



ODAK2023 Kick-Off Event

Sunrise for Concentrating Solar Thermal (CST) in Turkey
METU, Ankara, Turkey. 26th February 2020

PAN-EUROPEAN INITIATIVES ON CONCENTRATING SOLAR THERMAL

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GOBIERNO
DE ESPAÑA

MINISTERIO
DE CIENCIA
E INNOVACIÓN

Ciemat

Centro de Investigaciones
Energéticas, Medioambientales
y Tecnológicas



European Energy Research Alliance

LARGEST ENERGY RESEARCH COMMUNITY IN EUROPE

- Association of European public research centres and universities active in low-carbon energy research, bringing together;



50,000+
energy experts



250+
public research centres
and universities



30
countries

EERA'S MISSION

- To catalyze European energy research for achieving Paris Agreement target:
 - Help streamline regional, national and European research efforts
 - Deliver research results from basic research to the demonstration phase (TRLs 2 to 5) and ensure efficient transfer to industry and market
- EERA is the research pillar in the EU Strategic Energy Technology Plan (SET-Plan) aiming to accelerate the development and deployment of low-carbon technologies.

EERA'S CORE: ITS JOINT PROGRAMMES

- EERA's members work together in currently 17 joint research programmes, the EERA Joint Programmes, aligned with the priorities of the SET-Plan.



European Energy Research Alliance



- Associations (7)
- Industries (5)
- Research Organisations (107)
- Universities (93)

Joint Programme on CSP (JP-CSP): formed by 18 EU Research Organizations and 9 Universities



JP-CSP current composition

#	Name	Country	Role	Person-yr/yr
1	CIEMAT	SPAIN	JP Coordination + SP Coordination	14,0
2	ENEA	ITALY	Full participant + SP Coordination	13,5
3	FhG-ISE	GERMANY	Full Participant + SP Coordination	6,2
4	CNRS	FRANCE	Full Participant	5,5
5	CEA	FRANCE	Full Participant	9,6
6	CENER	SPAIN	Full Participant + SP Coordination	10,3
7	IMDEA	SPAIN	Full Participant	6,25
8	LNEG	PORTUGAL	Full Participant	6,5
9	CNR	ITALY	Full Participant	5,3
10	DLR	GERMANY	Full Participant + 2 SP Coordination	15,0
11	CYI	CYPRUS	Full Participant	5,0
12	TECNALIA	SPAIN	Full Participant	5,15
13	FBK	ITALY	Full Participant	5,5
14	TEKNIKER	SPAIN	Full Participant	9,65
15	ETHZ	SWITZERLAND	Full Participant	5,2
TOTAL COMMITTED FULL PARTNERS				122,65

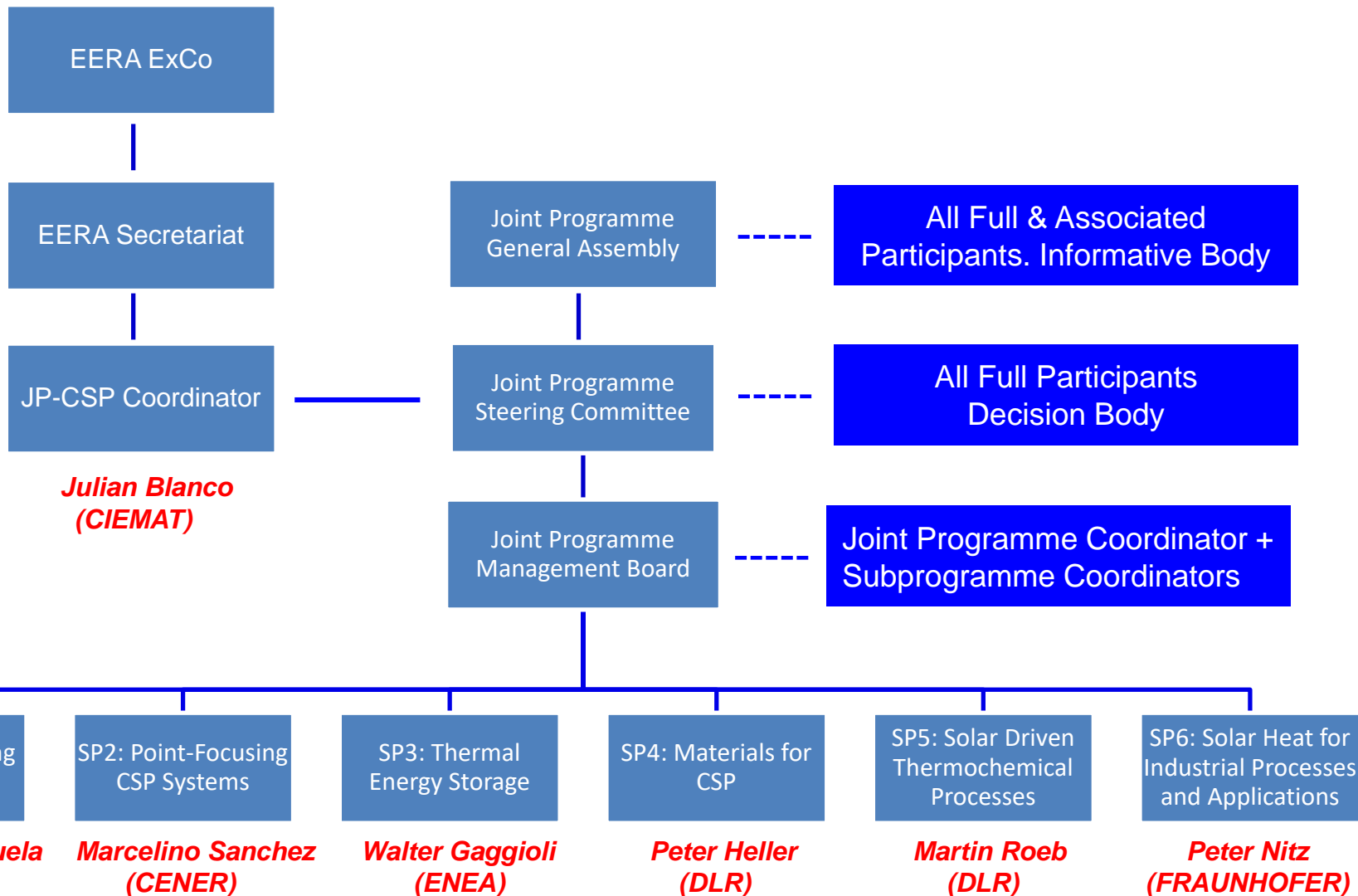


JP-CSP current composition

#	Name	Country	Role	Person-yr/yr
16	UEVORA	PORTUGAL	Associated Participant	4,5
17	UNIPA	ITALY	Associated Participant	1,5
18	CRANFIELD	UNITED KINGDOM	Associated Participant	6,0
19	USEVILLA	SPAIN	Associated Participant	4,35
20	UPC	SPAIN	Associated Participant	3,1
21	UNINA	ITALY	Associated Participant	5,0
22	CRES	GREECE	Associated Participant	9,0
23	UNIFI	ITALY	Associated Participant	2,0
24	METU	TURKEY	Associated Participant	2,5
25	CIC EnergiGUNE	SPAIN	Associated Participant	0,25
26	KIT	GERMANY	Associated Participant	4,25
27	CERTH	GREECE	Associated Participant	2,0
TOTAL COMMITTED ASSOCIATED PARTNERS				44,45
TOTAL COMMITTED JOINT PROGRAMME				167,1



EERA JP-CSP structure





JP-CSP achievements (2011-2019)

- **Greater cohesion in the CSP/STE sector**, with stronger links and fruitful communication channels between R+D centers and European Commission & SET-Plan, and also with industry, as demonstrated with the key contributions to the definition of CSP Implementation Plan.
- Identification of a very large number of **relevant R&D organizations in Europe** that have actively contributed to the progress of CSP/STE technology, increasing the number of active countries and partners involved in the field.
- Identification of core capabilities and competences of all organizations making possible the starting of a natural **process of clustering and specialization**.
- Creation of an **efficient collaborative group** at the European level in the field of CSP/STE research, with a broad vision and visibility actively supporting and favoring the integration of National and European research efforts and objectives.
- Creation of a wide network with **strong links with industries and international actors** to promote synergetic int. cooperation and create market opportunities for EU industry.
- Achievement and successful launching of both **IRP and ECRIA initiatives**, involving the whole JP-CSP partnership.



INSHIP: Solar Industrial Heat

■ INSHIP – Integrating National Research Agendas on Solar Heat for Industrial Processes

- H2020 LCE-33-2016 (RIA), GA: 731287
- 01.01.2017 – 31.12.2020 (48 months)
- Coordination: Fraunhofer ISE
- All JP-CSP organization participating as partners



■ INSHIP aims at the **definition of a European Common Research and Innovation Agenda** (ECRIA) engaging major European research institutes, with relevant and recognized activities **on Solar Heat to Industrial Processes** into an integrated structure

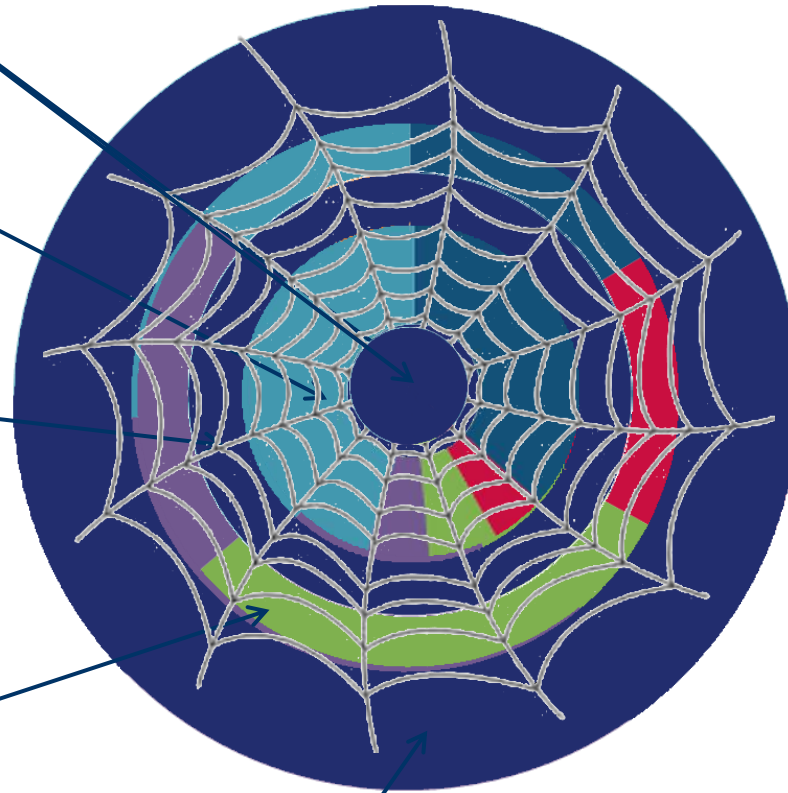
- coordination objectives
- coordinated R&D activities (TRLs 2 to 5)

■ Focus: 1) consolidation of existing EU and national resources towards a SHIP R&D Roadmap; 2) engagement of a wide range of EU R&D institutions in a coordinated R&D effort around SHIP activities.



JP-CSP achievements (2014-2016)

STAGE-STE Funding Alignment



Funding from :

- EU
- Spain
- Portugal
- France
- Italie
- Germany
- Cyprus

STAGE-STE
funding 10M€

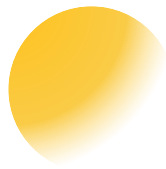
National projects
contributing
to STAGE-STE
~100M€

Other EU proj.
contributing to
STAGE-STE
~80M€

National pro-
jects funding of
STAGE-STE
co-operation
partners
(industry)
~ 100M€

EU project funding of STAGE-STE co-operation
partners (industry) ~200M€





CSP/STE Implementation Plan

Launching event: STAGE-STE Madrid Workshop (20th April 2016)

TWGs definition and TWG on CSP/STE composition:

- Governments/Funding Agencies from: Spain, Portugal, France, Germany, Italy, Cyprus and Turkey (+Belgium). Leadership: Spain (MINECO)
- European Solar Thermal Electricity Association (ESTELA) representing more than 100 entities; JP-CSP, representing 29 organizations and European Association of Gas and Steam Turbines Manufacturers (EUTurbines), representing 6 entities

CSP/STE Implementation Plan finally based on 3 pillars:

- First-of-a-kind (FOAK) commercial projects (1 to 3 plants)
- R&I Activities (12 defined), to provide FOAK projects eventual innovations
- EU-SOLARIS

CSP/STE Implementation Plan formal approval:

- Endorsed by the SET Plan Steering Group on 27.09.2017 and published in SETIS

Defined Goals/Targets:

- Development of the next generation of CSP/STE technology (new cycles)
- Power supply price < 10 c€/kWh for a DNI of 2050 kWh/m²/year (Southern Europe)



SET-Plan Implementation Plans



Batteries

H2020 supporting projects
Batteries Europe (ENER-2018-453-A7)



Carbon capture, storage & utilisation - CCS-CCU

H2020 supporting projects
IMPACTS9 (JA-2) - <http://www.zeroemissionsplatform.eu/>
SSFZEP (CC-4)



Concentrated solar power - CSP/STE

H2020 supporting projects
HORIZON-STE (JA-2) - <http://www.horizon-ste.eu/>



Deep geothermal

H2020 supporting projects
DG ETIP (LCE 2016) - <https://www.etip-dg.eu/>
SU-DG-FWG (JA-2) - <https://www.wegec.org/set-plan-h2020/>



Energy efficiency in buildings

H2020 supporting projects
SecRHC-ETIP (CC-4) - <https://www.thc-platform.org/>



Energy efficiency in industry

H2020 supporting projects
ENER-2018-453-A6



Energy consumers

H2020 supporting projects
Energy-SHIFTS (CC-4)



Nuclear safety



Ocean energy

H2020 supporting projects
ETIP Ocean 2 (CC-4) - <https://www.etip-ocean.eu/>
OceanSET (JA-2) - <https://www.oceanset.eu/>



Offshore wind

H2020 supporting projects
ETIP Wind (CC-4) - <https://etipwind.eu/set-plan/>
SETWind (JA-2) - <https://setwind.eu/>



Photovoltaics

H2020 supporting projects
ETIP PV - SEC II (CC-4) - <https://etip-pv.eu/set-plan/>
PV Impact (JA-2) - <https://pvimpact.eu/>



Energy systems

H2020 supporting projects
IntErSys4EU (LCE-2016) - <https://ip-urban-europe.eu/pecl/>



Positive energy districts

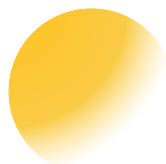
H2020 supporting projects
Intergovernmental initiative - <https://www.etip-snet.eu/intensys4eu/>



Renewable fuels and bioenergy

H2020 supporting projects
ETIP-B-SABS 2 (CC-4) - <http://www.zeroemissionsplatform.eu/>
SET4BIO (JA-2)



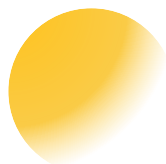


CSP/STE Implementation Plan

List of R&D proposed activities ranked according defined relevance (2017):

List of R&D proposal ranked according its defined relevance	Estimated budget (M€)
1) Proposal 5: Improved Central Receiver Molten Salt technology	20 – 22
2) Proposal 3: Parabolic Trough with Silicon Oil	6 - 8
3) Proposal 6: Next Generation of Central Receiver power plants	20 - 25
4) Proposal 1: Advanced Linear Fresnel technology	25 - 30
5) Proposal 2: Parabolic Trough with Molten Salt	10 - 14
6) Proposal 4: Open Volumetric Air Receiver	5 - 6
7) Proposal 8: Multi-Tower Beam Down System	7 – 8
8) Proposal 9: Advanced TES	8 – 10
9) Proposal 10: Supercritical Steam turbine	20 - 25
10) Proposal 11: Improved flexibility in CSP applications	4 - 5
11) Proposal 12: High Temp Brayton Sc. CO ₂	25 - 30
12) Proposal 7: Pressurized Air Receiver with Storage	4 – 6
TOTALS	154 - 189





CSP/STE Implementation Plan

Mapping of National Interest and proposal of possible needed sharing to CSP/STE Implementation Plan execution among interested countries, assuming 50% cost sharing by the industrial sector (2018):

	Spain	Portugal	France	Italy	Germany	Cyprus	Turkey	Belgium	TOTAL
Act. 1: Advanced Linear Fresnel tech.		5,50	5,50	4,00					15,00
Act. 2: P. Trough with Molten Salt		1,90		1,90	1,90				5,70
Act. 3: P. Trough with Silicon Oil	0,80			1,20	2,00				4,00
Act. 4: Open Volumetric Air Receiver				0,40	1,15		0,40	0,80	2,75
Act. 5: Improved Central Receiver Molten Salt tech.	3,00				3,00	1,00	2,00	2,00	11,00
Act. 6: Next Generation of Central Receiver plants	3,75		2,50			1,25	2,50	2,50	12,50
Act. 7: Pressurized Air Receiver									
Act. 8: Multi-Tower Beam Down		1,20		2,40		0,40			4,00
Act. 9: Advanced TES	1,00	0,50	1,50	1,00			1,00		5,00
Act. 10: Supercritical Steam Turbine									
Act. 11: Improved flexibility in CSP									
Act. 12: High Temp Brayton Sc. CO₂									
	8,55	9,10	9,50	10,90	8,05	2,65	5,90	5,30	59,95

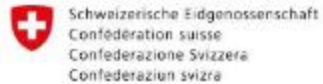
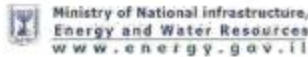
Four Activities/Projects discarded as no sufficient number of countries showed explicit interest



CSP ERANET (2019)



CSP ERA-NET has received funding from the European Union's Horizon 2020 Research and Innovation Programme under grant agreement No. 838311



9 M€ national funds

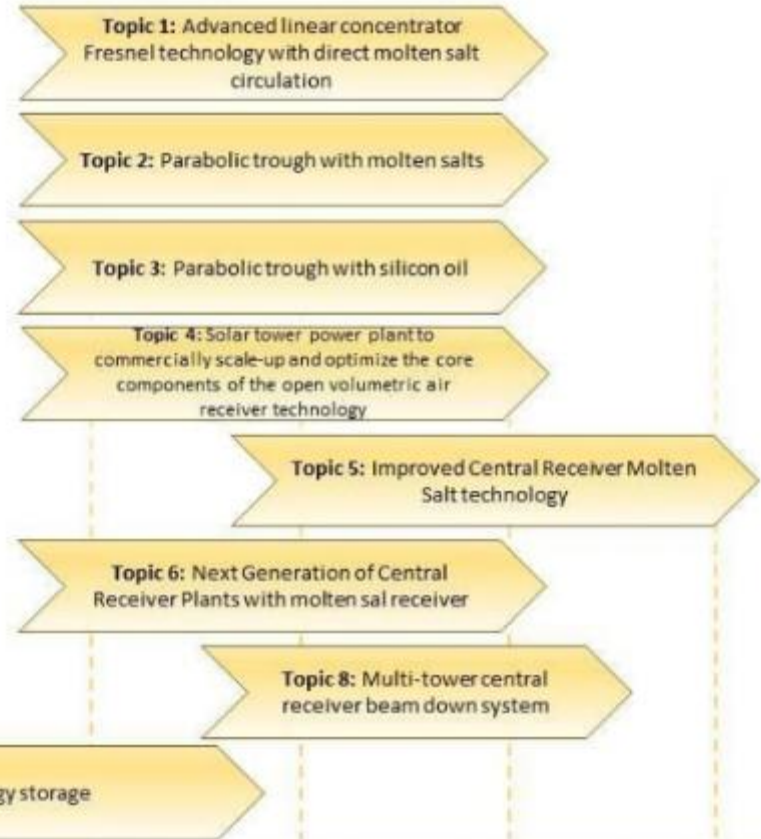
4 M€ EC funds 

PARTNERS



CSP ERANET (2019)

TRL levels for each one of the topics included in the Cofund and (possible) Additional Calls



TRL 1	TRL 2	TRL 3	TRL 4	TRL 5	TRL 6	TRL 7	TRL 8	TRL 9
Basic principles observed	Technology concept formulated	Experimental proof of concept	Technology validated in lab	Technology validated in relevant environment	Technology demonstrated in relevant environment	System prototype demonstration in operational environment	System complete and qualified	Actual system proven in operational environment / competitive



CSP ERANET (2020)

General eligibility requirements for transnational projects:

1. Minimum **3 partners from 3 different countries** participating in the ERANET & providing funding to the transnational project selected.
2. At least **1 partner from industry** (except topic 8)
3. Partners from **countries not participating** in the ERANET may participate with own funding
4. Maximum duration is of **36 months**.
5. Funding criteria to the individual partners **vary from country to country**.
6. Project partners need to **consult their national funding agencies before applying**, as projects are funded following national or regional requirements.
7. Nine proposals received and under assessment/evaluation



Clean Energy Transition (CET) Partnership

European countries actively involved in the discussion on CETP



13 countries:

AT BE CH DE ES FI IS IT NL NO SE TR UK

Mechanism replacing ERANETs and all other H2020 instruments to the alignment and coordination of national and regional energy-related RDI programmes and additional national funding, to the whole HEU Programme





EU-SOLARIS

VISION

- ESFRI Initiative to become the research infrastructure of reference in CSP/STE technologies development in Europe

MISSION

- Integrate and coordinate all existing R&D European infrastructures to offer to the INDUSTRY and SCIENTIFIC communities the best conditions for the development of CSP/STE research activities.

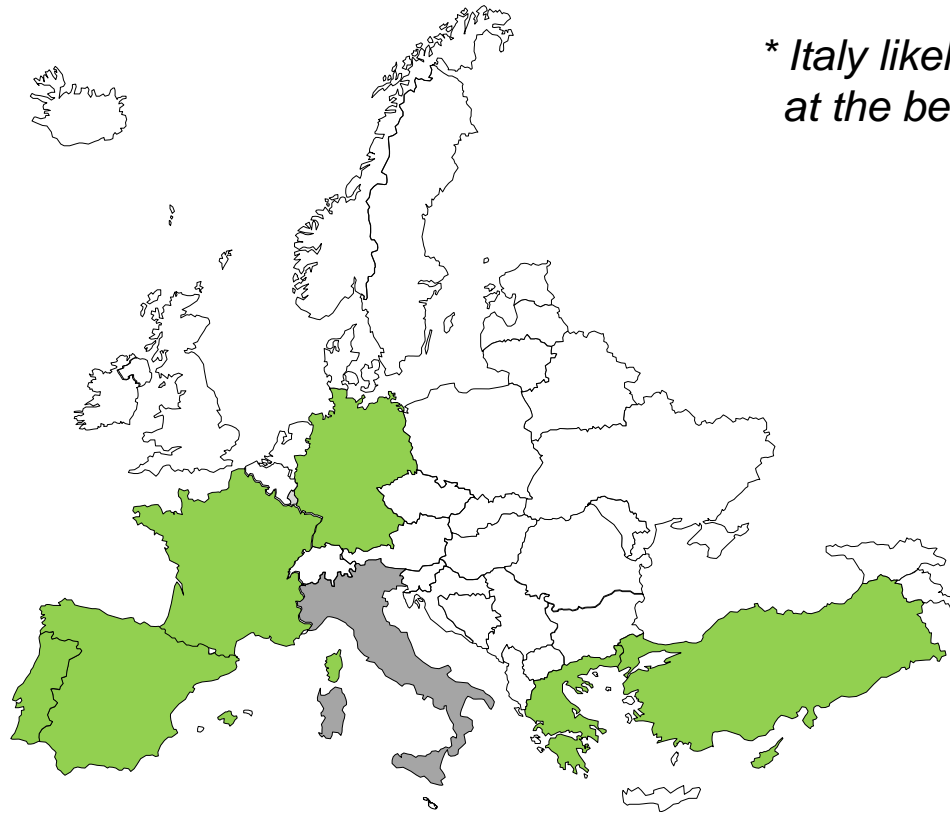
STRATEGIC OBJECTIVES

- Create a **stable and permanent structure** to achieve a deeper integration of whole CSP/STE sector.
- **Coordinate the existing R&D installations and provide a single contact point.**
- To provide the **most complete, high quality scientific infrastructure portfolio** at world level, **facilitating access** to researchers and industry.
- Propel the **collaborative research** in the main European centers of the sector.



EU-SOLARIS

- **Member Countries, not ‘Project Partners’**
- **Seven countries*** so far: Portugal, Spain, France, Germany, Greece, Turkey and Cyprus, sitting in a **Board of Governmental Representatives**.

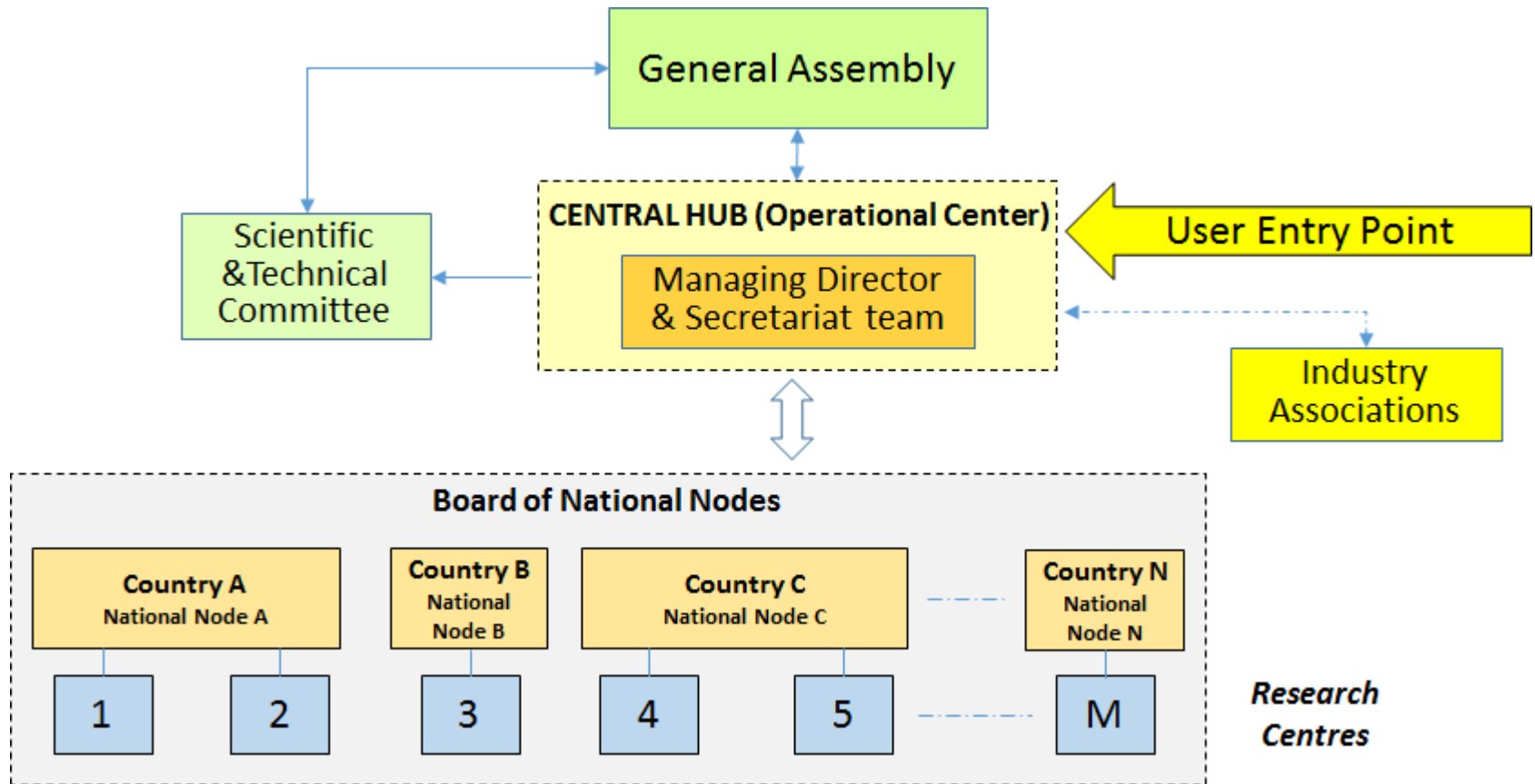


** Italy likely to be an Observer at the beginning*



EU-SOLARIS

Agreed and confirmed legal form → **European Research Infrastructure Consortium (ERIC)** with a collegiate governance system.



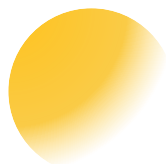


EU-SOLARIS

Core activities with own funds at Operational Phase

1. **Joint definition and standardization of common testing protocols, procedures and methodologies** with regard to the qualification of components and subsystems, improvement of measurement devices and other services.
2. **To promote and coordinate mobility and staff exchange actions/activities** to deeper advance in the partners' integration process.
3. **Promotion and coordination of access** to the members' R&D infrastructures to address specific high quality research.
4. **Optimization of similar existing research facilities** by promoting the differentiation among them and fostering the specialization of involved laboratories.
5. **Coordinating the provision of sectorial inputs** to reference European stakeholders, i.e. EC, SET-Plan, EERA, MS, Industry Associations, etc.) with regard to research agenda, prospective assessments, etc.





EU-SOLARIS

Test services portfolio



1) Solar & Meteorological Resource



10) Performance of the Whole Plant

2) Reflectors & Concentrators

3) Absorbers & Receivers

4) Heat Transfer Fluids

5) Pumps, valves & filters

6) Heat Storage (media & system)

7) Heat Exchangers

8) Power Block

9) Heat Rejection

11) Horizontal Measurement & Calibration Services

12) Specific Services of Solar Chemistry

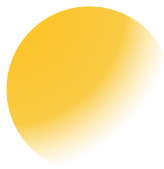
13) Specific Services of Solar Fuels

14) Material's Testing & Qualification

15) Access to Facilities and Training

16) Other Services Associated to Solar Concentration Technologies





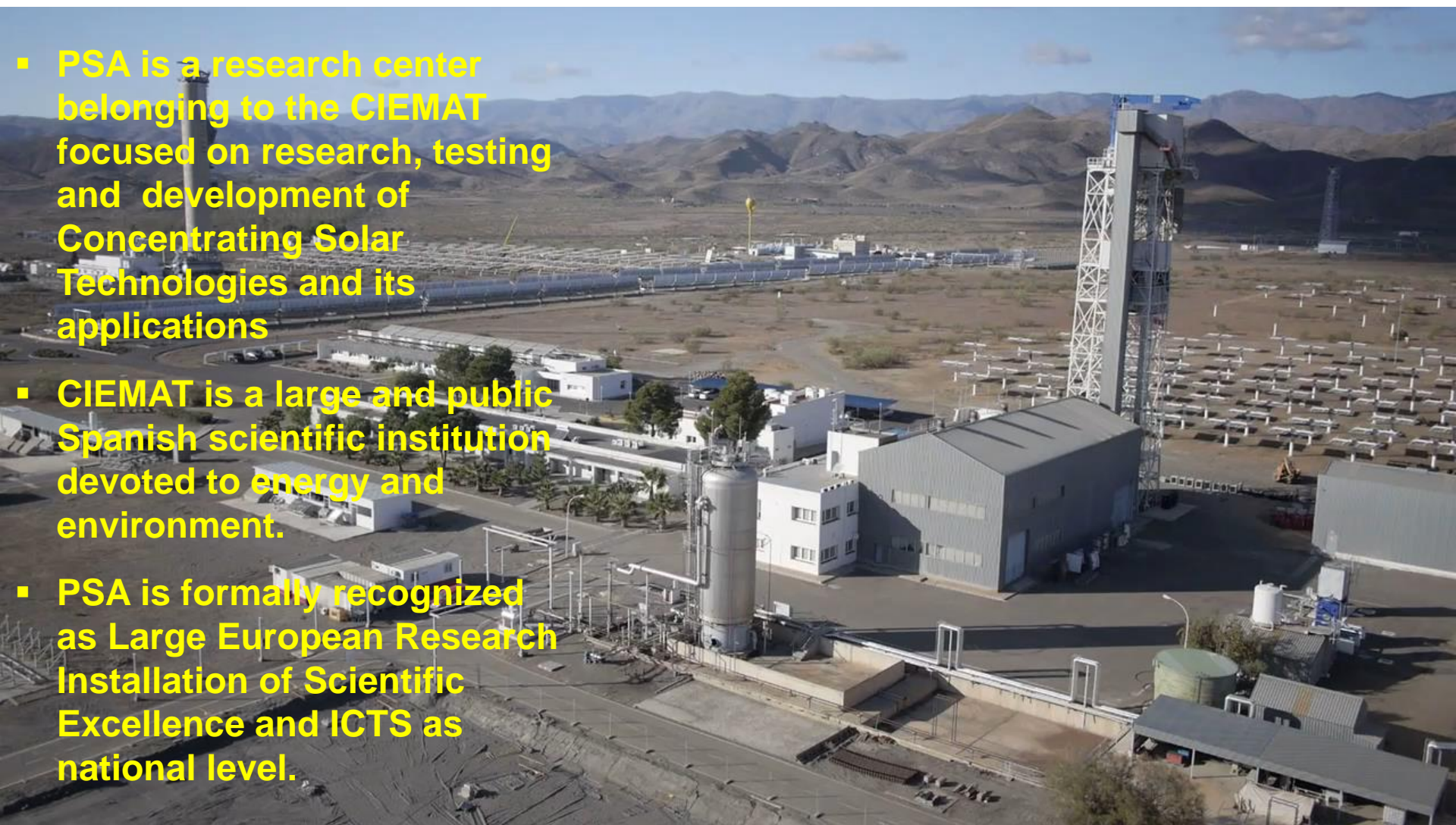
EU-SOLARIS

Current status

- **STEP 1** submitted by Spain in February 2019, with the official endorsement (email) of Portugal, Spain, France, Germany, Greece, Portugal, Turkey and Cyprus. Documents submitted: Estatutes and Technical and Scientific Description of EU-SOLARIS ERIC Research Infrastructure
- Feedback and comments from EC received on October 2020. An updated version of Statutes has been prepared according to the assessment results.
- Final **STEP 2** to be submitted as soon as Member countries manage to get the supporting documentation needed:
 - Estatutes
 - Technical and Scientific Description of EU-SOLARIS ERIC Research Infrastructure
 - Bussines model
 - Official signed letter from each Government supporting the ERIC creation
 - Official letter from Spanish financial Ministry acknowledging VAT exemption.
 - Formal letter from Spain requesting ERIC creation



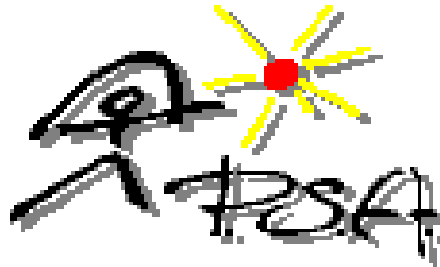
PLATAFORMA SOLAR DE ALMERIA



- PSA is a research center belonging to the CIEMAT focused on research, testing and development of Concentrating Solar Technologies and its applications
- CIEMAT is a large and public Spanish scientific institution devoted to energy and environment.
- PSA is formally recognized as Large European Research Installation of Scientific Excellence and ICTS as national level.



Thank You



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