Horizon2020
European Union Funding
for Research & Innovation

HORIZON STE

Proceedings of the Joint Industry and R&I Events

Deliverable 4.7

WP 4: **Communication and dissemination**

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Date: 31 August 2022

The project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 838514

DELIVERABLE FACTSHEET

Deliverable no.:	4.7
Title of Deliverable:	Proceedings of the Joint Industry and R&I Events
Responsible Partner:	ESTELA
WP no. and title:	WP4 – Communication and dissemination
Task no. and title:	Task 4.2: Tools and activities for communication and dissemination
Version:	1
Version Date:	31 August 2022
Submission Date:	31 August 2022

Dissemination Level	
X	PU = Public
	PP = Restricted to other programme participants (including the EC)
	RE = Restricted to a group specified by the consortium (including the EC)
	CO = Confidential, only for members of the consortium (including the EC)

This report should be cited as:

Project Coordinator, Work Package Coordinator and Lead Beneficiary

ESTELA, European Solar Thermal Electricity Association

Contributing Partners

CIEMAT, Centro de Investigaciones Energeticas, Medioambientales y Tecnologicas

ENEA, Agenzia nazionale per le nuove tecnologie, l'energia e lo sviluppo economico sostenibile

DLR, Deutsches Zentrum Fuer Luft - Und Raumfahrt EV

METU, Middle East Technical University

DISCLAIMER

The project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No 838514.

Project information	
Project Number:	838514
Project title:	Implementation of the Initiative for Global Leadership in Solar Thermal Electricity' — 'HORIZON-STE'
Starting date:	01/04/2019
Duration:	42 months
Call identifier:	H2020-LC-SC3-2018-JA2

ABOUT THE PROJECT

HORIZON-STE is a Horizon 2020 funded project aiming at supporting the Implementation of the Initiative for Global Leadership in Solar Thermal Electricity (STE), also known as Concentrated Solar Power (CSP), which was launched by the European Commission and adopted within the Strategic Energy Technology Plan (SET Plan) of the European Commission.

Since more than a decade, Europe's STE sector holds a worldwide technology leader until its further development abruptly hindered in Europe. To unlock this situation, the European Commission has launched a dedicated Initiative – Initiative for Global Leadership in CSP focusing on 2 targets: a cost reduction target and an innovation target, in order to keep STE's global technology leadership and rebuild a home market in Europe.

Acting as competence centre of the Implementation Working Group within the SET Plan of the European Commission, the overall goal of HORIZON-STE is to support the execution of the Implementation Plan regarding both STE Research and Innovation lines as well as First-Of-A-Kind projects that will help steer countries through political, legislative, and institutional shortcomings linked to various national policies concerning solar thermal electricity. Much of the focus centres on improving procurement of manageable renewable energy sources (RES) and increased public funding for STE research.

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INTRODUCTION

The HORIZON-STE Deliverable D4.7 "Proceedings of the Joint Industry and R&I Events" is an outcome of Task 4.2 "Tools and activities for communication and dissemination" as part of Work Package (WP) 4 "Communication and dissemination" for which ESTELA is WP leader. As a reminder, the overall objectives of WP4 are labelled as follows in the initial proposal:

"Establishing effective channels, platforms and means for:

- Disseminating the project objectives, activity progress and outcomes to all relevant stakeholders.
- Informing relevant stakeholders on progress and achievements of the CSP SET-Plan and the Implementation Working Group to foster their engagement and commitment.
- Informing and engaging decision makers in SET Plan countries, to streamline alignment and strengthen commitment to the execution of the Implementation Plans.
- Raising awareness and mobilising wider audience and showing how the impacts are relevant to public audiences, by creating jobs, introducing a better way of energy mix for a sustainable future.

Organising events, conferences and site visits for:

- Showcasing how the collaboration between CSP/STE industry and research institution can be archived for the sake of realisation of the FOAK project(s) in Europe.
- Making better use of the results by documenting and presenting the policy advices and ensuring the messages are taken up by policy makers.

Ensuring the alignment of the project's dissemination activities with international and national events of relevant EU projects and initiatives, as well as SET Plan Annual Events".

Task 4.2 lasted from M1 to M42 and was based on the outcomes of the country reports from Task 2.3 and Task 2.4 in WP2. Six (6) joint national Events with national decision makers and authorities, industry and R&I representatives were held in six identified countries after a series of brokerage meetings in WP2. The objective of these Events was twofold:

- To present the findings of the mapping exercise between needs and CSP/STE value proposition opening ground for potential cooperation.
- To facilitate dialogue and information exchange in a bidirectional manner (i.e. incorporate lessons learnt and discuss draft results and findings) – at national/regional level.

The resulting country mapping related to cooperation opportunities are basis for organisation of the EU Cooperation Event.

1 PROCEEDINGS OF NATIONAL EVENTS IN TURKEY

1.1 Overview

1.1.1 Brokerage Event

The first national event in Turkey was held on 26 February 2020 at METU premises in Ankara, Turkey as a part of the *ODAK$_{2023}$ Kick-Off Event* activities for the aligned Horizon 2020 project SolarTwins (GA: 856619). It was initially considered as a "brokerage event", but it proved valuable to execute it in a joint manner (similar to what was originally described as a "joint national event"). Therefore, this Event, organized by METU and ESTELA, was attended by the research institutions, industry, national decision makers and authorities, funding agencies and others.

ODAK means focus in Turkish and is the Turkish form for concentrated within the context of concentrated solar thermal. 2023 is Turkey's 100th anniversary, a year after both Horizon-STE and SolarTwins ended. Thus, *ODAK$_{2023}$* represented the start of a 3-year national effort to strengthen Turkey's scientific excellence in concentrated solar technology (CST):

- In harmony with EU initiatives including EU-SOLARIS and the Strategic Energy Technology Plan.
- To catalyse innovation-based growth in Turkey's CST industrial capacities and markets.
- To support the transition to a sustainable, secure, affordable and low-carbon energy future.

Subsequently the *ODAK$_{2023}$* initiative evolved into the indefinite *ODAK$_{TR}$* CST platform for Turkey. The METU team began to strategically advertise the *ODAK$_{2023}$* Kick-Off Event starting in September 2019 with a specific focus on advertising the Event during the one-to-one stakeholder outreach activities to map key turkish stakeholders for the aligned HORIZON-STE project and developing a contact list of people interested in Turkey's CST/STE sector.

In total, twenty five presentations were made by a diverse set of key stakeholders for Turkey's CST sector. Fourteen of these presentations were given by institutions participating in the Project, where it should be noted that DLR, PSA-CIEMAT, and METU are also partners in the co-sponsoring project SolarTwins: ESTELA (1), DLR (3), PSA-CIEMAT (4), and METU (6). Of the remaining 11 presentations, 5 were given by Turkish industry, 4 by Turkish universities other than METU, 1 by a Turkish scientific funding agency, and 1 by a Turkish ministry. The institutions making these presentations demonstrate the Joint Industry and R&I nature of this "brokerage event", which was wrapped up with a technical visit to METU facilities.

	Presenter	Affiliation	Title / Scope
8:15 - 8:45: Registration			
Session 1: Opening Session			
Chair: Serdar Erturan, Energy Institute of Mechanical Engineering, The City University of New York			
9:00	Derek Baker	SolarTwins Project Coordinator, METU-GÜNAM	Introduction to ODAK2023
9:15	Marcel Bial	Secretary General, ESTELA, Belgium	HORIZON-STE: A two-fold approach to the deployment of CST in Europe
9:40	Julian Blanco	Director, CIEMAT-PSA, Spain & Coordinator, EERA-JP-CSP	Pan-European Initiatives: EU-SOLARIS, EERA-JP-CSP, INSHIP ECRIA
10:05	Reiner Buck	Head Solar Tower Sys., DLR, Germany	DLR Activities and Capacities
10:30	**Q&A and Break**		
Session 2: Turkish Landscape			
Chair: Marcel Bial, Secretary General, ESTELA, Belgium			
10:50	Ahmet Yozgatlıgil	METU Vice President	Welcoming remarks from METU
10:55	Oğuz Can	Head of Energy Eff. & Environment Department, Ministry of Energy and Natural Resources	CST and Turkey
11:15	Görkem Günbaş	METU-GÜNAM	GÜNAM Vision & Spin-out, Lessons learned from growing PV industries & markets.
11:30	Yelda Erden-Topal	METU-TEKPOL	Development of CSP / STE Sector in Turkey: Local integration to Global Value Chains Through International Channels
11:40	Ilknur Yilmaz	H2020 Energy National Contact Point	CSP ERANET and other funding opportunities
11:50	**Q&A and Lunch**		Lunch served in lobby
Session 3: Strategic Research Partners			
Chair: Reiner Buck, Head Solar Tower Sys., DLR, Germany			
13:00	Eduardo Zarza	R+D Technical Coordinator, CIEMAT-PSA, Spain	Lessons learned from growing Spain's domestic CST industries and markets, SFERA-III and Open Access, PSA R&D Activities
13:25	Florian Wiesinger	DLR, Germany	CST Materials
13:40	Serdar Erturan	Energy Institute of Mechanical Engineering, The City University of New York .	Concentrated Solar Power (CSP) Tower Systems
13:55	Martin Roeb	DLR, Germany	Solar Heat for Industrial Processes & Solar Fuels/Chemistry
14:10	Isabel Oller	Solar Treat. of Water, CIEMAT-PSA, Spain	Solar thermal driven water treatment
14:25	Diego Alarcón	Solar Desalination, CIEMAT-PSA, Spain	Solar thermal driven desalination
14:40	**Q&A and Break**		
Session 4: National Activities and Capacities			
Chair: Eduardo Zarza, R+D Technical Coordinator, CIEMAT-PSA, Spain			
15:10	Ilker Tari	METU-GÜNAM	METU-GÜNAM's CST Research Activities and Capacites
15:20	Deniz Akçura	TEKFEN	Hi-Flex Concentrated Solar Power (CSP) Project
15:30	İbrahim Sinan Akmandor	Pars Makina Ltd.	Double Axis µCSP System
15:40	C. Güvenç Ogulgönen	State Oil Company of Azerbaijan (SOCAR)	Current Vision and Collaboration Potentials on CST Research and Applications with SOCAR R&D
15:50	Birol Kılkış	Polar Technology	A Combination of Fresnel Technology and Next-Generation Solar PVT System with Phase-Change Material and TEG Modules: FLPVT
16:00	Üner Çolak	Istanbul Technical U. (ITU) Energy Institute	Concentrated Solar Thermal Energy at ITU: Activities and Vision
16:10	Aynur Eray	YETAM - Hacettepe University	CSP Studies at YETAM-Hacettepe University
16:20	Hatice Duran	Dept of Materials Sci. & Nanotechnology Engr, TOBB U. of Economics and Technology,	Melting Temperature Depression of Nitrate-based Molten Salts Confined to Nanoporous Anodic Aluminum Oxide Membranes
16:30	Tufan Akba	Center for Energy, Environment and Economy (CEEE), Özyeğin University	Importance of Transient Modeling for The Feasibility of the Concentrating Solar Thermal Applications
16:40	Sasan Karimi	METU	Modeling and Optimization of solar energy and industrial waste heat integration into a heat distribution network for an industrial zone by TRANSYS-MATLAB linked method
16:50	**Q&A and Break**		
Session 5: Round Table and Open Discussions			
Moderator: Erkan Erdil, METU-TEKPOL			
17:15	Panel: Marcel Bial, Reiner Buck, Serdar Erturan, Eduardo Zarza		
18:00	**Refreshments and networking in lobby. Move to Uptown at METU Conference and Convention Center for dinner**		

Figure 1: The programme of the brokerage event in Turkey

1.1.2 Joint Industry and R&I Event

The Joint Industry and R&I National Event in Turkey (second event) was held on 7 April 2022 as the mini-conference *Pathways to the Deployment of Solar Technologies in Turkey: Concentrated Solar Thermal Energy and Photovoltaic Energy Technologies* as part of the 2022 Solar Energy and Technologies Fair in Istanbul (*SolarEx Istanbul*). SolarEx Istanbul was held between 6 and 8 April 2022 at Istanbul's Expo Center with an estimated daily attendance exceeding 2500 participants[1]. The mini-conference was co-organized by the aligned European Union Horizon 2020 CST projects HORIZON-STE and SolarTwins, Turkey's national center of excellence on solar energy *ODTÜ-GÜNAM*, and the national *ODAK*$_{TR}$ Concentrating Solar Thermal initiative. The Event was attended by the industry, research institutions, national decision makers and authorities and others.

The invited international presentations and industrial perspectives were devoted to CST. The Policy and Legal Perspectives addressed both CST and PV, while the last presentations were devoted to PV. ODTÜ-GÜNAM also had a booth at the fair, which allowed one-to-one engagement with key CST stakeholders.

The Secretary General of ESTELA, Marcel Bial, opened the Event with a briefly presentation on the main conclusions of Task 2.4 with respect to the Turkish Integrated Country Report. While indicating that the CSP is not an established industry in Turkey, he highlighted the sufficient R&I potential and application opportunities. The Event continued with two presentations delivered by R&I representatives from Spain. A representative from CIEMAT-PSA, Eduardo Zarza Moya, informed the attendees about CST applications and Spanish experience, emphasizing thermal storage as the main benefit of CST applications. A representative from EERA JP CSP and CIEMAT-PSA, Ricardo Sánchez, reported about both the EU and the global R&I perspectives. He emphasized the prioritization in the R&I strategy of the countries to reach the targets and gave details about EU-SOLARIS ERIC. Next, a representative from Energy Systems Engineer from the Ministry of Energy and Natural Resources of Turkey, H. Esad Yılmaz, presented the national energy policy and explained the renewable energy policies & strategies. Finally, a representative from Directorate of Energy Efficiency and Environment, Ministry of Energy and Natural Resources of Turkey, Fatma Dilek Öznur, presented the important developments achieved in the district heating and cooling area in Turkey.

The event closed with an industrial roundtable "Awareness Raising; Decreasing Manufacturing Costs; Cooperation". The discussion topics were cost and manufacturing issues for CST systems and components, the increasing role and importance of R&I investments in industrial CST applications, and research-industry cooperation in the area. In the discussion, which especially drew attention to the issue of R&I, it was agreed that cooperation should be emphasized by all stakeholders at the national and international level.

[1] *https://solarexistanbul.com/en/*

GOLD HALL — 7 APRIL 2022

FİRMA İSMİ	KONUŞMACI	KONU	SAAT
ODTÜ GUNAM	Presentation: Marcel Bial (Secretary General) European Solar Thermal Electricity Association - ESTELA / Belgium	INDUSTRY PERSPECTIVE - EU and GLOBAL	11:00-11:30
ODTÜ GUNAM	Moderation: Prof. Dr. Derek K. Baker (METU and ODTU GÜNAM) Presentations: Eduardo Zarza Moya (CIEMAT-PSA*): CST Applications and Spanish Experience Ricardo Sánchez (CIEMAT-PSA* and Coordinator of the EERA JP CSP**): EU and Global Research Perspective CIEMAT-PSA*: The Center for Energy, Environmental and Technological Research/ Spain EERA JP CSP**: European Energy Research Area- Joint Programme on Concentrated Solar Power	APPLICATIONS AND RESEARCH PERSPECTIVE - EU and GLOBAL	11:30-12:30 15 minutes for Coffee break
ODTÜ GUNAM	Moderation: Tayfun Hız- ODTÜ-GÜNAM Director Presentations: Mustafa ÇALIŞKAN General Directorate of Energy Affairs / Head of Renewable Energy Project Development and Monitoring Dept. Bilal DÜZGÜN Republic of Turkey Ministry of Energy and Natural Resources/ Head of Planning and Regulation Department	POLICY & LEGAL PERSPECTIVE in at NATIONAL LEVEL (TURKEY)	12:45-13:45
ODTÜ GUNAM	Moderation: Tayfun Hız- ODTÜ-GÜNAM Director Presentations and Discussions: Industrial Partners and Companies of • Mrs. Derya Gunvaran Soyler - Dow Chemicals Turkey • Mr. Ahmet Lokurlu, Soliterm Group (Aachen/Germany) • Mr. Gazi Kalkan-AKUO Energy / Turkey • Mr. Fatih Can- TEKFEN Engineering • Mr. Haluk Erdem, SISECAM Co., Atmospheric Coating Tech. Department • Mr. Serdar Erturan, City University of New York and Greenway CSP • Mr. Sinan Akmandor - Pars Makina Co.	INDUSTRY PERSPECTIVE - NATIONAL (PITCHES AND ROUNDTABLES)	13:45-14:45 15 minutes for Coffee break
ODTÜ GUNAM	Prof. Dr. Raşit Turan, Chairman of the Board of Directors of ODTÜ-GÜNAM, Coordinator of the SI-PV Division 20 minutes for Presentations & Discussion in Turkish	NEW GENERATION CRYSTALLINE SI SOLAR CELLS DEVELOPED BY ODTÜ- GÜNAM: TOPCon, IBC, n-PERT, SHJ	15:00-15:20
ODTÜ GUNAM	Assoc. Prof. Dr. Görkem Günbaş, Middle East Technical University, Dep. of Chemistry and ODTÜ GÜNAM, Coordinator of Emerging PV Division 20 minutes Slot for Presentations & Discussion in Turkish	EMERGING PHOTOVOLTAICS TECHNOLOGIES AT EXPANDING ODTÜ-GÜNAM: GENERAL OVERVIEW, PEROVSKITE SOLAR CELLS AND STRIKING OPPORTUNITIES	15:20-15:40
ODTÜ GUNAM	Dr. Talat Özden, ODTÜ-GÜNAM, Coordinator of Module Technologies Division	PV INTEGRATION TO AGRICULTURE (AGRI-PV), VEICHLES (VIPV) AND BUILDINGS (BIPV)	15:40-16:00

Figure 2: The programme of the Joint Industry and R&I Event in Turkey

1.2 Participants

1.2.1 Brokerage Event

The brokerage event in Turkey that took place in the form of a Joint Industry and R&I National Event was attended by total of 95 participants. Figure 3 and Table 1 show the breakdown of the participants into five categories, indicated in Section 1.1.1. Based on the number and sectors of participants, the Event is considered to be successful in engaging both the industry and research sectors of Turkey.

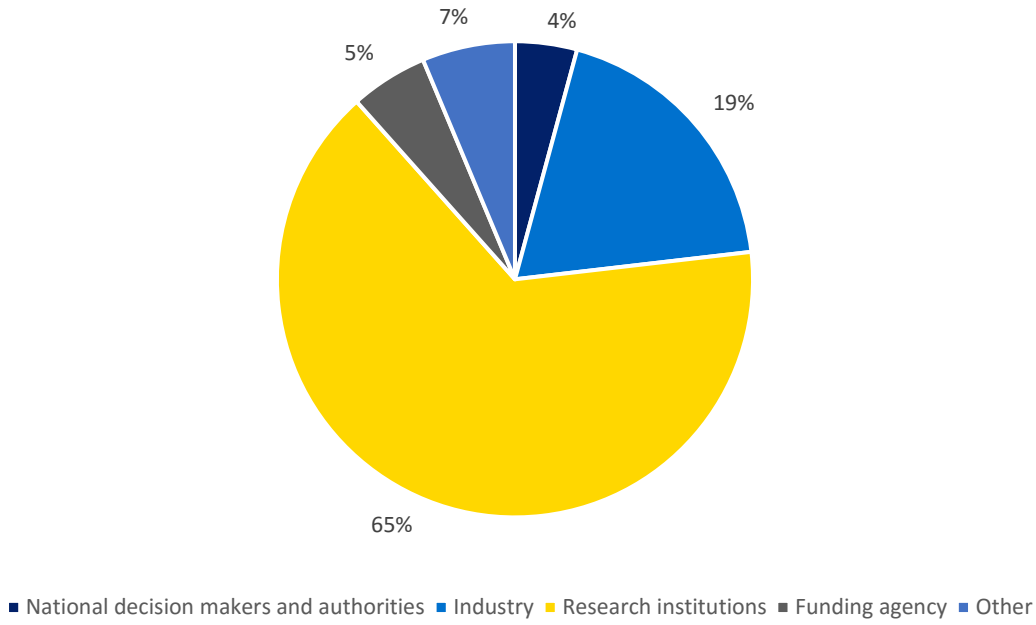


Figure 3: Breakdown of participants of the First Event in Turkey

Category	Number of participants	%
Research institutions	62	65%
Industry	18	19%
Other	6	7%
Funding agencies	5	5%
National decision makers and authorities	4	4%

Table 1: Breakdown of participants of the First Event in Turkey

1.2.2 Joint Industry and R&I Event

The Joint Industry and R&I National Event in Turkey was attended by total of 109 participants. Figure 4 and Table 2 show the breakdown of the participants into five categories, indicated in Section 1.1.2. Based on the number and sectors of participants, the

Event was successful at engaging both the Turkish industry and research and innovation communities.

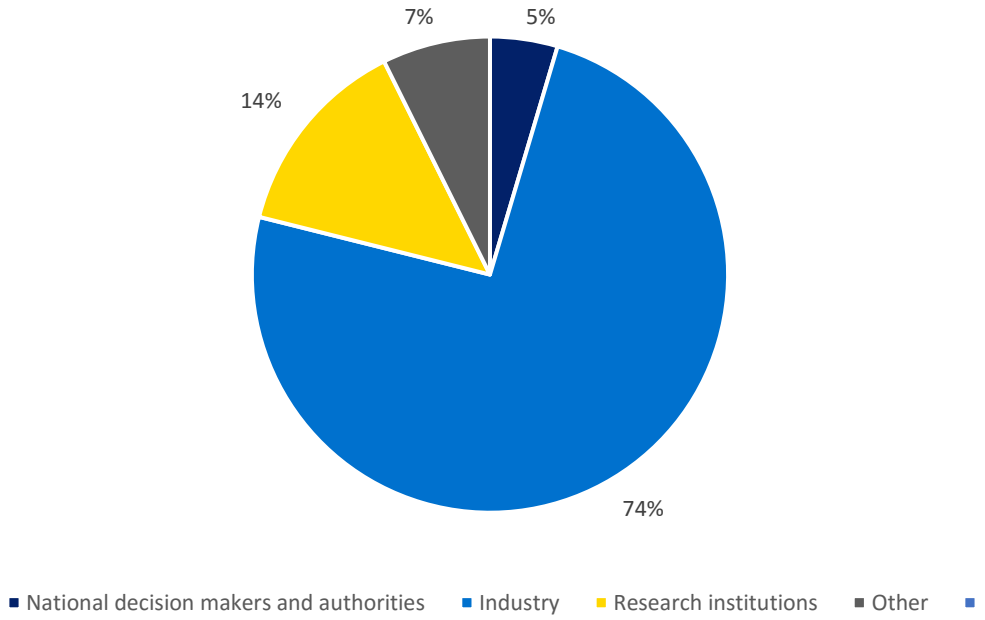


Figure 4: Breakdown of participants of the Second Event in Turkey

Category	Number of participants	%
Industry	81	74
Research institutions	15	14%
Other	8	7%
National decision makers and authorities	5	5%

Table 2: Breakdown of participants of the Second Event in Turkey

1.3 Photographs of the Events

1.3.1 Brokerage Event

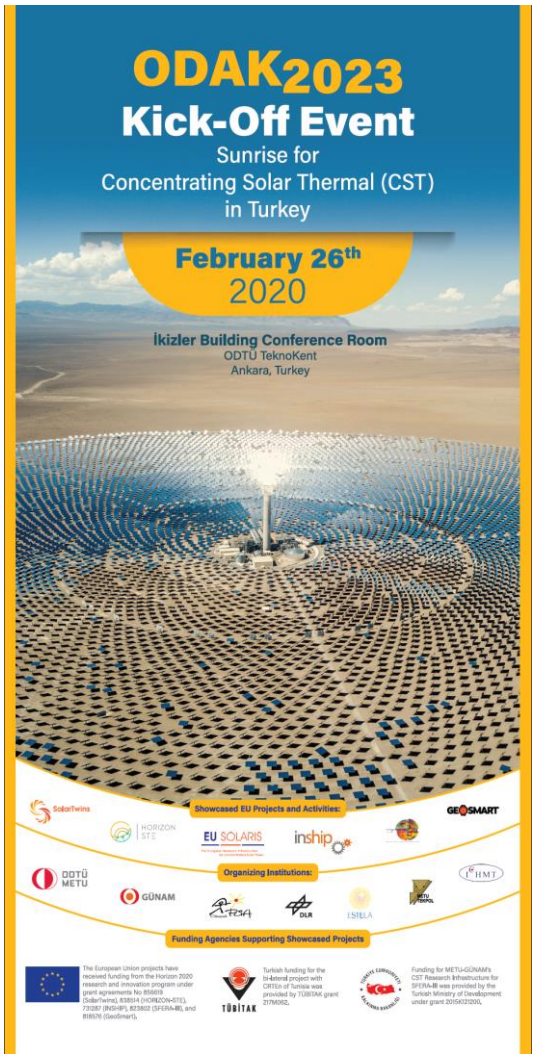


Figure 5: Roll-up poster of the Event

Figure 6: View of the Event's venue

Figure 7: Round table and open discussions with national and international research and industrial partners

Figure 8: Technical visit to METU - mechanical engineering, CST lab facilities (experimental and simulation work)

Figure 9: Technical visit to METU - membranes for energy and water laboratory in chemical engineering

Figure 10: Technical visit to METU - central laboratory

1.3.2 Joint Industry and R&I Event

Figure 11: ODTÜ-GÜNAM's booth

Figure 12: Entrance to SolarEx Istanbul

Figure 13: Industrial roundtable "Awareness Raising; Decreasing Manufacturing Costs; Cooperation"

Figure 14: Event's brochures distributed

Figure 15: ODTÜ-GÜNAM's booth

1.4 Conclusions & highlights drawn from the Events

The main conclusions and topics discussed at the Events are summarized in sections below, grouped according to the respective round table:

1.4.1 Brokerage Event

- A large number (95) and diverse set of key stakeholders participated in the Event. Co-organizing the Event with the aligned H2020 SolarTwins Project significantly increased participation and therefore impacts.
- The agenda for the ODAK2023 Kick-Off Event was specifically developed to give a platform to people outside METU to share their ideas, experiences and vision for CST in Turkey. As a result, the 25 presentations provided a diverse and relatively unfiltered set of perspectives on CST opportunities and activities in Turkey, and in total yielded a more complete and nuanced overview of the Turkish CST landscape in 2020 than could be given by any single institution or person.
- The most important broad outcome from the Event is that the most obvious entry point for CST in Turkey is 'Solar Heat for Industrial Processes (SHIP)', and therefore both METU and Turkey more generally should initially focus on developing SHIP R&I capacities and activities for the following reasons:
- Turkey has a strong potential to be a global leader in CST industrial capacities and markets. The challenge is to transform this potential into reality.
- SHIP systems tend to be smaller than STE systems, and therefore failures tend to be faster and cheaper for SHIP than STE, which results in faster and cheaper learning for SHIP than STE systems.
- SHIP is an emerging market at the global level without any dominant or established companies. In the short term, if METU can catalyse SHIP market growth in Turkey, it will be easier for Turkish companies to participate in these Turkish markets than in STE markets. In the longer term, if Turkish industry develops their SHIP capacities by exploiting growing domestic markets, these capacities can be used for export, especially to the Middle East and Northern Africa region, which has large SHIP market potentials.

1.4.2 Joint Industry and R&I Event

- Financial problems can only be solved embedding a supportive political environment for CST in Turkey in the context of the EU Green Energy and Sustainable Transition. The key to success to benefit from these technologies in the economy at large is to motivate the industry to invest in this area and to explain how to use these technologies in their own processes.
- Spanish R&I and industrial application experience in CST can be a guide for Turkey. This collaboration model and the lessons learned from the Spanish experience may be used to guide the Turkish CST sector development.

- EUSOLARIS ERIC is a powerful alliance for Turkey's development and its integration into the global CST sector. Despite Turkey being one of the group members of EU-SOLARIS since its establishment in 2012, it has not been included in the submitted EU-SOLARIS proposal. Still, it appears possible for Turkey to be part of EU-SOLARIS, but this will need time and regulatory changes to fully align with ERIC requirements. A participation in EU-SOLARIS via an observer status is possible and would be beneficial for the CST development in Turkey.
- Even without formal barrier to CST Technologies, there is no installed CST capacity. The demand should come from the private sector, which would lead the public sector to adapt.
- Solar heating and cooling is a promising CST application area for the country, with involved Ministries currently harmonizing the regulation on energy performance in buildings.

1.5 Glossary

CSP	Concentrated Solar Power
CST	Concentrated Solar Technology
RES	Renewable Energy Sources
SET-Plan	Strategic Energy Technology Plan
SHIP	Solar Heat for Industrial Processes
STE	Solar Thermal Electricity
WP	Work Package

2 Proceedings of National Event in Italy

2.1 Overview

The Joint Industry and R&I National Event in Italy was held on 14 July 2022 in the Hotel Cicerone in Rome, Italy and online via Zoom. The Event, organized by ENEA and ESTELA, was attended by the national decision makers and authorities, industry, research institutions and others.

The main goal of the Event was to discuss the status and development possibilities offered by CST for the realization of the "energy transition" in the light of the ambitious Green Deal objectives. Among the main objectives of the Event was the consolidation of the national network of stakeholders in the sector, to respond in a coordinated manner to the challenges towards the full exploitation of the technology's potential.

After the welcoming to the attendees by the President of ENEA, Gilberto Dialuce and his colleagues Simona De Iuliis, the Secretary General of ESTELA, Marcel Bial, presented the main conclusions of the Task 2.4, Italian Integrated Country Report. Document highlights the current situation of the CST technology in Italy from the point of view of research and industry, emphasising on the strengths and weaknesses. The key findings were discussed with Ministero della Transizione Ecologica (MiTE) representatives, industrial players involved in the construction of the first commercial plants and the secretary of the ESTELA. What followed were presentations from industry and national decision makers and authorities:

- "The experience of the first Italian commercial plants Partanna and Stromboli", delivered by representative from ECP.
- "The role of the CST in ENI's strategy for the ecological transition", delivered by representative from ENI, Paolo Pollesel.
- "Support policies for the development of commercial plants", delivered by representative from MiTE, Daniele Novelli.
- "R&I support policies", delivered by representative from MiTE, Marcello Capra.

The session was followed by discussion and queries.

The second part of the Event was focused on a discussion amongst the industry representatives, comparing positions of the various players and analyse strategies to make the most of the opportunities offered by current support policies.

The day ended with a visit to the solar park at the ENEA Casaccia research institutions, recently extended with the construction of a new infrastructure dedicated to the study of industrial applications of CST.

ESTELA

ENEA
Agenzia nazionale per le nuove tecnologie, l'energia e lo sviluppo economico sostenibile

STATI GENERALI DEL SOLARE TERMICO A CONCENTRAZIONE

Il ruolo del settore nella transizione energetica

Roma, 14 giugno 2022 - ore 9.00-17.00
Hotel Cicerone – via Cicerone 55/c, ROMA

PROGRAMMA

08:30	*Registrazione e welcome coffee*
09:00	Saluto di benvenuto Gilberto Dialuce, *Presidente ENEA*
09:10	Apertura dei lavori Simona De Iuliis, *ENEA* Marcel Bial, *ESTELA*

STATO ATTUALE E PROSPETTIVE DEL SOLARE TERMICO A CONCENTRAZIONE IN ITALIA

09:20	Presentazione del documento "*HORIZON-STE Integrated Country Report*" Marcel Bial, *ESTELA*
10:00	L'esperienza dei primi impianti commerciali italiani Partanna e Stromboli Rappresentanti di EPC e owner (*FATA, Sol.In.Par., Stromboli Solar*)
10:10	Il ruolo del CST nella strategia di Eni per la transizione ecologica Paolo Pollesel, *Eni*
10:20	Politiche di supporto allo sviluppo di impianti commerciali Daniele Novelli, *Ministero della Transizione Ecologica*
10:30	Politiche di supporto alla R&I Marcello Capra, *Ministero della Transizione Ecologica*
10:40	Q&A
11:00	*Coffee Break*

DIBATTITO

11:20	Tavola rotonda con gli operatori industriali della catena del valore italiana Intervengono: Eni, FATA, Brembana & Rolle, Ansaldo Energia, Ansaldo Nucleare, Ansaldo Green Tech, AC Boilers, Magaldi Power, Eastman, Elianto (*in attesa di altre conferme*) Modera: Simona De Iuliis, *ENEA*
12:20	Discussione con il pubblico
12:50	*Light lunch*

VISITA ALLA PIATTAFORMA SOLARE DEL CENTRO RICERCHE ENEA CASACCIA

14:00	*Trasporto organizzato dall'Hotel Cicerone al C.R. Casaccia*
15:00	Visita alle infrastrutture
16:30	Chiusura dei lavori
17:00	*Trasporto organizzato dal C.R. Casaccia alla stazione Termini*

The project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No 838514.

HORIZON STE

Figure 16: The programme of Joint Industry and R&I Event in Italy

2.2 Participants

The Joint Industry and R&I National Event in Italy was attended by total of 83 participants. Figure 17 and Table 3 show the breakdown of the participants into four categories, indicated in Section 2.1. The high number of attendees from industry and the research institutions demonstrates that the interest in concentrated solar technologies (CST) and their commercial applications is widespread across the energy sector.

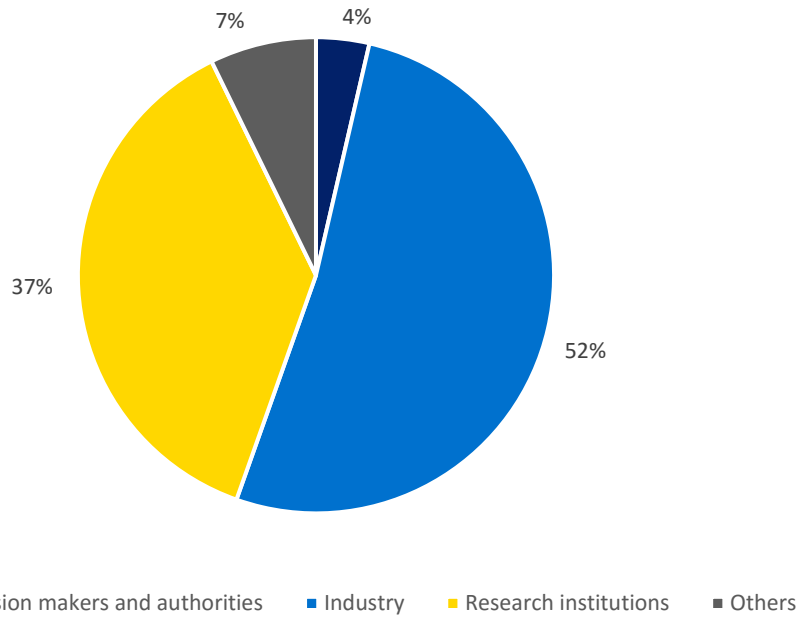


Figure 17: Breakdown of participants in Italy

Category	Number of participants	%
Industry	43	52%
Research institutions	31	37%
Others	6	7%
National decision makers and authorities	3	4%

Table 3: Breakdown of participants in Italy

2.3 Photographs of the Event

Figure 18: Event's programme and brochures distributed

Figure 19: Welcome to the attendees from ENEA President

Figure 20: Presentation of project's main conclusions

Figure 21: Presentation "Policies to support development of commercial plants"

Figure 22: Discussion amongst the industry representatives

Figure 23: Visit to ENEA Casaccia research centre – introduction

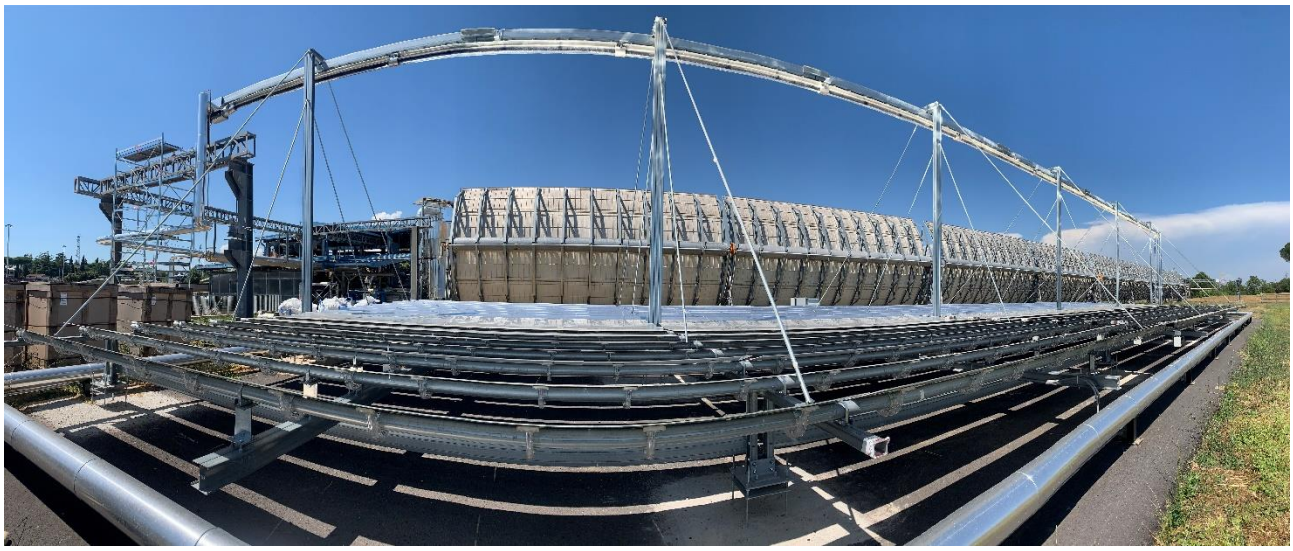


Figure 24: Visit to ENEA Casaccia research centre - linear fresnel and parabolic trough (back)

Figure 25: Visit to ENEA Casaccia research centre - parabolic trough

Figure 26: Visit to ENEA Casaccia research centre - steam generator

2.4 Conclusions & highlights drawn from the Event

The main conclusions and topics discussed at the Event are summarized in sections below.

2.4.1 National decision makers and authorities

Representatives from the MiTE confirmed Italy's commitment to cut GHG emissions by 55% compared to 1990 level. At the same time, the main Italian goal in the next three years is to diversify energy sources to ensure energy security. As such, the installation of an additional renewable capacity of 8 GW per year is envisaged by 2030. To meet this target, MiTE is working to address the main issues that are currently bottlenecking the deployment of new renewable energy plants, by:

- Shortening and simplifying the permitting processes.
- Involving the regional and local administrations in the identification of suitable areas for the installation of new RE plants to reduce social acceptance issues.

Furthermore, MiTE also confirmed the inclusion of an incentive scheme for CSP in the forthcoming FER 2 decree.

2.4.2 Industry

- Industry stakeholders engaged in the two CSP commercial plants currently under commissioning/construction in Sicily (each with a capacity of about 4.2 MWe) stated that a capacity of 5 MW for CSP plants is not cost-competitive and indicated 20 MW to be the minimum plant capacity for a reasonable project remuneration. Furthermore, it was highlighted that the hybridization of CSP with photovoltaics can be a winning strategy, as confirmed by the owner of the Partanna project. In this regard, industry stakeholders suggested a change in the regulatory framework making a mix of renewables eligible in auction specifications. All attendees agreed that a good design of the auction procedure is crucial to support the deployment of CSP as any other energy technology, and an inappropriate legislative and/or regulatory framework can ultimately hinder, rather than foster, the development of a renewable energy technology, regardless of its CAPEX and OPEX.
- Stakeholders stressed the potential of the CST technology due to its thermal storage assets. FATA SpA experiences as EPC indicate the need of Italian manufacturing processes for about 15/16 hours of thermal storage. They further suggest introducing a dedicated policy to foster thermal storage system deployment separated from electricity or heat production.
- The potential of CST technologies to produce heat in the temperature range 150-300 °C has been highlighted by Eni SpA. They are elaborating techno-economic studies to evaluate the implementation of the technology in their production sites, mainly in North Africa. At the same time, the company has been working on developing less costly system components to produce electricity. Brembana&Rolle suggested amending the "Conto Termico"

measure so to include the production of heat from solar sources not only for residential but also for industrial applications.

- The discussion revealed that the technology is ready and the whole supply chain covered by Italian companies, which have shown a strong resilience during the last decade. However, further dedicated policy measures and a revamped auction design are needed.
- An Eastman Chemicals concern shared by all participants is the lack of European economic policy vision, unlike the Chinese approach.

2.5 Glossary

CSP	Concentrated Solar Power
CST	Concentrated Solar Technology
MiTE	Ministero della Transizione Ecologica
RES	Renewable Energy Sources
SET-Plan	Strategic Energy Technology Plan
STE	Solar Thermal Electricity
WP	Work Package

3 PROCEEDINGS OF NATIONAL EVENT IN GERMANY

3.1 Overview

The Joint Industry and R&I National Event in Germany was held on 30 June 2022 in the Hotel Aquino in Berlin, Germany. The Event, organized by DLR and ESTELA in collaboration with Deutsche-CSP, was attended by the national decision makers and authorities, the industry, research institutions, associations, and others. The main goal was to discuss the possibilities offered by CSP for the realization of the "heat transition" (German "Wärmewende", similar to the approach of the "Energiewende" dedicated to the decarbonization of the electrical energy sector) in Germany and Europe with the support of German stakeholders. It raised the awareness on the possible applications of CST in the industry and heating networks.

Secretary General of ESTELA, Marcel Bial, welcomed to the attendees and briefly presented the main conclusions of Task 2.4 with respect to the German Integrated Country Report. The morning continued with an introduction from Federal Ministry for Economy and Climate Action, delivered by Christian Maaß and continued by a keynote "Process heat in industry: How do we leverage the potential for decarbonization?", delivered by representatives from VEA and DLR, Eva Schreiner and Dr. Robert Pitz-Paal respectively. What followed were two sessions filled with presentations from industry, think-tanks, research institutions:

- Session 1 - Challenges and Fields of Application:
  - "Priorities on the way to climate-neutral process heat", delivered by representative from Agora Energiewende, Paul Münnich.
  - "Concentrating solar thermal in industry and municipalities - starting point for market ramp-up in Germany", delivered by representative from Deutsche Energie-Agentur (DENA), Dr. Rita Ehrig.
  - "Planning and optimization of industrial process heat supply", delivered by representative from Fichtner GmbH & Co. KG, Johannes Kretschmann.
  - "Key points for solar thermal systems in heating networks", delivered by representative from Solites Steinbeis Research Institute for Solar and Sustainable Thermal Energy Systems, Dirk Mangold.
  - "Data-supported regional heat management planning", delivered by representative from DigiKoo GmbH, Tobias Küper.
- Session 2 - Project possibilities and financing:
  - "Process heat plants with parabolic trough in Belgium – experiences from 2 Years of Operation", delivered by representative from Azteq, Kari Ven.
  - Parabolic troughs in German district heating and process heat applications - new approaches and project proposals, delivered by representative from Solarlite CSP Technologies GmbH, Joachim Krüger.

- "On the economic efficiency of solar process heat using the example of the food industry", delivered by representative from ADM Wild Europe GmbH & Co. KG, Fabian Bekemeier.
- "Economic heat turnaround in industry & commerce through hybrid energy systems with subsidy optimization" delivered by representative from IZAAC.ENERGY, Eike Christian Toepfer.
- "Solar process heat for fodder drying for sustainable agriculture", delivered by representative from Protarget AG, Martin Scheuerer.
- "Solar thermal as part of the hybrid generation models of the future", delivered by representative from E.ON SE, Kevin Bär.
- Use of the parabolic troughs for cold generation and long-term storage (seasonal storage), Dr. Ahmet Lokurlu, Soliterm Group GmbH

Both sessions were followed by discussions and queries. The outcomes of the Event can be summarized as follows:

- Key messages:
  - A mix of different renewable energy technologies combined with efficiency measures is needed to ensure a secure, climate-friendly and cost-efficient heat supply for industry.
  - The various technology options for providing heat from renewable sources, through electrification and the use of green hydrogen can and must be combined.
  - In this context, CST represents an important part of the hybrid supply portfolio of a decarbonized industry.
- This requires:
  - The definition of a development target for process heat including the accompanying measures.
  - Ensuring consistent remuneration schemes for renewable heat, renewable electricity and green electricity and green hydrogen - also as hybrid solutions.
  - The promotion of concentrating solar thermal reference projects as a kick-start for market ramp-up in Germany.
  - The launch of an information campaign for heat consumers and the establishment of a pool of consultants.

PROGRAMM

Konzentrierende Solarthermie für die Wärmewende: Einsatzmöglichkeiten in Industrie und Wärmenetzen

30. Juni 2022, 10:30 – 16:30 Uhr,
Hotel Aquino, Hannoversche Str. 5B, 10115 Berlin

Moderation:
Juliane Hinsch, Deutscher Industrieverband Concentrated Solar Power (DCSP)

BEGRÜßUNG

10:45 Uhr Marcel Bial, European Solar Thermal Electricity Association (ESTELA), Koordinator Horizon-STE

GRUßWORT

11:00 Uhr Christian Maaß, Bundesministerium für Wirtschaft und Klimaschutz (BMWK)

KEYNOTES

11:20 Uhr *Prozesswärme in der Industrie: Wie heben wir das Potenzial zur Dekarbonisierung?*

Eva Schreiner, Bundesverband der Energie-Abnehmer (VEA)

Prof. Dr. Robert Pitz-Paal, Institut für Solarforschung, Deutsches Zentrum für Luft- und Raumfahrt (DLR)

SESSION 1: HERAUSFORDERUNGEN UND ANWENDUNGSFELDER

11:50- 13:15 Uhr

Prioritäten auf dem Weg zu klimaneutraler Prozesswärme, Paul Münnich, Agora Energiewende

Konzentrierende Solarthermie in Industrie und Kommune – Startpunkt für den Markthochlauf in Deutschland, Dr. Rita Ehrig, Deutsche Energie-Agentur (dena)

Planung und Optimierung von industrieller Prozesswärmeversorgung, Johannes Kretschmann, Fichtner GmbH & Co. KG

Kernpunkte für Solarthermieanlagen in Wärmenetzen, Dirk Mangold, Solites Steinbeis Forschungsinstitut für solare und zukunftsfähige thermische Energiesysteme

Datengestützte regionale Wärmeleitplanung, Tobias Küper DigiKoo GmbH

Podiumsdiskussion

13:15 – 14:15 Uhr Mittagspause

SESSION 2: PROJEKTMÖGLICHKEITEN UND FINANZIERUNG

14:15 – 15:45 Uhr

Process heat plants with parabolic trough in Belgium – experiences from 2 Years of Operation, Kari Ven, Azteq

Parabolrinnen in deutschen Fernwärme- und Prozesswärmeanwendungen – neue Ansätze und Projektvorschläge, Dr. Joachim Krüger, Solarlite CSP Technologies GmbH

Zur Wirtschaftlichkeit solarer Prozesswärme am Beispiel der Lebensmittelindustrie, Fabian Bekemeier, ADM Wild Europe GmbH & Co. KG

Wirtschaftliche Wärmewende in Industrie & Gewerbe durch hybride Energiesysteme mit Fördermitteloptimierung, Eike Christian Toepfer, IZAAC.ENERGY

Solare Prozesswärme zur Futtertrocknung für eine nachhaltige Landwirtschaft, Martin Scheuerer, Protarget AG

Solarthermie als Teil der hybriden Erzeugungsmodelle der Zukunft, Kevin Bär, E.ON SE

Einsatz der Parabolrinnen für Kälteerzeugung und Langzeitspeicherung (Saisonalspeicherung), Dr. Ahmet Lokurlu, Soliterm Group GmbH

Beiträge und Rückfragen

ENDE DER SESSIONS UND NETWORKING

15:45 – 16:30 Uhr

Mit Unterstützung von:

Marktoffensive Erneuerbare Energien · THEMA CONSULTING GROUP · BERLIN BRANDENBURG ENERGY NETWORK e.V.

The project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No 838514.

ESTELA · DLR Deutsches Zentrum für Luft- und Raumfahrt e.V. · DCSP Deutscher Industrieverband Concentrated Solar Power · eclareon

Figure 27: The programme of Joint Industry and R&I Event in Germany

3.2 Participants

The Joint Industry and R&I National Event in Germany was attended by total of 79 participants. Figure 28 and Table 4 show the breakdown of the participants into five categories, indicated in Section 3.1. The largest fraction came from German industry which confirms the capabilities and interest of the industry on the branch of renewable heat. This was followed by an equal number of participants from research institutions as well as associations. The smaller but still important number of participants came from consultants and other types of organizations and from national decision makers and authorities. This mixed audience indicates a positive shift towards spreading the messages into the different sectors that play an important role in the heat transition and considering their priorities and capabilities.

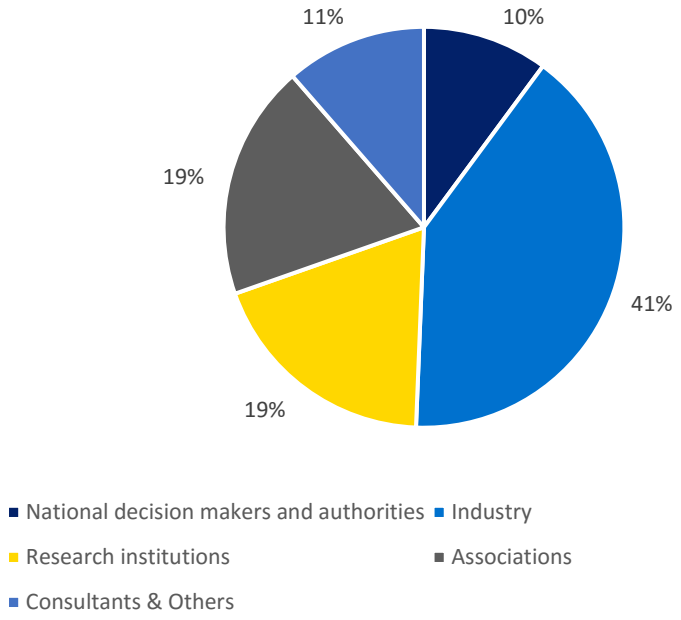


Figure 28: Breakdown of participants in Germany

Category	Number of participants	%
Industry	32	41%
Research institutions	15	19%
Associations	15	19%
Consultants & others	9	11%
National decision makers and authorities	8	10%

Table 4: Breakdown of participants in Germany

3.3 Photographs of the Event

Figure 29: Event's programme and brochures distributed

Figure 30: Event's opening and welcome to the attendees by DCSP representative

Figure 31: Welcome to the attendees from ESTELA Secretary General

Figure 32: Introduction from Federal Ministry for Economy and Climate Action

Figure 33: Keynote speech, delivered by representative from VEA

Figure 34: Continuation of keynote speech, delivered by representative from DLR

Figure 35: Presentation "Priorities on the way to climate-neutral process heat"

Figure 36: Discussion following the session 1 - Challenges and Fields of Application

Figure 37: Presentation "Parabolic troughs in German district heating and process heat applications - new approaches and project proposals"

3.4 Conclusions & highlights drawn from the Event

Following the Event in Germany, Deutsche CSP has published the following recommendations for the German policy[2]:

> The analysis of low-CO_2 technologies shows the fundamental feasibility of the "heat transition" in Germany, but also beyond national borders. Implementation can succeed in stages if it is accompanied in parallel by research and transfer activities. The achievable speed depends to a large extent on accompanying political measures. To this end we would like to make the following recommendations for action:
>
> - Development of target paths:
> - The rapid phase-out of fossil heat should be the goal of all upcoming legislative amendments. The fuel risk and import dependencies for oil and gas must be reduced as quickly as possible. To this end, the market ramp-up of climate-friendly heating technologies must be accelerated vigorously and at top speed.
> - Anchoring an expansion target for renewable energies in process heat in addition to the targets for renewable energies in the heat supply as a whole.
> - Development of a catalogue of measures to decarbonize the industry, building on comprehensive efficiency measures to create a renewable hybrid supply portfolio. In this portfolio, the possibilities of renewable heat sources and heat storage, technologies for electrification and green hydrogen are equally considered as potential solutions.
> - Technology agnosticism should be the central requirement. A one-sided focus on specific and individual technologies should be avoided. The ambitious development targets can only be achieved through the parallel use of all technologies.
> - Create suitable framework conditions and incentives:
> - Anchoring renewable heating and cooling generation and storage technologies as an essential pillar for decarbonizing the industry.
> - Development of a surcharge-free heat electricity tariff or a heat guarantee price to create investment security for the user side.
> - Align support for thermal, climate-friendly technologies with support for heat pumps or green hydrogen. A level playing field for CO2-saving technologies that is open to all technologies is needed, underpinned by appropriate market incentive programs.

[2] *Translated from the "Positionspapier" from DCSP published on July 6th 2022 after the realization of this Horizon-STE event.*

- Adequate compensation for flexibility and services to the network.
- Implementation of energy communities for industry for the easy-to-achieve joint development of heat potentials and for more acceptance of the use of renewable heat as well as of waste heat.
- Faster planning and permitting processes.
- Promoting digitalization in the industrial sector and in the context of approval procedures.

– Promote innovation and create awareness:
  - Information campaign for the use of thermal technologies and other technology options for decarbonizing industry for politicians, associations, engineering firms and know-how multipliers.
  - Promote demonstration projects to showcase possible solutions. With the aim of accelerating the market ramp-up, the focus should be on ensuring that the technology can be implemented and functions quickly at industrial level.
  - Introduction of an innovation bonus for innovative technologies to reduce CO2 emissions. The CO2 avoidance costs, for example, could be used as a criterion for this.

– Consulting & concept creation:
  - Establishment of a pool of consultants for application and system-oriented consulting. There are no one-size-fits-all solutions in the industry segment. This poses a significant challenge for the industry in identifying a suitable combination of the technologies.
  - Promote energy flow metering in industry, as data is often insufficient at the level of companies, leaving many decarbonization and savings options unexploited.
  - Promoting the development of solution concepts for individual industrial sites and companies through free, proactive initial consulting in the form of so-called promotion/design checks.

3.5 Glossary

CSP	Concentrated Solar Power
CST	Concentrated Solar Technology
DENA	Deutsche Energie-Agentur
RES	Renewable Energy Sources
SET-Plan	Strategic Energy Technology Plan
STE	Solar Thermal Electricity
WP	Work Package

4 Proceedings of National Event in Spain

4.1 Overview

The Joint Industry and R&I National Event in Spain was held on 6 July 2022 at the premises of CIEMAT in Madrid, Spain. The Event, organized by CIEMAT and ESTELA in collaboration with PROTERMOSOLAR, was attended by the national decision makers and authorities, industry and research institutions.

The General Director of CIEMAT, Yolanda Benito Moreno, welcomed the attendees and the Secretary General of ESTELA, Marcel Bial, briefly presented the main conclusions of Task 2.4 with respect to the Spanish Integrated Country Report, highlighting the situation of the concentrated solar thermal sector in Spain. Next, Assistant to the Secretary General of Foresight, Strategy and Regulations in Energy Matters, Ministry of Ecological Transition and Demographic Challenge (MITERD), Lucia Blanco, made a brief presentation entitled "Solar energy in the strategic framework of energy and climate". Finally, to close the first part of the Event, Head of the Solar and Self-consumption Department of the Institute for Energy Savings and Diversification (IDAE), Carlos Montoya, spoke about the solar applications to industrial process heat and the development programs that the Spanish government is promoting for this type of applications for concentrating solar thermal technologies. Following the first part of the Event, three round tables were held with the objective to highlight the vision and point of view of the national decision makers and authorities, industry and research institutions.

During the first-round table, the institutional vision of concentrated solar thermal technologies was discussed, both for electricity generation and process heat applications. The round table was moderated by Yolanda Benito Moreno and featured panellists from CIEMAT Energy Department, Innovation Coordination and Ministry of Science and Innovation (MICINN).

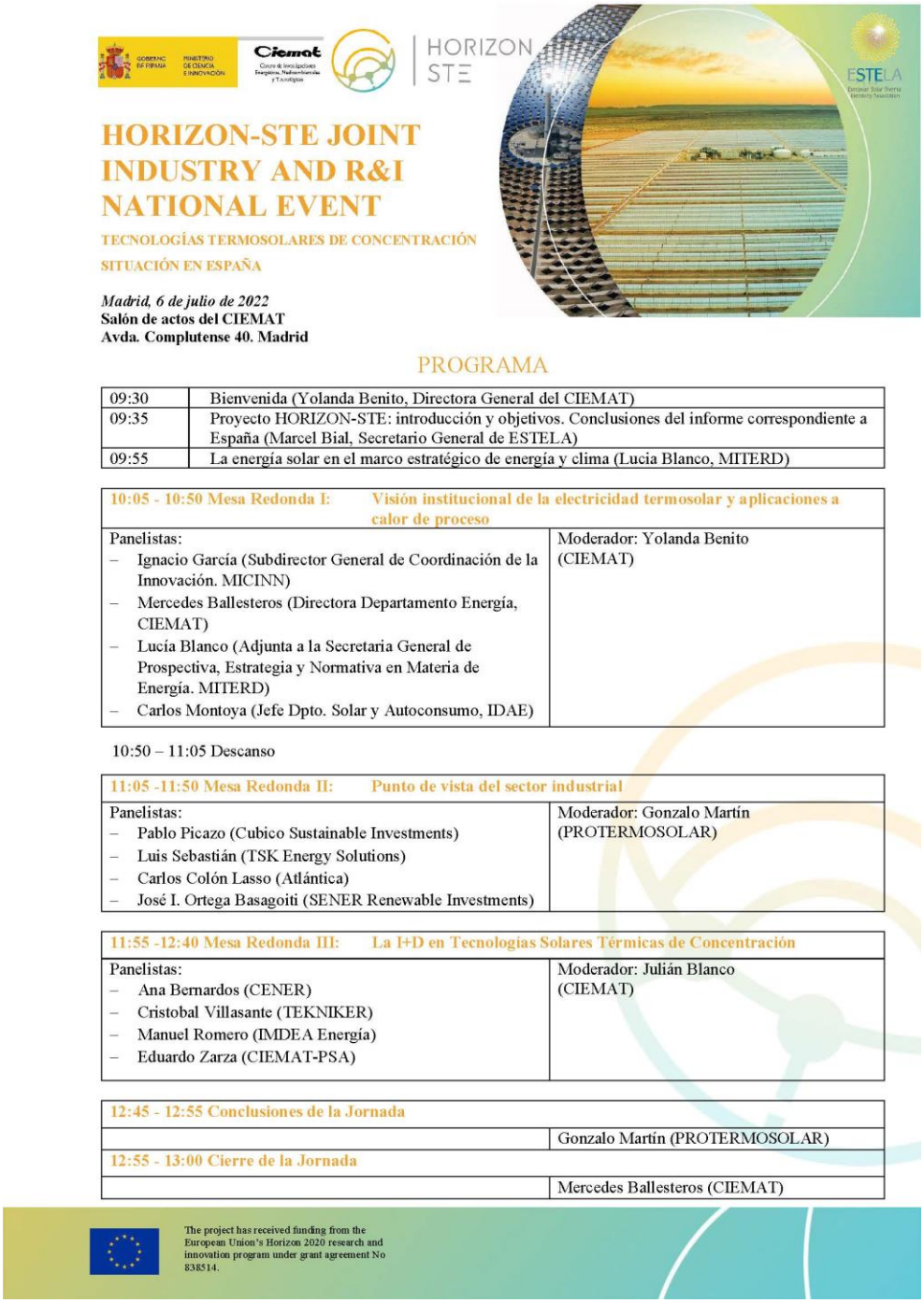
The objective of the second-round table was to highlight the vision of the industry. This round table was moderated by Gonzalo Martín, PROTERMOSOLAR, and features panellists from Atlántica Sustainable Infrastructures, SENER Renewable Investments, TSK Energy Solutions and Cubico Sustainable Investments.

The third and last round table was dedicated to the Spanish research institutions with interest in concentrating solar thermal technologies. It was moderated by Julián Blanco, Plataforma Solar de Almería, and included panellists from the Department of Solar Thermal Energy of CENER, Renewable Energies Area of TEKNIKER, Plataforma Solar de Almería and IMDEA Energy.

In the various round tables, topics of interest were debated among the participants, including a time slot at the end of each table for questions made by the audience. The main conclusions and topics discussed during the different round tables were summarized at the end of the day by Gonzalo Martin, before the closing of the day and farewell by Mercedes Ballesteros.

The Event achieved media coverage, with Channel Extremadura publishing a story "Why the concentrated solar thermal and photovoltaic plants stop in the hours of the most

sun?"[3] that includes interviews with Lucia Blanco, Marcel Bial and Mercedes Ballesteros, all speakers at the Event.



HORIZON-STE JOINT INDUSTRY AND R&I NATIONAL EVENT

TECNOLOGÍAS TERMOSOLARES DE CONCENTRACIÓN
SITUACIÓN EN ESPAÑA

Madrid, 6 de julio de 2022
Salón de actos del CIEMAT
Avda. Complutense 40. Madrid

PROGRAMA

09:30	Bienvenida (Yolanda Benito, Directora General del CIEMAT)
09:35	Proyecto HORIZON-STE: introducción y objetivos. Conclusiones del informe correspondiente a España (Marcel Bial, Secretario General de ESTELA)
09:55	La energía solar en el marco estratégico de energía y clima (Lucía Blanco, MITERD)

10:05 - 10:50 Mesa Redonda I: Visión institucional de la electricidad termosolar y aplicaciones a calor de proceso	
Panelistas: – Ignacio García (Subdirector General de Coordinación de la Innovación. MICINN) – Mercedes Ballesteros (Directora Departamento Energía, CIEMAT) – Lucía Blanco (Adjunta a la Secretaria General de Prospectiva, Estrategia y Normativa en Materia de Energía. MITERD) – Carlos Montoya (Jefe Dpto. Solar y Autoconsumo, IDAE)	Moderador: Yolanda Benito (CIEMAT)

10:50 – 11:05 Descanso

11:05 -11:50 Mesa Redonda II: Punto de vista del sector industrial	
Panelistas: – Pablo Picazo (Cubico Sustainable Investments) – Luis Sebastián (TSK Energy Solutions) – Carlos Colón Lasso (Atlántica) – José I. Ortega Basagoiti (SENER Renewable Investments)	Moderador: Gonzalo Martín (PROTERMOSOLAR)

11:55 -12:40 Mesa Redonda III: La I+D en Tecnologías Solares Térmicas de Concentración	
Panelistas: – Ana Bernardos (CENER) – Cristobal Villasante (TEKNIKER) – Manuel Romero (IMDEA Energía) – Eduardo Zarza (CIEMAT-PSA)	Moderador: Julián Blanco (CIEMAT)

12:45 - 12:55 Conclusiones de la Jornada	
	Gonzalo Martín (PROTERMOSOLAR)
12:55 - 13:00 Cierre de la Jornada	
	Mercedes Ballesteros (CIEMAT)

The project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No 838514.

Figure 38: The programme of Joint Industry and R&I Event in Spain

[3] *See : https://www.canalextremadura.es/noticias/extremadura/por-que-las-termosolares-y-fotovoltaicas-paran-en-las-horas-de-mas-sol*

4.2 Participants

The Joint Industry and R&I National Event in Spain was attended by a total of 56 participants. Figure 39 and Table 5 show the breakdown of the participants into three categories, as indicated in Section 4.1. The high number of attendees from industry and the research institutions demonstrates that the interest in concentrated solar technologies (CST) and their commercial applications is widespread across the energy sector.

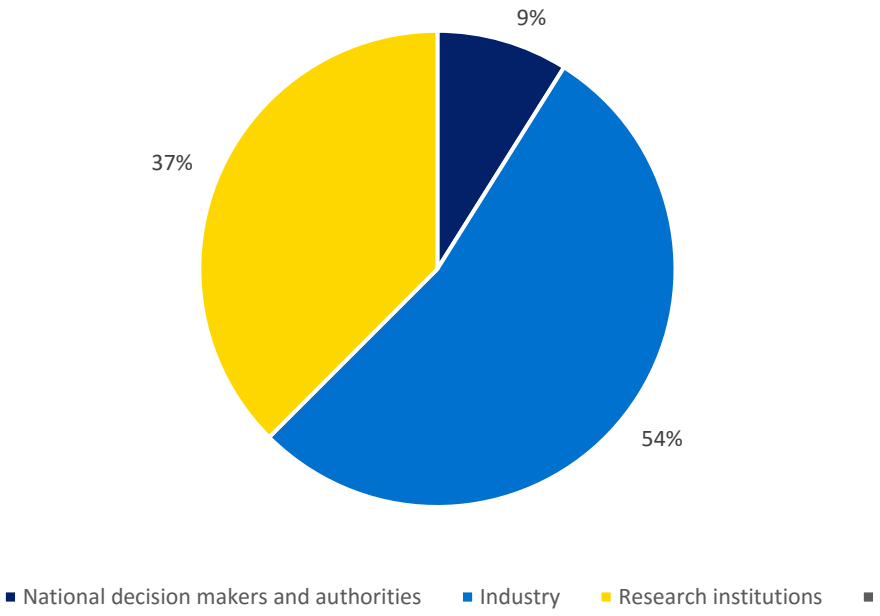


Figure 39: Breakdown of participants in Spain

Category	Number of participants	%
Industry	30	54%
Research institutions	21	37%
National decision makers and authorities	5	9%

Table 5: Breakdown of participants in Spain

4.3 Photographs of the Event

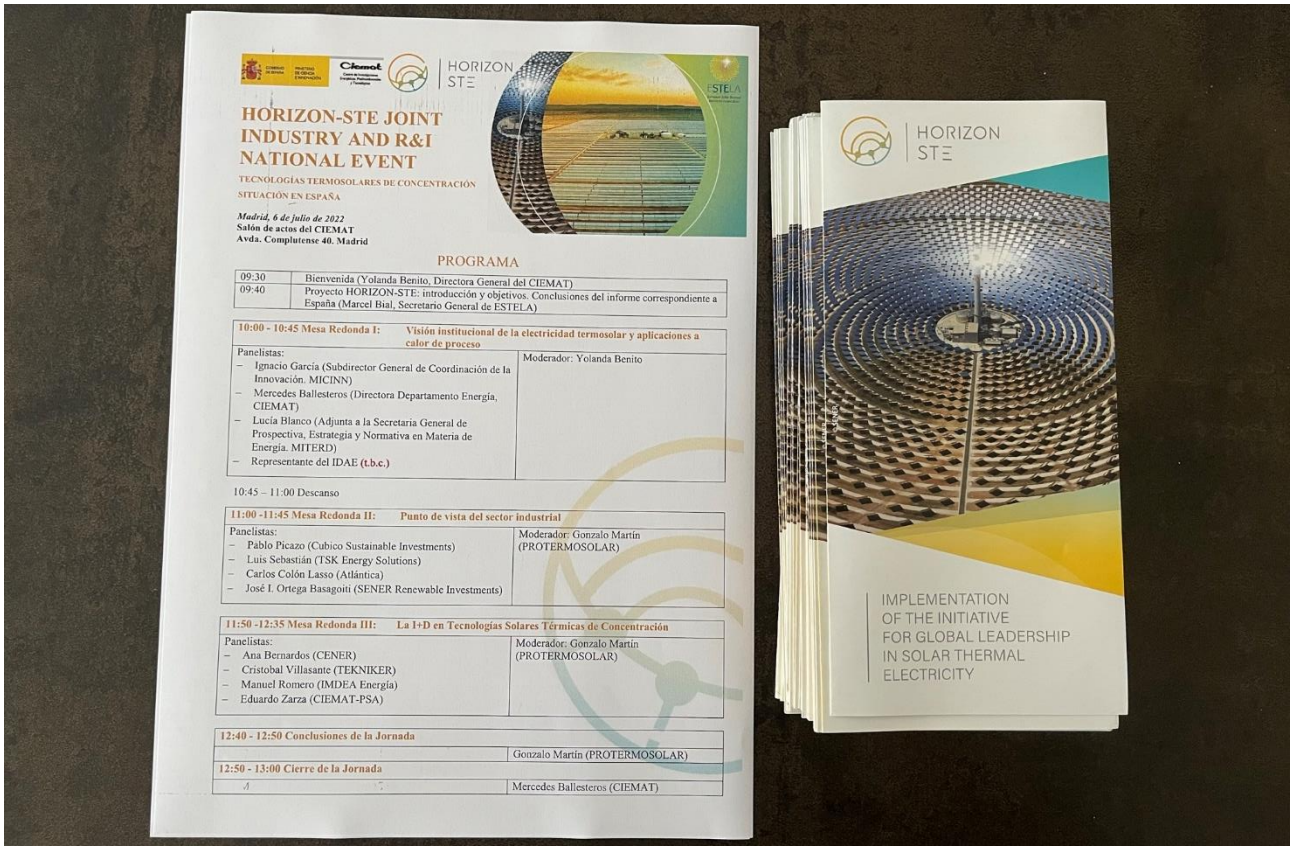


Figure 40: Event's programme and brochures distributed

Figure 41: Welcome to the attendees from General Director of CIEMAT

Figure 42: First panel discussion about the institutional vision of concentrated solar thermal technologies

Figure 43: Second panel discussion about the vision of the industry

Figure 44: Third panel discussion between the research institutions with interest in concentrating solar thermal technologies

Figure 45: View of the Event's venue

Figure 46: Secretary General of ESTELA interviewed by Channel Extremadura

4.4 Conclusions & highlights drawn from the Event

The main conclusions and topics discussed at the Event are summarized in sections below, grouped according to the respective round tables.

4.4.1 National decision makers and authorities

- It was announced that the PNIEC (Integrated National Energy and Climate Plan) drawn up by the Spanish Government will be reviewed shortly, under a mandate from the European Commission, and in the context of the changes that the current international energy situation is imposing. The figures given in the current version could be modified in this revision. This review was considered positive if it is carried out from a realistic point of view, so that the PNIEC objectives become achievable in practice (since reaching additional 5 GWe of solar thermal power plants by 2030 is questionable, the revised PNIEC could include a figure considered today as feasible). However, the Spanish Administration should be aware that the lower the new installed capacity of solar thermal power plants, the higher natural gas consumption in Spain since the manageability of solar thermal power plants is essential to reduce or replace gas consumption for electricity in Spain.
- From the Administration there is a clear desire to promote applications for industrial process heat, with various programs that provide important subsidies. This is very positive, and it is considered necessary to continue with this aid, but it seems necessary to increase it to create a market big enough to allow the commercial take-off of this type of solar applications. Spain is in an excellent position to address this, since much of the experience gained with solar thermal power plants is applicable to process heat applications.
- The auction mechanism implemented to new solar thermal power plants is necessary to develop the market, but the current mechanism separating the auctioning of new capacities and the access point must be modified; the current mechanism brings a high risk for the promoters to win an auction for a project without a connection point to the grid that triggers the loss of the bank guarantees acquired by the promoters. This is even more important since many solar thermal, photovoltaic and wind power plants are not allowed to produce electricity during sunlight hours because, according to the Spanish grid operator (REE), their access points are overloaded. This causes significant economic damage to the plants and prevents the injection of renewable electricity into the network. At the same time, this leads to high consumption of natural gas in combined cycles. As long as this strong capacity limitation exists in the network, it may not make much sense to increase renewable capacity in Spain, since the new plants would not be able to operate efficiently and profitably.
- The Next Generation funds make it possible to expand the storage capacity of the Spanish solar thermal power plant park, which would help reduce natural gas consumption and offer REE more possibilities for managing that storage capacity in a more efficient way.

- Due to the problem with Russian gas, Germany has recently shown a much more prone attitude towards relaunching the concept pursued by the DESERTEC project. This situation should be used by Spain to join forces and promote a wide network of solar thermal power plants in southern Europe and North Africa. This initiative would mean a great boost for the CSP sector, so this more favourable environment should be taken in advantage of by the Spanish Government.

4.4.2 Industry

- A significant loss of "talent and know-how" is taking place in the industrial sector because the lack of new solar thermal power plant projects resulted in transferring personnel specialized in this technology to other projects of a different nature. If new solar thermal power plants are not promoted quickly, this loss of talent will worsen and it will surely not be available when needed, so Spain will have lost its current leadership in this sector.
- Solar thermal power plants do not compete with photovoltaic plants but rather complement them. Solar thermal power plants offer dispatchability of large capacity at a competitive price, while current photovoltaic plants offer neither dispatchability nor synchronous power to the electricity grid. Solar thermal power plants should be compared with combined cycles, not with photovoltaic plants, and today solar thermal electricity is cheaper than that of the combined cycle. According to a study carried out by PROTERMOSOLAR, the use of natural gas in the Spanish combined cycles during the last 12 months has generated an extra cost of 6 billion euros for the Spanish electricity system when compared to long-term average cost of electricity of 50 €/MWh.
- A fundamental problem is that the benefits of various technology options for Spain including the full supply chain, beyond the sole cost of electricity produced, is not valued in the procurement mechanisms for new RES capacity. Spain can produce all the necessary components for a solar thermal power plant (except the turbo machinery), while for photovoltaic plants depend on supplies from non-European countries. Reducing energy dependency and increasing security of supply in Spain and Europe implies using solar thermal electricity, in addition providing local wealth to economically-stressed areas where solar thermal power plants are installed.

4.4.3 Research institutions

- R&D is essential to continue with technological improvement, and public R&D is necessary, but it is not enough. A significant R&D effort is also needed from companies, as it happened between 2007-2013, when many companies invested significant resources in R&D.
- Innovative ideas exist to further reduce costs and increase the efficiency of solar thermal power plants. However, the necessary public support to develop these innovative ideas is missing. The current aid programs, both at national and European level, appear insufficient. The budget allocated by the European Commission to R&I for concentrated solar thermal technologies is today

substantially lower compared to the European R&I budget dedicated to photovoltaic and wind power is very striking.

- As an example, for the Spanish R&I contribution to CSP technology was the introduction of large-capacity thermal storage systems using molten salts, still considered an important technological “break-through”.
- The Spanish industrial sector has developed new components in recent years (rotary joints, heliostats, parabolic trough collectors…) that reduce costs and increase efficiency, but these innovations have not yet been implemented due to the lack of new commercial projects.

4.5 Glossary

CSP	Concentrated Solar Power
CST	Concentrated Solar Technology
IDAE	Institute for Energy Savings and Diversification
MICINN	Ministry of Science and Innovation
MITERD	Ministry of Ecological Transition and Demographic Challenge
RES	Renewable Energy Sources
SET-Plan	Strategic Energy Technology Plan
STE	Solar Thermal Electricity
WP	Work Package

5 Proceedings of National Event in Portugal

5.1 Overview

The Joint Industry and R&I National Event in Portugal was held on 8 July 2022 at the premises of LNEG, Edifício Solar XXI in Lisbon, Portugal and online via Zoom. As there were no Portuguese partners in the project, mitigation measures were applied to address this lack in the organization of the country's Event. Substantial assistance was received from LNEG that made important interactions among the actors possible, enabling the Event to take place in Lisbon, including a visit to the laboratory's facilities. The Event was attended by the national decision makers and authorities, industry, research institutions and others.

After the welcoming to the attendees by the Director of LNEG, Helder Gonçalves, the Secretary General of ESTELA, Marcel Bial, presented the main conclusions of Task 2.4 with respect to the Portuguese Integrated Country Report, highlighting the situation and future perspective of the concentrated solar thermal sector in Portugal. The Event continued with following presentations:

- "CSP technologies in the national energy system", delivered by Senior Researcher at Directorate-General for Energy and Geology, Luís Gil.
- "Solar thermal and industry decarbonization – Case study and vision for the future", delivered by representatives of Institute of Science and Innovation in Mechanical and Industrial Engineering (INEGI), Ana Magalhães and Ricardo Barbosa.
- "CSP research and innovation activities at U. Évora", delivered by Renewable Energies Chair Chairman and Coordinator Researcher at University of Évora, Pedro Horta.
- "CSP research and innovation activities at LNEG", delivered by Technical Officer at LNEG, João Cardoso.

Following the presentations, the attendees enjoyed a virtual technical visit to EMSP facility and finally, the Event was wrapped up with a technical visit to LNEG facilities.

Figure 47: The programme of Joint Industry and R&I Event in Portugal

5.2 Participants

The Joint Industry and R&I National Event in Portugal was attended by at least 19 participants in-person and at least 47 remotely-connected participants. Figure 48 and Table 6 show the breakdown of the event registrants into four categories, indicated in Section 5.1. The significant interest from research institutions indicates the R&I potential in the country. Furthermore, the balanced ratio of event registrations between the industry and national decision makers and authorities demonstrates that both see a potential in CST from commercial applications and national interest side.

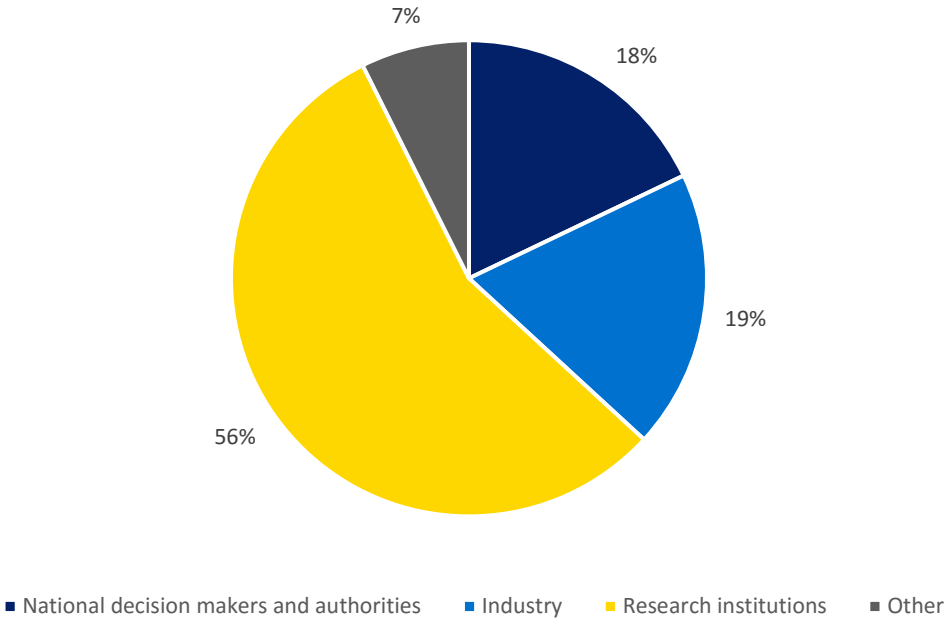


Figure 48: Breakdown of event registrants in Portugal

Category	Number of event registrants	%
Research institutions	53	56%
Industry	18	19%
National decision makers and authorities	17	18%
Other	7	7%

Table 6: Breakdown of participants in Portugal

5.3 Photographs of the Event

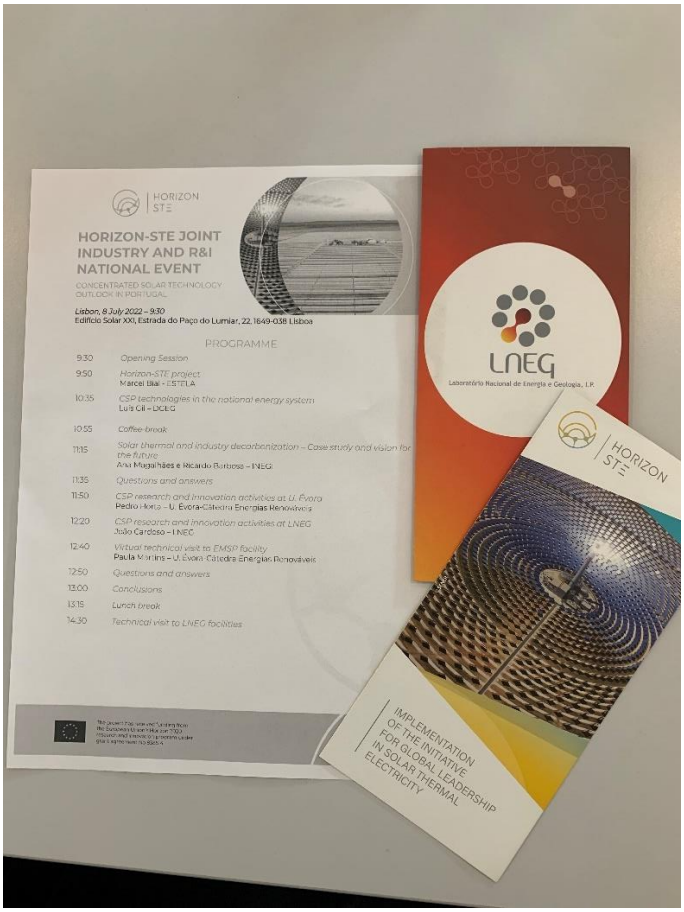


Figure 49: programme and brochures distributed

Figure 50: Presentation of project's main conclusions

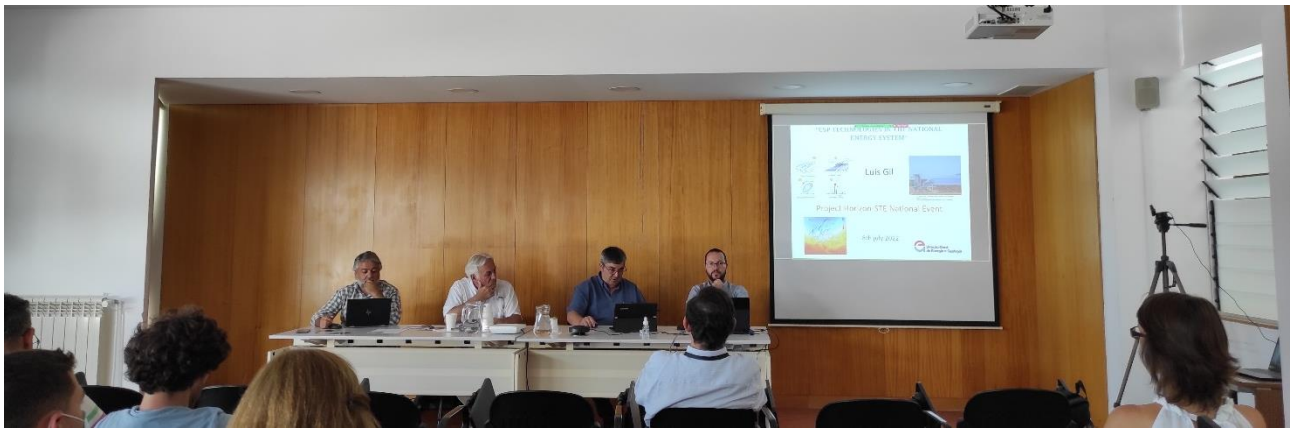


Figure 51: Presentation "CSP from the perspective of the Portuguese TSO"

Figure 52: Presentation "Solar thermal and industry decarbonization – Case study and vision for the future"

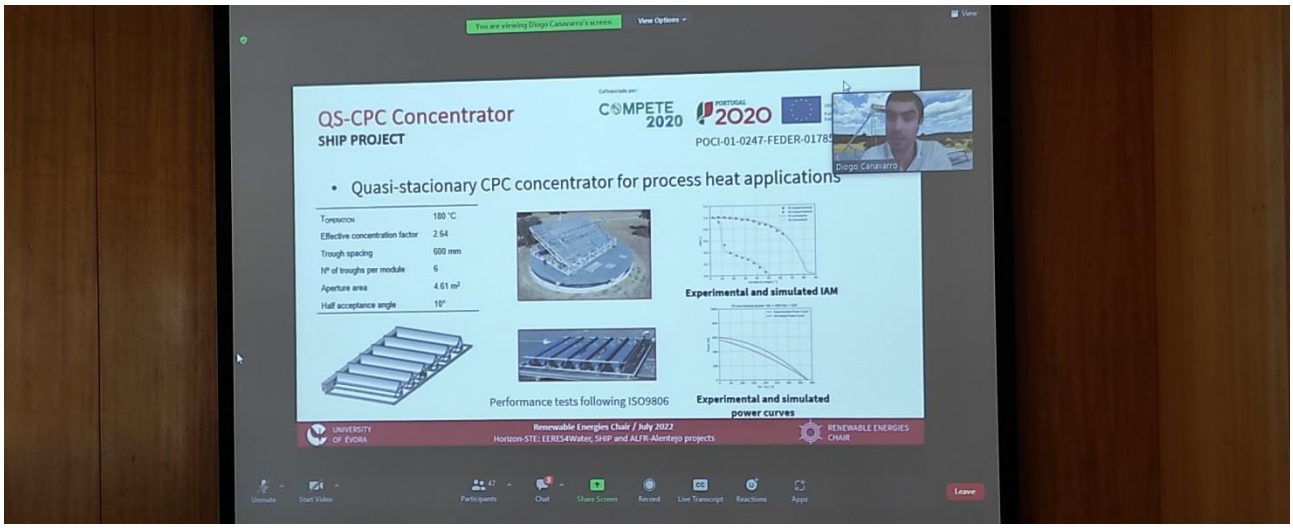


Figure 53: Presentation "CSP research and innovation activities at U. Évora"

Figure 54: Technical visit to LNEG facilities – introduction

Figure 55: Technical visit to LNEG facilities - solar tower testing facility

Figure 56: Technical visit to LNEG facilities - top of the solar tower

Figure 57: Technical visit to LNEG facilities - inside of the solar tower

Figure 58: Technical visit to LNEG facilities - solar tower testing facility

Figure 59: Premises of LNEG, Edifício Solar XXI

5.4 Conclusions & highlights drawn from the Event

The main conclusions and topics discussed at the Event are summarized below:

- There was a very good response from Portuguese authorities to the requests of the project for contacts about the national Portuguese strategy which confirms the Portuguese interest in CSP, as clearly expressed in the Portuguese NECP.
- It appears that the national decision makers and authorities are aware of the fact that this technology could benefit to the national economy and the current ambitions of the energy strategy.
- A specific case study performed for Portugal revealed that a massive reduction of curtailments is achievable at a moderate higher cost (10% more cost with the effect of a 60% reduction of curtailments) resulting from a more balanced participation of CSP in the Portuguese system.
- Furthermore, such a reduction of curtailments should not only be seen as an operational issue, but as a structural flaw of the RES capacity procurement mechanisms leading to market dysfunctionalities (regarding the awarded auction prices as well as effective, non-financial support to more variable RES in the system).
- Costs (as commonly expressed via LCOEs) are not the sole element for developing new technologies in the country; the costs of equipment and the impact of R&I results on such costs are also taken into account with a perceivable awareness during the national Event about the costs of dependencies (raw materials, technology know how, manufacturing capacities, etc.).
- A full cost integration (currently not applied in any country reviewed) would reveal a correlation between apparent costs (LCOEs) and the costs of feedstock dependence, technological leadership previously lost to non-European competitors, production infrastructure, as well as the costs of decommissioning nuclear plants, operational risk mitigation, and waste management (nuclear, batteries, etc.).
- DGEG as “armed wing” of the Secretariat of State for finetuning the national energy strategy was also actively involved in the discussions also in the national Event seeking for uses of CST aligned with the Portuguese targets.
- National decision makers and authorities maintain their commitment to install new CSP capacities as described in the NECP so that the prospect of seeing new CSP power plants in Portugal remains realistic.
- R&I know-how and extended capacities are available in the country (LNEG, Evora,..) and currently focussing their activities on uses of CST with the main objective of decarbonising the industry.
- R&I entities are working in a well-coordinated manner with DGEG and are therefore well positioned within the institutional framework guiding political decision-makers.

- Nevertheless, a supporting promotion of a wider deployment of CST via various national Events and general communication campaigns could be launched.
- The communication efforts (both for lobbying and improving the general public awareness about) have been so far minimal and worsened due to the lack of a dedicated CSP lobbying platform, well-coordinated outside or within the overarching general representation of the renewables industry (APREN).
- Such a platform should act towards the respective policymakers and the related regulatory environment to demonstrate the maturity of the industry in all its value chain segments to quickly offer solutions, also endeavour to identify market niches where CSP could appear as supporting other RES technologies.
- Having in mind that Iberian electricity market is coupled between Spain and Portugal, a better coordination or even active cooperation (including joint ventures of Spanish and Portuguese companies fed by common research activities in CSP technology) would be able to increase the benefits of CST for both countries.
- The key industrial actors present in Spain and Portugal are the same, but just focusing their activity on PV and wind.
- These industry actors do not primarily invoke a lack of funding for realising their projects but the need to increase the interconnection capacity to the rest of Europe and to achieve more consistent regulatory conditions across the border.
- The maturity of the CST industry would make the delivery of immediate solutions in the context of the 3 possible uses of the CST technology: electricity generation – with a focus on dispatchability achieved via thermal storage, heat applications and – possibly at a later time horizon- generation of green H2 and solar fuels.

5.5 Glossary

CSP	Concentrated Solar Power
CST	Concentrated Solar Technology
RES	Renewable Energy Sources
SET-Plan	Strategic Energy Technology Plan
STE	Solar Thermal Electricity
WP	Work Package

6 PROCEEDINGS OF NATIONAL EVENT IN FRANCE

6.1 Overview

The Joint Industry and R&I National Event in France was held online on 12 July 2022 via Webex. The use of the online participation method allowed wider participation, enabling the message to be extended, beyond mere national borders. The absence of contact points made the process of obtaining information more difficult, especially due to the lack of participation from an institutional point of view. The Event was organized by ESTELA and was structured into three panel discussions:

- Discussion round I – the industrial perspective.
- Discussion round II – R&I and concentrated solar technology.
- Discussion round III – TSO & policy perspective.

The Secretary General of ESTELA, Marcel Bial, welcomed the participants and presented the main conclusions of Task 2.4 with respect to the French Integrated Country Report, highlighting the situation and future perspective of the concentrated solar thermal sector in France. The presentation generated interest in the participants, who actively participated in the Event, through the live sharing of key findings via social platforms and through live comments and questions.


HORIZON STE

HORIZON-STE JOINT INDUSTRY AND R&I NATIONAL EVENT

CONCENTRATED SOLAR TECHNOLOGY OUTLINE IN FRANCE

Webex Online Event, 12 July 2022 from 9.30 till 13.00

PROGRAMME

09:30	Welcome & opening of work Marcel Bial, *ESTELA*
09:35	PRESENTATION OF THE PROJECT - key findings, conclusions & recommendations Marcel Bial, *ESTELA*
10:15	DISCUSSSION ROUND I – the industrial perspective **Round table with the French Industrial stakeholders**
11:00	DISCUSSSION ROUND II – R&I and concentrated solar technology **Round table with the French R&I stakeholders**
11:45	Break
12:00	DISCUSSSION ROUND III - TSO & policy perspective **Round table with the French TSO & policy-makers**
12.45	Conclusions

Figure 60: The programme of Joint Industry and R&I Event in France

6.2 Participants

The Joint Industry and R&I National Event in France was remotely attended by total of 27 participants. Figure 61 and Table 7 show the breakdown of the participants into two categories. Unfortunately, the lack of interest in CSP from French decision makers and authorities, industry and research centres meant that the Event was attended poorly with only fraction of the attendees representing French industry and research centres.

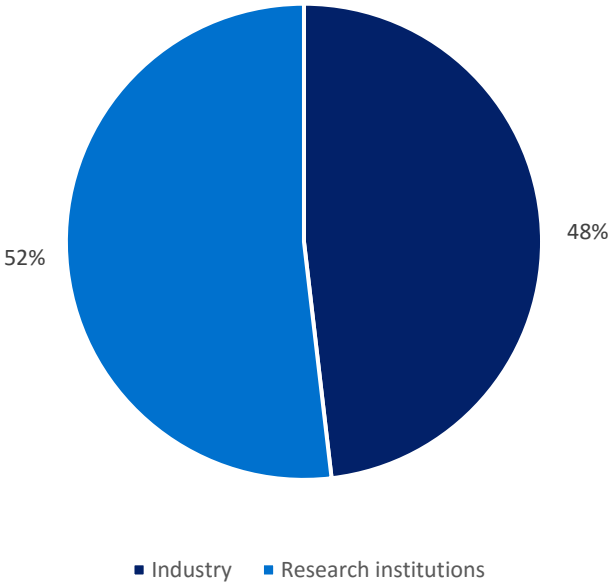


Figure 61: Breakdown of participants in France

Category	Number of participants	%
Industry	13	48%
Research institutions	14	52%

Table 7: Breakdown of participants in France

6.3 Photographs of the Event

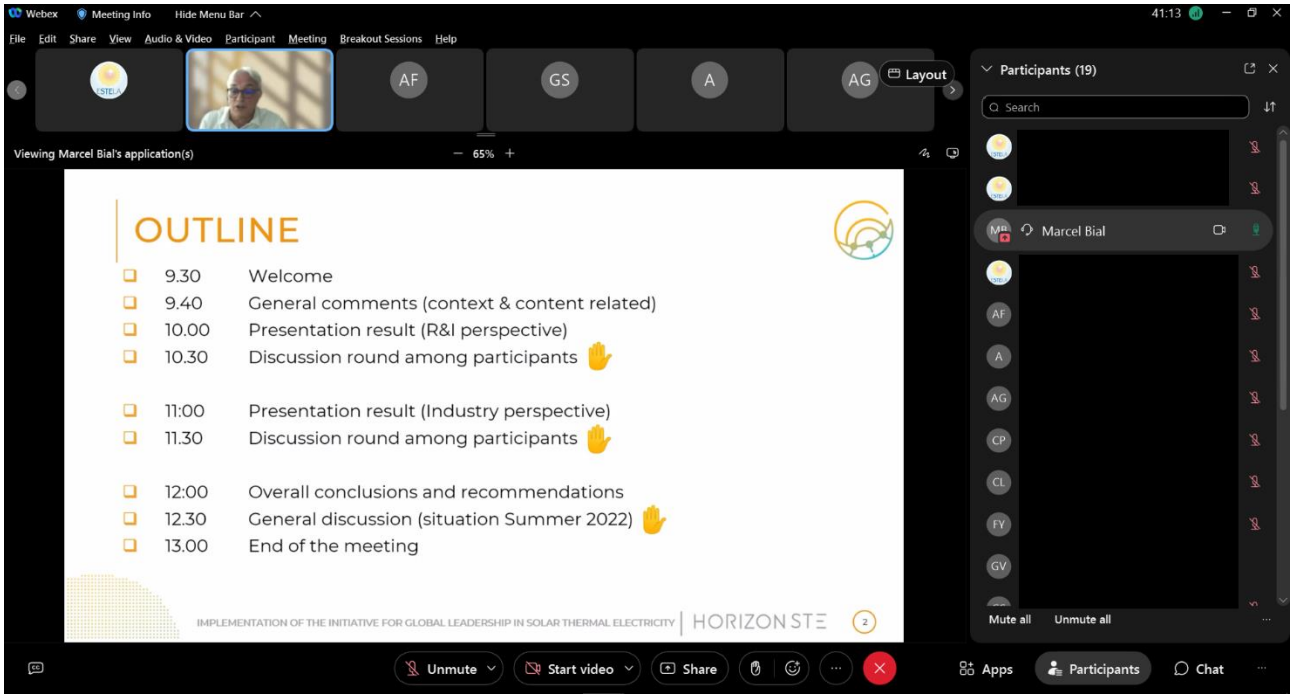


Figure 62: Welcome to the attendees

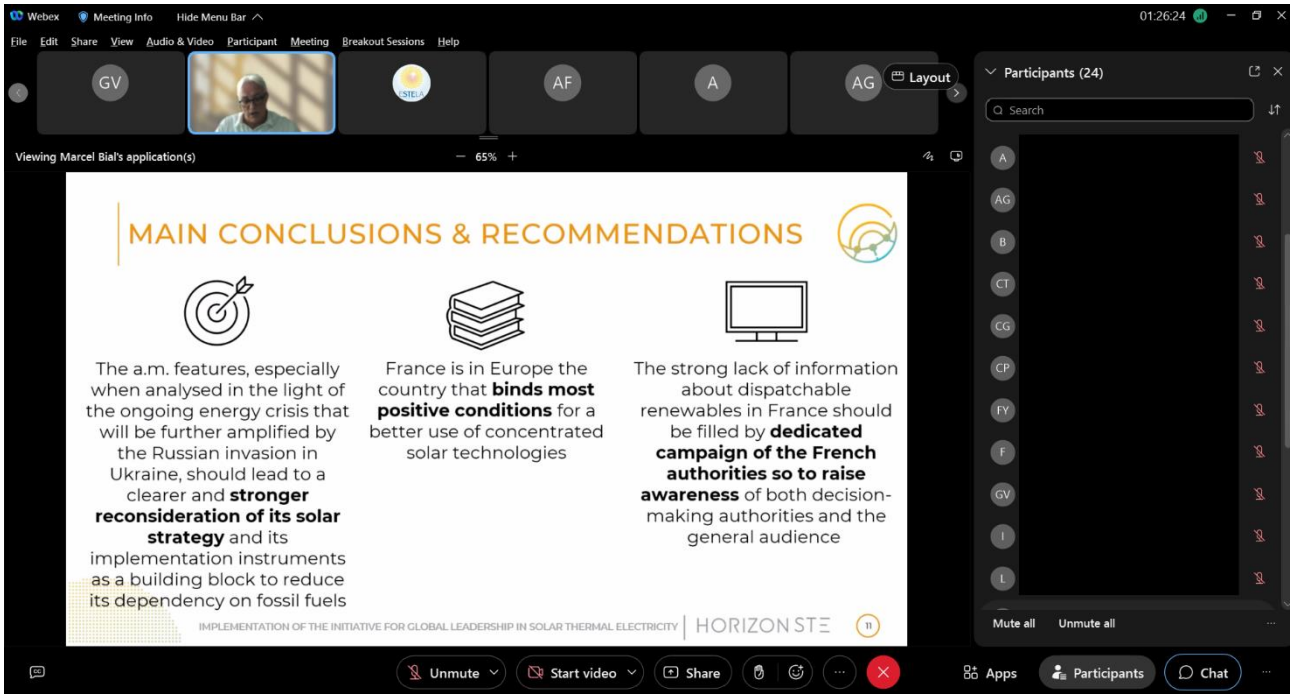


Figure 63: Presentation of project's main conclusions

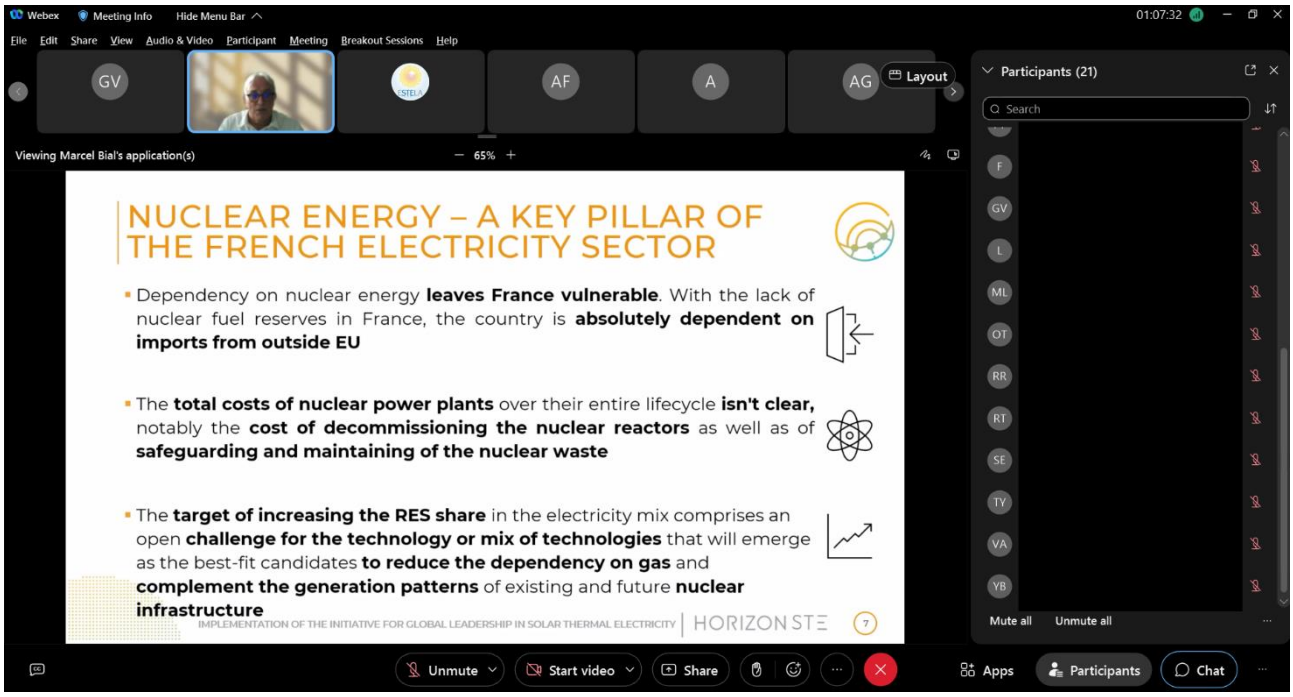


Figure 64: Round table - Industrial perspective

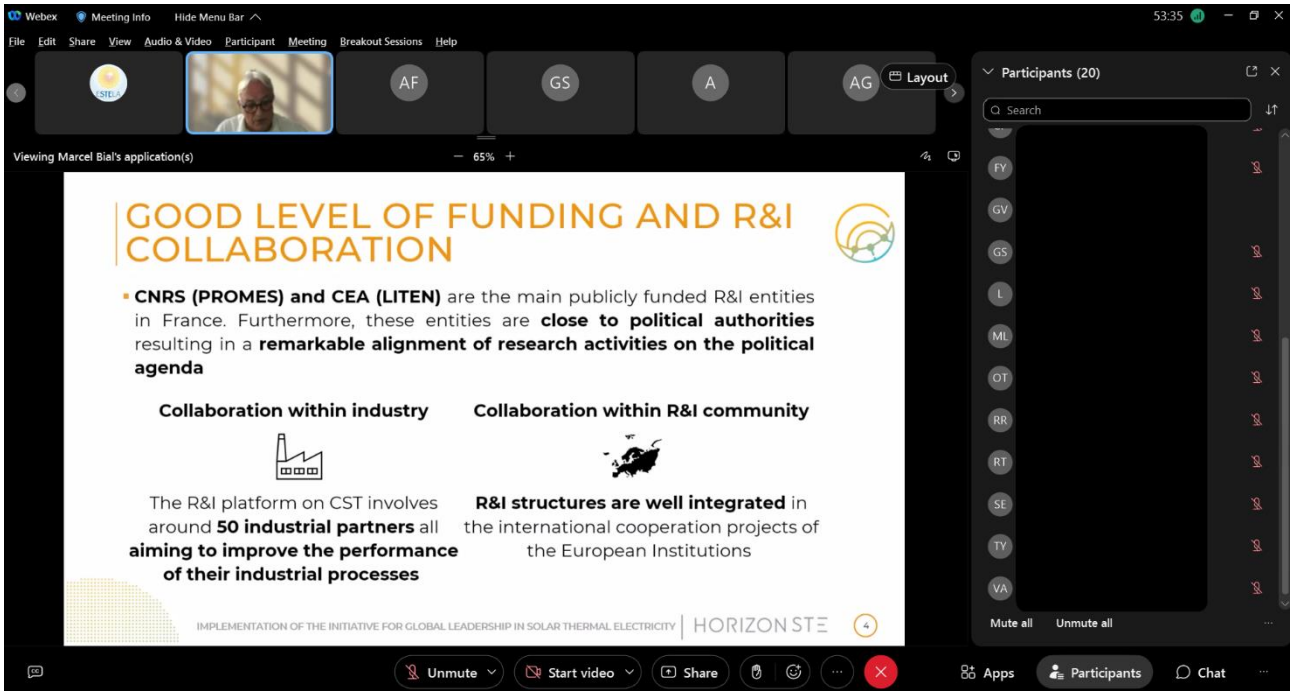


Figure 65: Round table - R&I and concentrated solar technology

6.4 Conclusions & highlights drawn from the Event

The main conclusions and topics discussed at the Event are summarized in sections below.

6.4.1 Difficulties encountered

- There was no response by French authorities to our requests for the conduct of our research which resulted in a lack of participation of French actors during the Event – though this Event was primarily dedicated to French industry and research stakeholders.
- As possible background for the above said the project identified via its own media screening (newspapers, TV, etc.) a total absence of information about dispatchable renewables in France.
- This calls for a dedicated campaign - at least driven by the potentially involved industry and/or industry platforms such a Syndicat des Energies Renouvelables (SER) - to close the gap and raise awareness of both decision-making authorities and the general audience about CST.

6.4.2 R&I strong potential and its use

- France looks back at a strong R&I infrastructure (with Centre National de la Recherche Scientifique (CNRS) and Commissariat à l'Énergie Atomique et Aux Énergies Alternatives (CEA) as most important publicly funded entities) with strong interactions with other European and non-European research institutions.
- France's energy research community is active across the entire CST R&I value chain, involved in all steps of technology developments, from basic and applied research to demonstration.

6.4.3 A French paradox

- Besides good natural resources, the country features several major companies with a strong industrial potential to promote CSP backed by top-performing R&I entities, remarkably well aligned on the political energy strategy.
- Although CSP is not included neither in the NECP nor in the underlaying considerations that led to the "Futurs Energétiques 2050 " released by Réseau de Transport d'Électricité (RTE) France, country's industry approach to CSP is exclusively oriented toward export business in non-EU countries (e.g., Morocco, South Africa, Emirates, and Saudi Arabia).
- Similarly, to the French R&I institutions that enjoy a stable funding level and successfully placed numerous R&I proposals to calls of the Horizon-Europe programme, French industry players are also successful in tendering processes launched in so-called active CSP markets. But this performance does not translate into a CST program for France.

- The impact of the a.m. strong interaction between R&I and industry in France is expected to increase the competitiveness of French industry projects in CST on export markets (namely a reduction of component costs and/or improving the performance of storage facilities).

6.5 Glossary

CEA	Commissariat à l'Énergie Atomique et Aux Énergies Alternatives
CNRS	Centre National de la Recherche Scientifique
CSP	Concentrated Solar Power
CST	Concentrated Solar Technology
RES	Renewable Energy Sources
RTE	Réseau de Transport d'Électricité
SER	Syndicat des Energies Renouvelables
SET-Plan	Strategic Energy Technology Plan
STE	Solar Thermal Electricity
WP	Work Package