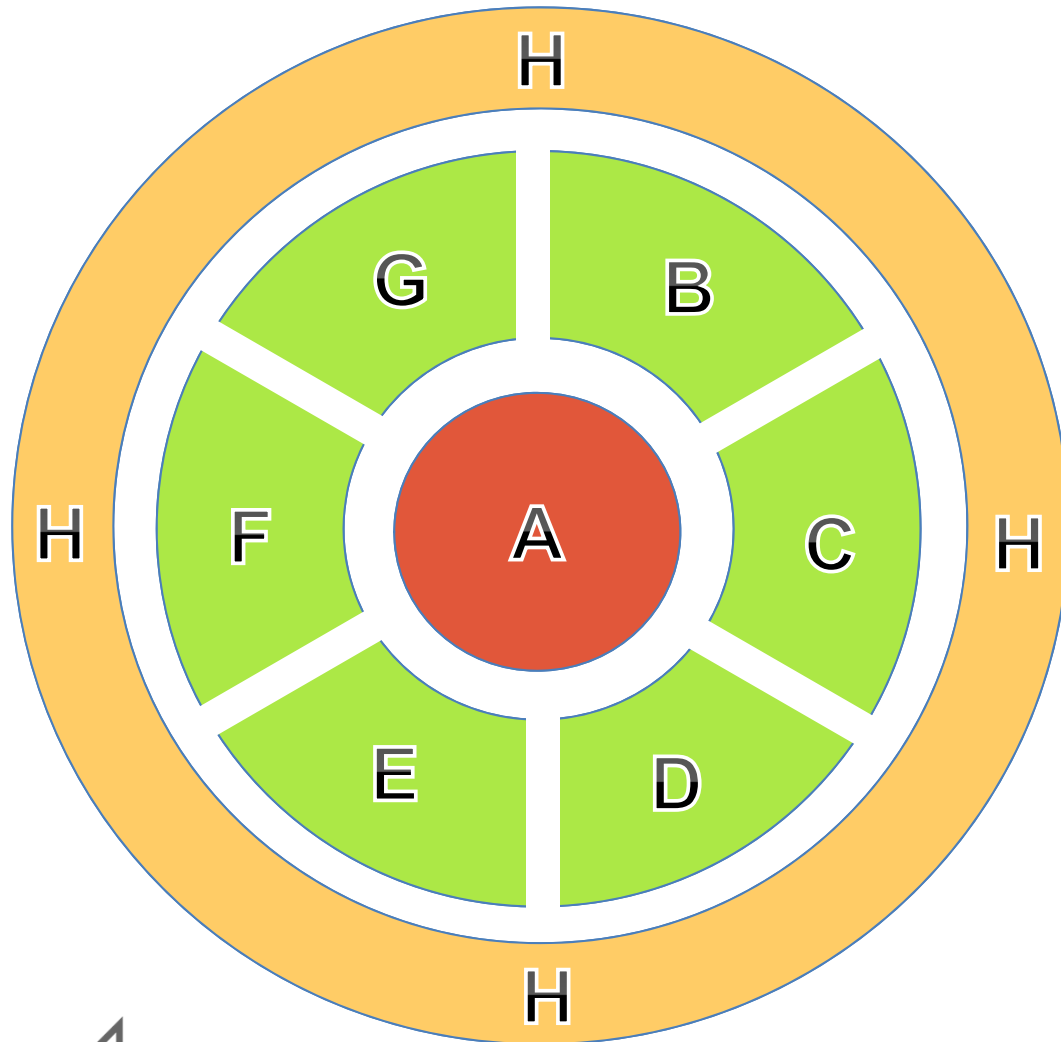
- Intensify the cooperation to more efficiently coordinate, complement and reinforce the activity of the different R&D European Research Centers on the CSP/STE field.
- A more comprehensive portfolio of capacities and installations could be offered to accelerate the technology transfer to the European industry and to make possible the maintenance of its current world leadership.

No	Work Package name	Nature <sup>1</sup>	Coordinator
WP1	Consortium governance and management issues	MGT	CIEMAT
WP2	Integrating Activities to Lay the Foundations for Long-lasting Research Cooperation	COORD	CYPRUS INSTITUTE
WP3	Enhancement of STE Research Facilities cooperation	COORD	CTAER
WP4	Capacity Building and Training Activities	OTHER	CNRS-PROMES
WP5	Relationship with Industry & Transfer of Knowledge activities	COORD	CEA
WP6	International Cooperation Activities	COORD	FRAUNHOFER

[1]: **COORD** = Coordination; **MGT** = Consortium Management, **OTHER** = dissemination activities, courses, staff exchange, etc.



# STAGE-STE Core Objectives



- A. Main core objective: increased real collaboration among EU research organizations
- B. Cooperative technical and scientific development (WPs 7 to 12)
- C. Research infrastructures effective sharing (strong interaction with SFERA and EU-SOLARIS)
- D. Substantial staff exchange
- E. Training and capacity building
- F. Alignment of national and EC financial resources + co-sharing
- G. International collaboration
- H. Interaction with industry



## Research Work Packages

- *Coordinated Research Activities* that cover the whole spectrum of topics related with Concentrated Solar Energy and addressing, within the 4 years of project duration, the considered as most urgent activities to be done.
- The research component of the STAGE-STE project intends to demonstrate and start to run the feasibility of deeper and effective integral European collaboration and coordination.

No	Work Package name	Nature <sup>1</sup>	Coordinator
WP7	Thermal Energy Storage for STE Plants	RTD	ENEA
WP8	Materials for Solar Receivers and STE Components	RTD	DLR
WP9	Solar Thermochemical Fuels	RTD	PSI
WP10	STE plus Desalination	RTD	CIEMAT
WP11	Linear focusing solar concentrating technologies	RTD	CIEMAT
WP12	Point focusing STE Technologies	RTD	CENER

[1]: **RTD** = Research and Technical Development



# Research Work Packages

## **WP7: Thermal Energy Storage for STE Plants (Walter Gaggioli, ENEA)**

- Task 7.1: Advanced fluids and materials for high temperature heat storage
- Task 7.2: Aging of components with MS, High Tech Systems and Materials (HTSM) and PCM
- Task 7.3: Advanced thermal storage systems
- Task 7.4: Integration/hybridization of TES in STE plants



# Research Work Packages

## **WP8: Materials for Solar Receivers and STE Components (Peter Heller, DLR)**

- Task 8.1 Development of an integrated methodology for accelerated aging of reflectors
- Task 8.2 High temperature absorbers and materials
- Task 8.3 Performance of CSP components in desert environment
- Task 8.4 First surface mirrors with high reflectivity



# Research Work Packages

## **WP9: Solar Thermochemical Production of Fuels (Anton Meier, PSI)**

- Task 9.1: Solar fuels from carbonaceous feedstock
- Task 9.2: Solar fuels from thermochemical cycles
- Task 9.3: Innovative materials for next generation solar chemical reactors
- Task 9.4: Technology assessment of solar thermochemical fuel production



# Research Work Packages

## **WP10: Concentrated Solar Power and Desalination (Diego Alarcón, CIEMAT)**

- Task 10.1- Low temperature desalination processes for integral power & water production
- Task 10.2- STE cooling issues and desalination
- Task 10.3- Model development and simulation of STE+D configurations



# Research Work Packages

## **WP11: Linear Focusing STE** **Technologies (Loreto Valenzuela,** **CIEMAT)**

- Task 11.1- Small scale and low cost installations for power and industrial process heat applications
- Task 11.2- Methodologies for dynamic testing and predictive maintenance of large solar fields



# Research Work Packages

## **WP12: Point Focusing CSP Systems** **(Marcelino Sanchez, CENER)**

- Task 12.1: Development of low cost heliostat fields
- Task 12.2 High concentration optical systems and new receiver concepts for next generation solar towers



# Relevance of STAGE-STE project

- As the project achieved the involvement of, practically, the whole European sector and significant participation from all over the world, this could be a very good opportunity to internationally reinforce and consolidate the relevance of CSP/STE technologies.
- As IRP projects are a new Commission tool (and STAGE-STE achieved the max. possible score) many people in Europe will be closely following and paying attention to our project evolution.
- Therefore, the success or failure of this project could have implications far beyond the own technical project objectives.







Thank you very much for your attention!

