

Grant Agreement No. 727348

Project Acronym:

SOCRATCES

Project title:

**Solar Calcium-looping integRAtion for Thermo-
Chemical Energy Storage.**

DELIVERABLE D9.9

Networking report

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1 INTRODUCTION

The 'Open Science' approach of the EC extends the open access to publication set in Horizon 2020 to a wider concept where project results shall be as open as possible and as closed as necessary. This approach highlights the importance of sharing knowledge as a crucial step to promote innovation and maximise the impact of the exploitation strategy.

EU projects shall be proactive in the communication and dissemination of project results, but this communication is more effective when there is a solid network that needs to be continuously engaged during the project. Thus, the creation of networks has been a priority for the consortium and started at the very beginning of the project.

The purpose of this document is to show the work done in SOCRATCES to create a network of contacts to disseminate its results and exchange ideas and lessons learnt with organisations and initiatives outside the consortium.

Collaboration with other projects and initiatives also help to join forces and maximise the impact of the dissemination. Such collaboration enables to reach a wider audience and be more effective in the communication of the project objectives and results.

Finally, it is important to engage a wide variety of actors and not only the potential users of our results. First of all, because it is important to provide visibility of EU investment in research and innovation, the civil society shall be aware of the results of EU funded R&I. This strengthens the role of R&I investment as a driver for innovation and contributes to its sustainability in time.

2 LINKS AND SYNERGIES WITH RELATED PROJECTS

2.1 H2020 CSP PROJECTS GROUP

SOCRATCES has joined the **H2020 CSP projects Group**. This group aims to communicate the ongoing activities and disseminate the results of the Concentrated Solar Power projects funded by the Innovation and Networks Executive Agency (INEA) under the H2020 funding programme.



Figure 1: Section at SOCRATCES website related H2020 CSP Projects group

The group has an active LinkedIn profile (<https://www.linkedin.com/groups/13519618/>) and different agreements agreement on collaboration to disseminate their results. To achieve this goal, a series of workshops were organised by the group with the support of the European Commission, where the coordinators of the group's projects were able to learn in-depth about the work that the rest of the members are doing, reviewed the state of the context of H2020 and Horizon Europe CSP and had the opportunity to hold networking discussions on potential synergies & opportunities.

Furthermore, the group organised joint participation within SolarPACES 2019, which took place on Korea.



Figure 2: H2020 CSP Project booth at SolarPACES 2019

Finally, the group developed a joint newsletter that launched with information, events and news about their members:

- [June 2018](#)
- [November 2018](#)
- [April 2019](#)
- [November 2019](#)
- [April 2020](#)
- [January 2021](#)

2.2 SUN GROUP

2.2.1 CREATION OF THE SUN GROUP (HORIZON RESULT SERVICE)

SOCRATCES consortium requested the service 1 - Portfolio Dissemination & Exploitation Strategy - Module A (PDES A) to identify and create the portfolio of R&I project results within the Horizon Results Booster August 2020, which was granted by the European Commission and was developed in February and March 2021.

This service identifies and forms groups of projects, or Project Group (PG), in order to create a Portfolio of Research & Innovation Results that can benefit from joint dissemination from the participating projects. A key element of this process is the identification of commonalities between projects in terms of results, areas of research and target stakeholders. This is the foundation for the establishment of a cohesive Project Group. The module also includes a mapping of stakeholders/target audiences for joint dissemination actions and an identification of the best dissemination channels. All the information was compiled in the Portfolio of Research & Innovation Results – D1.1 (ANNEX I).



Figure 3: Steps and methodology for PDES A

BIOAZUL, as representative of SOCRATCES and project leader of the service, identified projects that could join the Project Group called "SUN GROUP". These projects were selected based on common results, research areas and target stakeholders. With the support of the service team and following convergence points, the group was confirmed. Projects were contacted and invited to join the HRB platform.

Table 1: Proposed Project Group

PROJECT	GA No.	STATUS	COMMENT
SOCRATCES	727348	Joined group	Initial beneficiary
NEXTOWER	721045	Joined group	NA
POLYPHEM	764048	Joined group	NA
SFERA-III	823802	Joined group	NA
SHIP2FAIR	792276	Joined group	NA
MUSTEC	764626	Joined group	NA
ASTEP	884411	Did not reply	As no confirmation of interest was received, the project was not included in the group

The main challenges tackled by the SUN GROUP are summarised in the following table:

Table 2: Collective challenges

Type of Challenge	Complementary Challenge and Description
Societal	Secure, clean, and efficient energy.
	Climate action, environment, resource efficiency and raw materials.
	Food security, sustainable agriculture and forestry, marine and maritime and inland water research, and the bioeconomy.
Scientific and Technological	SOCRATCES: CaCO ₃ /CaO (CaL) process for energy storage lies at a low level of maturity (TRL 4). Despite important advances to properly in recent years, the solar calciner (particle receiver) and the high-temperature systems to store and convey the particles remain as major technological challenges to guarantee a proper system performance at large scale plants.
	NEXTOWER: The main barriers from the technological point of view are related to the development and testing of materials that must be used in very high-temperature applications (above 700 degrees). Being able to reach higher temperatures in the receiver and keep them high at a storage level, the overall efficiency of a CSP tower plant will be higher. For example, molten lead as a fluid for thermal storage has good characteristics, good stability, and high boiling point, but lower thermal conductivity, more corrosive, and more expensive than sodium. On the receiver side, the main challenges for coatings are high costs, scalability of synthesis, and durability at high temperatures in oxidising environments. Lower performances compared to the ones in a testing environment and high costs can be unattractive for the investors.
	POLYPHEM: The project will build a 60-kW prototype plant with a 2 MWh thermal storage unit and will validate this innovative power cycle in a relevant environment (TRL 5), assess its technical, economic, and environmental performances and establish the guidelines for its commercial deployment. The baseline technology consists of an air Brayton cycle as the top cycle and an Organic Rankine Cycle (ORC) as the bottom cycle. The project broadens this technology by driving the top cycle with solar energy by developing an advanced technology of pressurised air solar receiver and including an innovative thermal energy storage unit between both cycles.
	SFERA-III: The project addresses Concentrating Solar Thermal (CST) by integrating key European research infrastructures aiming at offering to the R&D community a new level of high-quality services. The spectrums of research themes are: Thermal Energy Storage for CST plants; Desalination and solar water treatments; Solar fuels production; Materials for solar receivers and CST components; Linear and point CST technologies; The design of an e-infrastructure aiming to provide virtual access to Ris and support the creation of new services.
	SHIP2FAIR: The project main technological pillars are competitive solar thermal technologies, optimal heat integration and tailored control strategies. The solar technologies selected have already been successfully tested, achieving promising profitability in smaller projects, thus project constitutes a unique opportunity to demonstrate them at the industrial level in the EU agri-food sector. The heat integration is designed to maximise the heat transfer efficiency from the solar collectors to the processes. An innovative DSS based on a model predictive control is developed to optimise the management of solar production. A tool to perform pre-feasibility studies is being developed to ease the further replication of the project.

Type of Challenge	Complementary Challenge and Description
Industrial	<p>SOCRATCES: Most of today's renewable energy plants at large scale lack storage systems, forcing the electric grid operators to remain dependent on fossil fuels. Pumped hydro storage (PHS) is the most developed energy storage system. However, it requires specific locations for implantation. Electrochemical systems, like batteries, present a high cost. Thermal energy storage based on molten salts is, for now, the most cost-competitive solution on the market. So, it is fundamental to look for other alternatives to provide large-scale storage.</p>
	<p>NEXTOWER: The main barriers from the technological point of view are related to the development and testing of materials that must be used in very high-temperature applications (above 700 degrees). Being able to reach higher temperatures in the receiver and keep them high at a storage level, the overall efficiency of a CSP tower plant will be higher. For example, molten lead as fluid for thermal storage has good characteristics, good stability, and high boiling point, but lower thermal conductivity, more corrosive, and more expensive than sodium. On the receiver side, the main challenges for coatings are high costs, scalability of synthesis, and durability at high temperatures in oxidising environments. Lower performances compared to the ones in a testing environment and high costs can be unattractive for the investors.</p>
	<p>POLYPHEM: The power block considered in the project is a combined cycle intended to be used for decentralised small-scale power generation in the range of 40 kW to 2000 kW in remote areas. The purpose is to meet the variable demand of energy of a mini-grid. The main challenge is to get economically viable electricity generation for small scale CSP in remote areas.</p>
	<p>SFERA-III: Considering the nature of these research infrastructures, the use by a multi-disciplinary community should be ensured, especially from the private sector. These infrastructures can host and support not only CTS technology researches but also other high-temperature researches such as nanomaterial synthesis (new coatings for the automotive market, electronic components such as LEDs and capacitors, improved biocompatibility of medical implants, energy storage for batteries or hydrogen ...) and high-temperature material characterisation for aeronautic, aerospace, nuclear or automotive sectors (thermal barriers, structural components ...). The overall challenge is to liaise with multiple industrial sectors to foster the use of research infrastructure.</p>
	<p>SHIP2FAIR: Solar thermal can provide a large amount of industrial heat demand; however, the current deployment levels remain low. The challenges tapping its potential are related to SHIP economic competitiveness, relatively low prices of fossil fuels charged to the industry due, in some cases, to governmental subsidies, and the complexity of the integration in existing industrial processes. The agri-food industry involves thermal energy-consuming processes, therefore, dependent on the increasing and volatile prices of fossil fuels and, in parallel, it is characterised by an average low degree of innovation. Over 60% demand of this sector can rely on solar technologies.</p>
	<p>MUSTEC: It is a policy-oriented project and is not directly engaged in the challenges faced by the CSP industry in terms of technology. It will support the implementation of CSP projects through the collaboration of EU member states and the use of the collaboration mechanisms. It also promotes the need for recognising the role of dispatchability and flexibility through specific auction design. These policy tools are expected to create the framework conditions for the CSP industry to develop within the EU.</p>

A synthesis view of the main results from the projects in the SUN GROUP is provided in the table below as the basis for the service definition and stakeholder mapping.

Table 3: Dissemination portfolio results grid

Id	Result	Result type ¹	Project(s)	TRL
R1	Energy storage system	Infrastructure	SOCRATCES	5-Large scale prototype. Tested in the intended environment.
R2	Calciner reactor	Prototype	SOCRATCES	5-Large scale prototype. Tested in the intended environment.
R3	Carbonator reactor	Prototype	SOCRATCES	5-Large scale prototype. Tested in the intended environment.
R4	Ceramic Receiver CUPS	Prototype	NEXTOWER	6-Prototype system. Tested in an intended environment close to expected performance.
R5	FeCrAl composite tube	Demonstrator	NEXTOWER	7-Demo system. Operating in an operational environment at a pre-commercial scale.
R6	FeCrAl overlay welding feedstock	Demonstrator	NEXTOWER	7-Demo system. Operating in an operational environment at a pre-commercial scale.
R7	Standardised procedure for ceramic characterisation	Application	NEXTOWER	9-Full commercial application. Technology on 'general availability' for all consumers.
R8	Procedures for absorber/receiver testing	Demonstrator	NEXTOWER	7-Demo system. Operating in an operational environment at pre-commercial scale.
R9	Large scale prototype commissioning	Prototype	POLYPHEM	5-Large scale prototype. Tested in the intended environment.
R10	Research infrastructure improved services	Infrastructure	SFERA-III	9-Full commercial application. Technology on 'general availability' for all consumers.
R11	Four demo-sites with implementation of SHIP	Infrastructure	SHIP2FAIR	7-Demo system. Operating in an operational environment at a pre-commercial scale.
R12	Replication Tool	Demonstrator	SHIP2FAIR	7-Demo system. Operating in an operational environment at a pre-commercial scale.
R13	Control Tool	Demonstrator	SHIP2FAIR	7-Demo system. Operating in an operational environment at a pre-commercial scale.
R14	Guide on lesson learned and best practices	Framework document	SHIP2FAIR	9-Full commercial application. Technology on 'general availability' for all consumers.
R15	Roadmap for collaborative CSP development in Europe	Policy document	MUSTEC	3-Applied research. First laboratory tests completed; proof of concept.
R16	Action plan and policy recommendations	Policy document	MUSTEC	3-Applied research. First laboratory tests completed; proof of concept.

¹ Results types are: Blueprint; Commercial solution; Data set / data pool; Demonstrator; Feasibility study; Framework (e.g. software environment, policy document, legal framework); Hardware (e.g. chip, appliance, drone, sensor, system); Infrastructure (e.g. IT infrastructure, transport infrastructure, energy infrastructure, water infrastructure, building etc.); Methodology; Model (e.g. risk model, mathematical model, data model, physical model, business model etc.); Patent (e.g. utility, design patents and plant patents); Policy report; Prototype; Proxy/broker service; Research and/or virtual environment; Scientific publication (Refereed); Scientific publication (Non-refereed); Software (e.g. routine, integrated platform, library, plugins); Standard (e.g. norms, policies); Taxonomy / Ontology; Tool / Toolkit / toolbox; Training (e.g. learning tools, services, modules); White paper or similar publication; Other.

Stakeholder / target audience mapping

The service also included a full mapping of stakeholders/target audience referred to the identified Portfolio of R&I results, including specifications on how SUN GROUP should address them through the most effective dissemination channels and dissemination networks to leverage on.

Stakeholders are parties that will be affected by operations, objectives and results of SUN GROUP. Stakeholders that are relevant for each project in the group were categorised and mapped according to several different perspectives, including their geographical broadness, domains, type of activity, interest in the portfolio of results, and level of influence.

Each stakeholder group's influence and interest were considered to define their strengths in terms of supporting the uptake of the group's result. This helped SUN GROUP understand where to invest the effort to maximise dissemination activities.

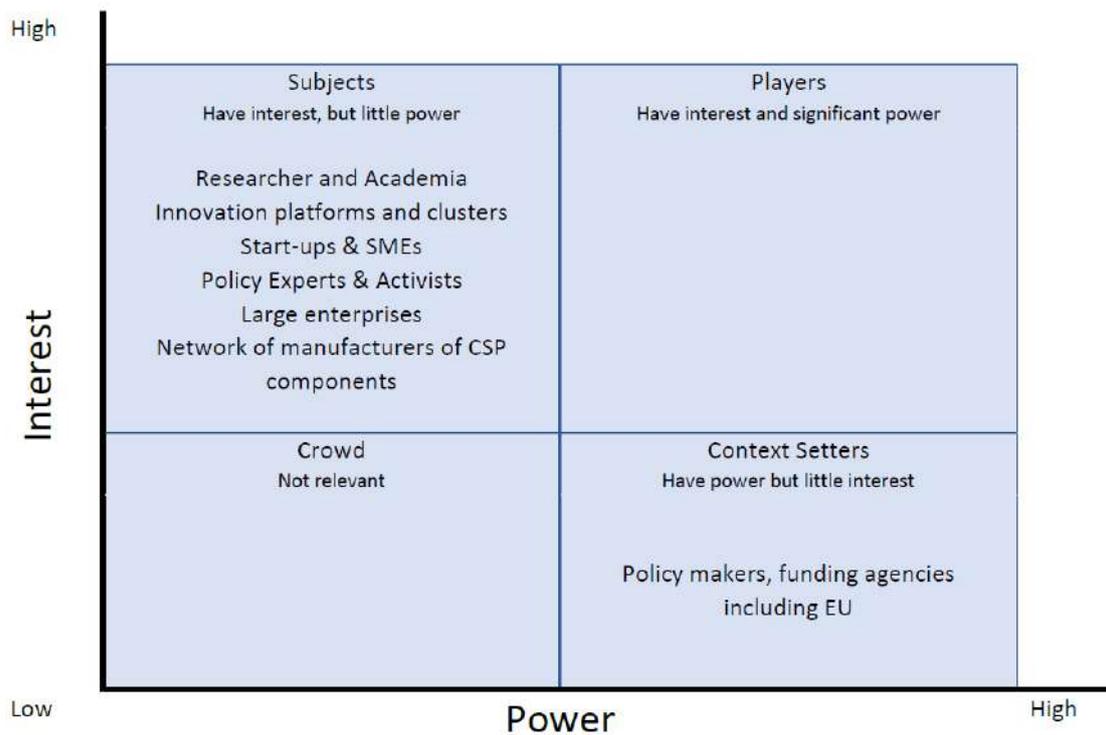


Figure 4: Influence vs interest grid

- **Subjects:** the stakeholders falling into this quadrant hold high interest but low power. Within this Project Group, these stakeholders are represented by Research & Academia, Innovation Platforms and clusters, Start-ups & SMEs, Large enterprises, Policy Experts & Activists, Manufacturers of CSP components, who are highly interested in the Project Group results but bear little influence on unleashing the uptake of SUN GROUP's results.
- **Context setters:** Policymakers and funding agencies (EU, national) positioned as stakeholders setting the context, meaning they bear high power to spur impact, and they represent the key stakeholder setting the framework and its conditions within whom the research and innovation activities of the Project Group are positioned.

Furthermore, the service team mapped the stakeholder groups according to geographical dimension and current levels of engagement between the projects in the group.

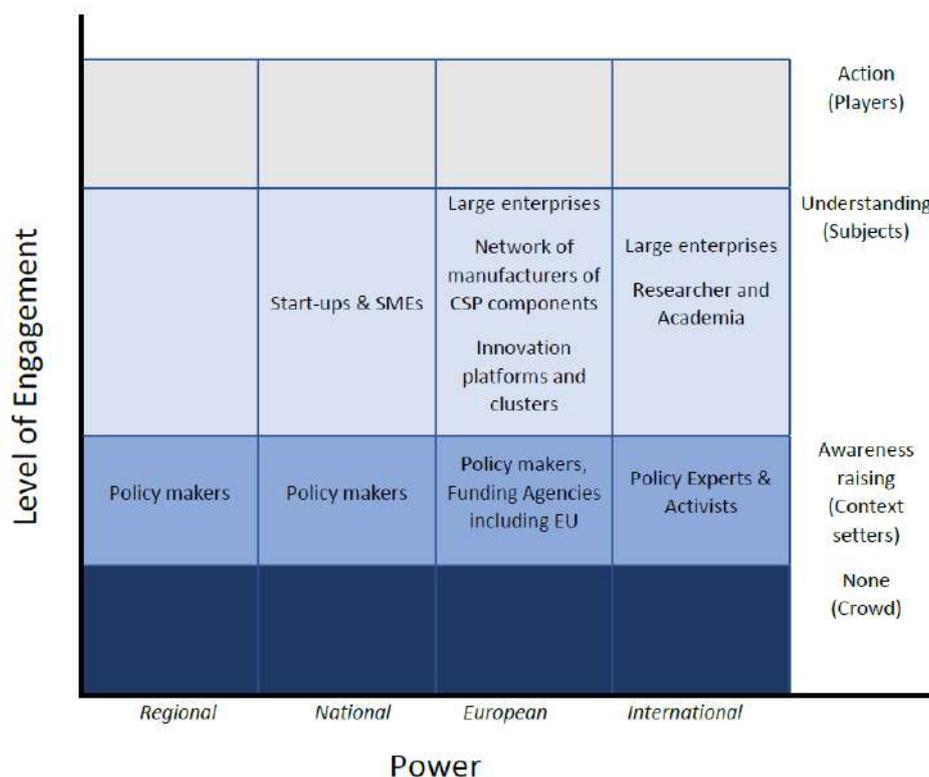


Figure 5: Geographical dimension vs level of engagement grid

Based on the desired level of engagement and the dissemination network, the diagram below maps the stakeholders with the most appropriate dissemination channel to use to create the greatest impact.

	Researcher & Academia	Large enterprises	Policymakers, funding agencies	Policy Experts & Activists	Start-ups & SMEs	Innovation platforms & clusters	Network of manufacturers of CSP components
Demos and Videos	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Website and Blogs	Yes	Yes	Yes	Yes	Yes		
Newsletters	Yes		Yes	Yes		Yes	Yes
Twitter	Yes		Yes	Yes			Yes
LinkedIn	Yes	Yes	Yes	Yes			
Press Releases and Kits			Yes	Yes		Yes	Yes
Collaterals: Flyers, Banners, Posters	Yes		Yes	Yes			Yes
Events and Workshops	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Presentations	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Infographics	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Datasets and insights	Yes		Yes	Yes	Yes		Yes
Policy Briefs			Yes	Yes		Yes	Yes

2.2.2 SUN GROUP JOINT WEBINAR

After working together to prepare the portfolio, the component projects of the SUN GROUP have maintained a fluid relationship of collaboration in the analysis of the results of the projects and in the dissemination efforts of the group members. It must be highlighted the organisation of the **CSP PROJECTS JOINT WEBINAR** led by SOCRATCES together with MUSTEC, NEXTOWER and SFERA-III projects with the aim of highlighting Concentrated Solar Power Plants, their potential and the future within the new Horizon Europe framework.

More than **100 participants registered** for the event. The webinar started with an **introductory session** where the participating projects were introduced: MUSTEC "Market uptake of solar thermal electricity through cooperation", NEXTOWER "Advanced material solutions for next-generation high efficiency concentrated solar power tower systems", SFERA-III project on Solar Facilities for the European Research and SOCRATCES "Solar Calcium-looping integration for Thermo-Chemical Energy Storage".

There was also a **special session dedicated to CSP ERANET**, a Public-public partnership in the Concentrated Solar Power technology, for bridging the gap between research and commercial deployment in the Concentrated Solar Power (CSP) technology. It was described in detail as CSP ERANET members have committed more than 9 million EUR for launching the Cofund 1st Joint Call for proposals and more than 6 million EUR for the Additional Call, coming September 2021.

The last session of the webinar was a **round table** on the potential of Concentrated Solar Power Plants. This discussion was moderated by Luis M. Romeo, Professor of the Mechanical Engineering Department at the University of Zaragoza, and as speakers we had Alexandra Papadopoulou, Senior Researcher at TEESLab, University of Piraeus Research Center; Antonio Rinaldi, Senior researcher at the ENEA Sustainability Department of Productive and Territorial Systems; Eduardo Zarza, Head of the Line-Focus Solar Thermal Technologies Unit at the Plataforma Solar the Almería and Ricardo Chacartegui, Professor of the Energy Engineering Department of the University of Seville.

They discussed important questions as:

- What are the niche opportunities for CSP in the electricity systems of the future?
- Which is the biggest barrier to the development of CSP (political, financial, regulation, etc.)?
- How do you see the future development of this technology in the EU context? How can we increase the actual funding resources available for CSP technologies and research?
- In which CSP plant component is most required a performance improvement (e.g. absorbers, mirrors, storage, etc.)?

It was a very interesting round table where we listened to the current situation of our projects and the researchers working in this sector, and the concerns that exist in the future of CSPs.



Figure 6: CSP PROJECTS JOINT WEBINAR Round table

2.3 CSP ERANET

As a consequence of the organisation of CSP PROJECTS JOINT WEBINAR, the SOCRATCES consortium established a fruitful collaboration with CSP ERANET, a public-public partnership in the Concentrated Solar Power technology, for bridging the gap between research and commercial deployment in the Concentrated Solar Power (CSP) technology. It aims to coordinate the efforts of Member States, Associated Countries and Regions towards achieving CSP SET-Plan objectives by pooling their financial resources to implement joint calls for R&I proposals, resulting in strategic projects with substantial volumes of investment, which cannot be allocated by individual countries or by the European Commission on their own

Furthermore, to maintain a fluid correspondence and study possible submission of proposals in the next calls that the program launched in 2021. SOCRATCES and CSP ERANET jointly organised the **CSP TECHNOLOGY DAY**, a webinar that will take place as part of the [EU Sustainable Energy Week EUSEW 2021 Sustainable Energy Days](#).

This event aimed to present the achievements and further challenges of CSP and present upcoming funding opportunities on the sector to keep feeding the development of this promising sustainable technology.

The webinar began with the presentation of Piero De Bonis (DG RTD, Clean Energy Transition) who explained the **European policy objectives of the CSP technology**. After this intervention, Marcel Bial (Secretary General of ESTELA) introduced the **current European perspective of Concentrated Solar Plants**. He also highlighted that future solar plants should be hybrid concepts with large low-cost storage.

The following session was destined to a **round table** focused on a general overview of the CSP technology and H2020 SOCRATCES project, followed by three main expert blocks: challenges to increase performance and reduce costs in CSP and solar technologies, new materials challenges and energy storage challenges. Moderated by Ricardo Chacartegui (H2020 SOCRATCES project coordinator), the round table started with Eduardo Zarza (Head of CSP Research Unit at PSA, CIEMAT), who talked about the challenges to increase performance and reduce costs in line-focus solar technologies. Then was the turn of Manuel Silva from the University of Seville, who explained what the parabolic dishes and the challenges of CSP are related to energy storage. From CERTH, George Karagiannakis highlighted the importance of energy storage for RES penetration. After was the turn of Michael Geyer from the German Aerospace Centre DLR, who presented the CSP storage for repurposing coal plants for a fair energy transition, this round table ended with Luis Pérez-Maqueda from CSIC and his presentation about the thermochemical energy storage (TCES).

Funding opportunities of the CSP Technology was the third session of this webinar, where Cristina Garrido from CDTI made an introduction to Horizon Europe CSP related topics. She also highlighted some future related events as the Spanish Infoday Cluster 5, the Commission Infoday Cluster 5 and the Brokerage event Cluster 5.

The event ended with Rachel Tully, who presented the **CSP ERANET Additional Call** Promotion. CSP ERANET aims to coordinate the efforts of the Member States, Associated Countries and Regions towards achieving CSP SET-Plan objectives by pooling their financial resources to implement joint calls for R&I proposals, resulting in strategic projects with substantial volumes of investment, which cannot be allocated by individual countries or by the European Commission on their own.



Figure 7: Screenshots of the CSP TECHNOLOGY DAY

2.4 STORIES

In the framework of identifying opportunities for further use and exploitation of the carbonator reactor after the end of the SOCRATCES project, CERTH responded positively to an invitation to participate as a subcontractor in a proposal submitted in September 2020 to the Green Deal Call and, more specifically in response to the "LC-GD-9-1-2020: European Research Infrastructures capacities and services to address European Green Deal challenges" Call Topic. The proposal is entitled "[Storage Research Infrastructure Eco-System](#)" (**STORIES**), and **its main aim is to set up and initiate the coordinated operation of a large European-wide Infrastructure on a broad range of (renewable) energy storage technologies spanning from batteries to thermal and thermochemical heat storage**. CERTH's installation (i.e. carbonator) covers aspects related to thermochemical energy storage (TCS) with the aid of particle reactors and emphasis on the CaO/CaCO₃ TCS concept. If funded, this proposal provides CERTH with an opportunity to offer R&D services in the relevant field to interested industrial and Academic organisations worldwide and contribute to the promotion of TCS, which is currently considered an emerging and promising concept. It is expected that via **STORIES**, CERTH will have the opportunity to set up new collaborations while at the same time always considering the continuation of successful cooperation with interested SOCRATCES partners whenever possible.

STORIES is coordinated by the Karlsruhe Institute of Technology (KIT). An informative video regarding the **STORIES** undertaking can be found here: <https://lnkd.in/eKGnj4g>

For CERTH, to promote collaboration given the opportunity presented by the participation in **STORIES**, it is a priority to set up a bilateral collaboration with USE should the proposal be **approved**. This means that the carbonator, possibly in combination with the rest of the integrated SOCRATCES system, can be operated at USE's premises. In such a case, CERTH, via budget to be received by **STORIES** if relevant requests for services are submitted, will cover the operating costs to the maximum extent possible. In order to avoid potential complications and delays during the proposal preparation phase, the location of operation stated in the submitted documents were CERTH's premises. A justified modification will be pursued as soon as possible should the proposal is approved for funding.

2.5 LEILAC 1 and 2

[LEILAC 1 and LEILAC 2](#) projects: Flash calcination in Calix Technology calciners; identification of applicability to other industries, e.g. cement, lime, phosphate.

LEILAC: SOCRATCES and the LEILAC projects share a calcination technology, albeit with different energy sources. SOCRATCES WP3 benefitted from the calcination kinetics development that was performed in LEILAC 1 WP2, which was transferred via Calix in 2018 & 2019. WP6 benefitted from equipment and process development in LEILAC 1, both in terms of the electric support of the calciner but also the ancillary equipment. Again, this was transferred via Calix employees.

Breakthroughs in LEILAC 1 and LEILAC 2 regarding optimal particle size distributions of limestone feed were communicated to the consortium and used during the implementation stage (WP7).

2.6 MSLOOP

SOCRATCES established synergies with the [MSLOOP](#) project, which aims to improve the storage capacity of existing parabolic trough solar plants, and it will be configured to make the integration of a hybrid plant concept possible while providing firm and dispatchable electricity and using 100% renewable energy sources.

MSLOOP has been focused on the market-drivers' interests from the beginning of the Project in order to launch the solution in open tenders in less than six months after the start of the Project, boosting significant contributions to industry, environment and society. This is one of the links that the project considered very interesting for the future development of SOCRATCES technology, as it can involve a deeper penetration of CSP plants in the generation mix and, thus, an increase of the renewable share.

In this context, Carlos Ortiz as a representative of the consortium, participated in an informative event that was held at the Complutense University of Madrid (Spain) on 9th of July 2019.



Figure 8: Images of MSLOOP workshop and the round table.

2.7 GRIDSOL & WISEGRID

[GRIDSOL](#) Project and [WiseGrid](#) Project co-organised a joint workshop entitled "RES Integration and Customer engagement". The event engaged a wide spectrum of stakeholders like generators, prosumers, grid operators, policymakers, investors, project developers, manufacturers, aggregators, research centres and universities. And it was the opportunity to establish contacts with these projects to work together in the identification of these stakeholders and possible joint opportunities.

In addition, the event organised a panel to present other H2020 projects as CROSSBOW, FLEXITRANSTORE, INTEGRIDY and SOCRATCES. Over 60 participants were given the opportunity to engage in a series of practice-driven discussions about the current EU-funded projects working on smart grids, renewable energy & energy storage from material research to market development, with a strong focus on discussing barriers shortcuts to renewable energy integration in Europe.



Figure 9: Spyros Voutetakis (CERTH) at the workshop panel

2.8 ULYSSEUS EUROPEAN UNIVERSITY

During SOCRATCES lifetime, was created the European University ULYSSEUS, <https://ulysseus.eu/>, coordinated by the University of Seville. It is formed by six universities.

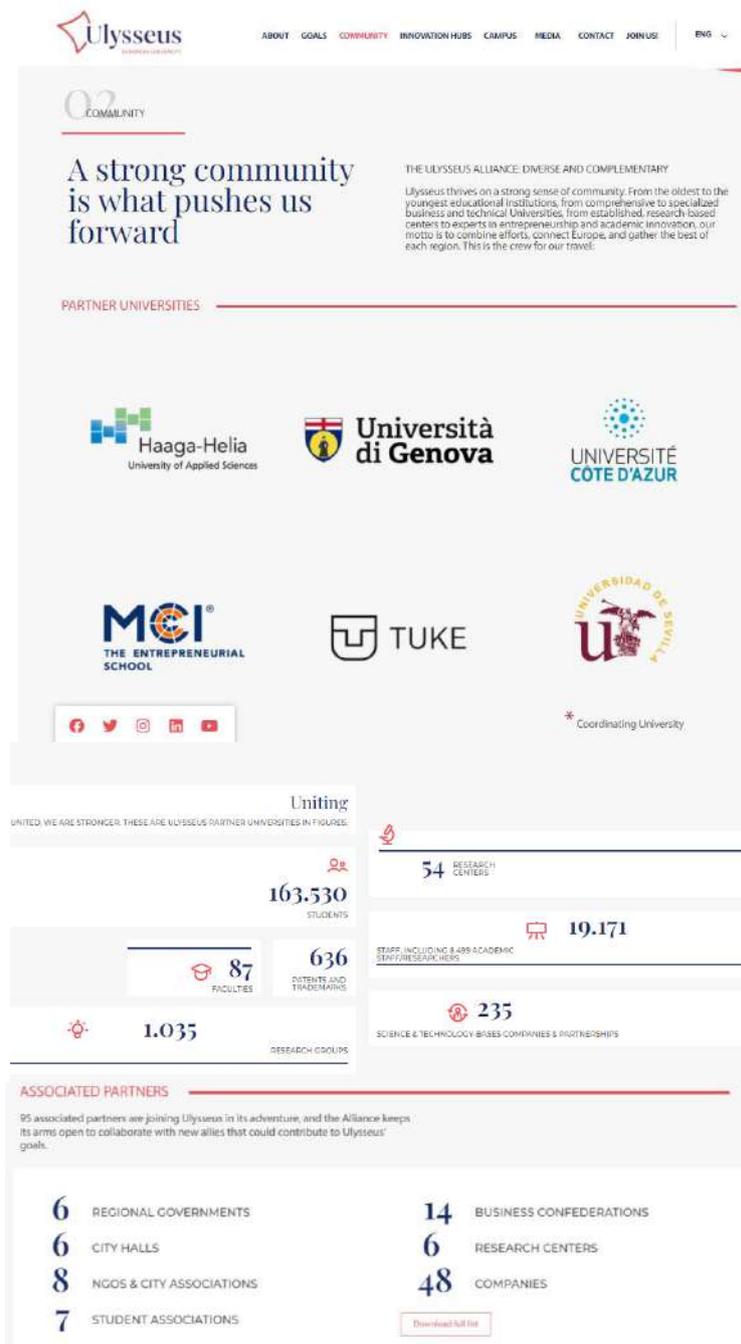


Figure 10: Screenshots of Community section from Ulysseus website

SOCRATCES project was selected as a representative project for the Ulysses innovation hub cluster, led by the University of Seville. In the open Event (11/05/2021), Ricardo Chacartegui, coordinator of SOCRATCES, presented different research activities in the field of energy with special attention to SOCRATCES activities and their evolution. There were more than **1000 participants** from all over Europe in the open event that was recorded for further visualisations.

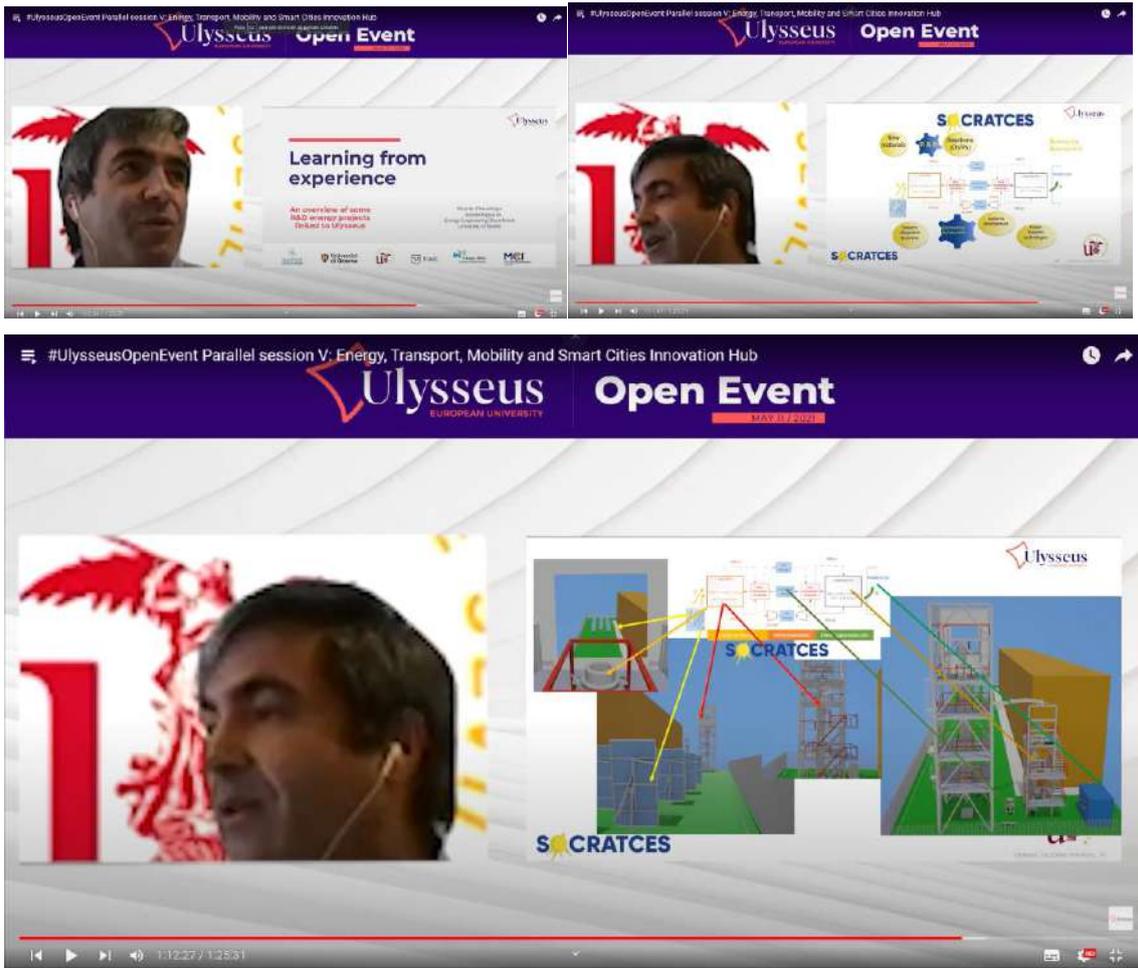


Figure 11: Screenshots of the Ulysseus Open Event

It provides a great framework for outreach stakeholders and for developing networking activities at different levels: students, multidisciplinary R&D groups, companies and policymakers.

3 COLLABORATION AND SYNERGIES WITH STAKEHOLDERS

SOCRATCES partners have tried to establish connections with different groups, associations, companies and entities for future collaborations both at a scientific level and possible exploitation of the project results. Some of them are listed below:

- **"Speed-Networking für Wissenschaftler/innen aus Bremerhaven"** meetings in which professionals in the field of science and technology in the city of Bremerhaven met and exchanged their contacts and information on expertise.
- Collaboration with the **SAMCA Chair of Technological Development** and the **Aragón Engineering Research Institute (I3A)** to organise a new Technological and Business Forum dedicated to Climate Change and Business Opportunities: Industrial Decarbonization and Technologies for Capturing, Storage and Uses of CO₂. The meeting had the support of CEOE Aragón (businessman group) and Cámara Zaragoza.
- The SOCRATCES Project has been discussed during one-to-one speech with **Adriano Sciacovelli**, a Researcher and Lecturer at the **University of Birmingham**, working on the design of new materials and devices to store hot and cold thermal energy for the efficient use of renewable energy.
- The project has also been presented to the Italian company **Genoastirling S.r.l.**, during a Physical Meeting that is a developer of Stirling engine with a long research experience in the field, working in cooperation with the University of Genoa and other Universities.
- Taking advantage of the fact that BIOAZUL is a member of the **WATER EUROPE platform**, the SOCRATCES project was part of the conference Water Innovation Europe 2019 edition "*Water meets Energy, Energy meets Water*", edition aimed to explore the interdependencies between water and energy services and offer synergy opportunities between the attendees. Antonia Lorenzo from Bioazul attended the event as the Water and Agrifood Working Group leader within the Cluster Water Smart Rural of the Water Europe. She participated in the activities related to Renewable energy group and has the opportunity to introduce the work carried out within the SOCRATCES project and how it can be linked to other projects or policies that promote the Concentrated Solar Plants.
- Ricardo Chacartegui (USE) has presented the SOCRATCES concept in one to one online meetings to **COSENTINO and ACCIONA**, some of the largest companies of Spain, and large energy companies such as Brightsource, Shell, other companies related to energy as ESASUR, and those companies belonging to the Advisory board.

4 ACTIVITIES WITH YOUTH AND STUDENTS

The SOCRATCES consortium has paid special attention to educational activities, taking advantage of the presence of universities and educational centres in the consortium, training and dissemination activities have been developed to show the potential of solar energy as a key tool in the fight against change climate and as a basis for future energy sustainability. In addition, the consortium took advantage of these activities to discuss with students about gender issues and the role of women in science.

Through the University of Seville and CSIC, SOCRATCES has been in close collaboration with the [ClimACT project](#) who has worked in the transition to a Low Carbon Economy in schools. Besides, ClimACT was the winner of the [European Sustainable Energy Awards 2019](#) in the youth category, and finalist of several European competitions. Within this collaboration, SOCRATCES has participated in 9 activities in schools and high schools from Andalusia, Spain, and three of Madrid, during three years, where there were multiple activities on sustainability and solar energy (solar oven, development of toy cars for competitions...) and training activities with students.

During 2020 and 2021 edition, SOCRATCES has been one of the innovative projects that collaborates with "[Youth with Researchers SCIENCEIES Sevilla](#)", with USE and CSIC participants. This programme involves secondary schools in the province of Seville, more than 20 researchers, 18 secondary school teachers, and almost 90 secondary school students. The main objective is to show high school students what research is and how it is carried out, highlighting its importance of it in today's world. Students have the opportunity to participate in projects led by renowned scientists, learn first-hand what the scientific method is, what research is, and seek their vocation and talent from an early age.

Students from the local university (Hochschule Bremerhaven) were invited and 11 students from different departments joined to learn about the SOCRATCES project on February 11th. After the head of process engineering department Mr. Faraz Rasheed Mir welcome the students and introduced the speaker, Mr. Muhammad Eusha commenced his talk with a brief overview of the project and what it is trying to accomplish. Different modules of the project, i.e. calciner, carbonator and power block were briefly discussed with the last receiving the most emphasis since that is the module TTZ is involved in. Stirling engines, their operation relevance and potential were presented as well. Afterwards the students were offered refreshment, following which a visit to the laboratory followed to conclude the presentation.

Furthermore, SOCRATCES activities has been presented to the student of Industrial Engineering during the course "**Energetica e Ecologia**"; the students reached from the activity are about 100 coming from Italy, France and Spain.

5 OTHER DISSEMINATION & COMMUNICATION ACTIVITIES

With the objective of a continuous follow-up of the communication and dissemination strategy, a monitoring document was created for these activities, which was reviewed periodically. For periodic monitoring of the execution of the communication and dissemination activities foreseen in the project and for a deeper analysis of the involvement and engagement of partners, a monitoring document was made available, in which each partner had to fill in the activities they were carrying out. This document was divided into three distinct sheets, each sheet had a different purpose for filling in, as the name suggests:

1. Diss. & Comm. Activities
2. Scientific publications
3. Media Activity

Below you can see the information regarding dissemination and communication activities that includes conferences and events. All of them have given the consortium the opportunity to disseminate the project's work but also to establish links and find synergies with relevant contacts for possible new collaborations and research. Here is a summary of these conferences and the oral presentations that the partners made.

Table 4 – List of Dissemination & communication activities carried out by SOCRATCES consortium.

Dissemination & communication activities					Estimated number of persons reached	
Name of the activity / URL	Date	Location	Role	Partner	Target group	Outreach
16ª FERIA DE LA CIENCIA	3-5/05/2018	Seville (Spain)	Stand	USE	Civil Society & Scientific Community	7000
ISCRE 25 2018—The 25th International Symposium on Chemical Reaction Engineering	20-23/05/2018	Florence (Italy)	Poster presentation	AUTH	Scientific Community & Industry	500
CIES 18	22/06/2018	Madrid (Spain)	Oral presentation	USE	Scientific Community & Industry	
PRES 2018	25-29/08/2018	Prague (Czech Republic)	Oral presentation	CERTH	Scientific Community & Industry	300
PRES 2018	29/08/2018	Prague (Czech Republic)	Oral presentation	USE	Scientific Community & Industry	300
ESTAC12	27-30/08/18	Brasov (Rumania)	Oral presentation	CSIC	Scientific Community	400
GRIDSOL	25/09/2018	Athens (Greece)	Poster presentation	CERTH	Industry & Scientific Community	300
THE EUROPEAN RESEARCHERS' NIGHT	28/09/2018	Seville (Spain)	Oral presentation	USE	General Public & Civil Society	
SOLARPACES 2018	04/10/2018	Casablanca (Morocco)	Oral presentation	USE	Scientific Community & Industry	
Workshop on Thermochemical Solar conversion	18/10/2018	Seville (Spain)	Oral presentation	USE	Scientific Community	30
Youth with Researchers - SCIENCEIES	16-28/01, 13/02, 04/04/2020	Seville (Spain)	Other	USE	General Public	50
Youth with Researchers - SCIENCEIES	16-28/01, 13/02, 04/04/2020	Seville (Spain)	Other	CSIC	General Public	50
11th Annual MENA New Energy 2019	26-27/03/2019	Dubai (UAE)	Oral presentation	VM	Industry & Scientific Community	400
CATCAR28 & MoldTAC2	9-10/05/19	Timisoara (Romania)	Oral presentation	CSIC	Scientific Community	

Dissemination & communication activities					Estimated number of persons reached	
Name of the activity / URL	Date	Location	Role	Partner	Target group	Outreach
17ª FERIA DE LA CIENCIA	16-18/05/2019	Seville (Spain)	Stand	USE	Civil Society & Scientific Community	7000
ICheaP 14	26-29/05/19	Bologna (Italy)	Oral presentation	CNR	Scientific Community & Industry	300
12th Panhellenic Scientific Conference of Chemical Engineering	29-31/05/2019	Athens (Greece)	Oral presentation	AUTH	Scientific Community & Industry	500
Water Innovation Europe 2019	11-12/06/19	Brussels (Belgium)	Attendance	BIOAZUL	Industry & Investors	
11th Mediterranean Combustion Symposium - MCS11	16-20/06/2019	Tenerife (Spain)	Oral presentation	CNR	Scientific Community & Industry	200
ECOS 19	23-28/06/2019	Wroclaw (Poland)	Oral presentation	USE	Scientific Community & Industry	200
ECOS 19	23-28/06/2019	Wroclaw (Poland)	Oral presentation	POLITO	Scientific Community & Industry	200
ECOS 19	23-28/06/2019	Wroclaw (Poland)	Oral presentation	ZAR	Scientific Community & Industry	200
ECOS 19	23-28/06/2019	Wroclaw (Poland)	Oral presentation	CERTH	Scientific Community & Industry	200
ECOS 19	23-28/06/2019	Wroclaw (Poland)	Oral presentation	CNR	Scientific Community & Industry	200
Workshop MSLOOP 2.0	09/07/2019	Madrid (Spain)	Oral presentation	USE	Scientific Community & Industry	
CEEC-TAC5 & Medicta2019	27-30/08/19	Rome (Italy)	Poster presentation	CSIC	Scientific Community	300
The 12th European Congress of Chemical Engineering	15-19/09/2019	Florence (Italy)	Oral presentation	AUTH	Scientific Community & Industry	
Aportando valor al CO2	02-03/10/2019	Madrid (Spain)	Poster presentation		Scientific Community & Industry	90
PRES 2019	20-23/10/2019	Agios Nikolas, Crete (Greece)	Oral presentation	POLITO	Scientific Community & Industry	200

Dissemination & communication activities					Estimated number of persons reached	
Name of the activity / URL	Date	Location	Role	Partner	Target group	Outreach
PRES 2019	20-23/10/2019	Agios Nikolas, Crete (Greece)	Oral presentation	CERTH	Scientific Community & Industry	200
CAPTure WORKSHOP AT THE EUROPEAN UTILITY WEEK	12/11/2019	Paris (France)	Oral presentation	CALIX	Industry & General Public	33
13th Annual CSP MADRID 2019	19-20/11/2019	Madrid (Spain)	Attendance	VM	Industry & Scientific Community	600
IX International Workshop for the efficient use of sustainable energy	19-21/2019	Arequipa (Perú)	Oral presentation	USE	Scientific Community	50
Publication in the newspaper Nordseezeitung	04/02/2020	Bremerhaven (Germany)	Other	TTZ	Civil Society	
Introduction to the SOCRATCES project	06/02/2020	Bremerhaven (Germany)	Oral presentation	TTZ	Scientific Community	12
Annual meeting of the ProcessNet specialist group for energy process engineering	04-05/03/20	Frankfurt (Germany)	Poster presentation	TTZ	Scientific Community	
ICSREE 2020	5/05/2020	Online	Oral presentation	POLITO	Scientific Community	30
ECOS 20	29/06/2020-3/07/2020	Osaka (Japan) ONLINE	Oral presentation	POLITO	Scientific Community & Industry	200
ECOS 20	29/06/2020-3/07/2020	Osaka (Japan) ONLINE	Paper presentation	ZAR	Scientific Community & Industry	200
SOLARPACES2020	1-5/09/2020	Albuquerque (New Mexico)	Oral presentation	USE	Scientific Community & Industry	200
SDEWES congress 2020	1-5/9/2020	Cologne (Germany)	Paper presentation	VM	Industry	570
SDEWES congress 2020	1-5/9/2020	Cologne (Germany)	Paper presentation	USE	Industry	570
SDEWES congress 2020	1-5/9/2020	Cologne (Germany)	Oral presentation	POLITO	Industry	570
SDEWES congress 2020	1-5/9/2020	Cologne (Germany)	Oral presentation	AUTH	Industry	570

Dissemination & communication activities					Estimated number of persons reached	
Name of the activity / URL	Date	Location	Role	Partner	Target group	Outreach
SDEWES congress 2020	1-5/9/2020	Cologne (Germany)	Paper presentation	CERTH	Industry	570
ATI 20	15-16/09/20-	Roma (Italy) ONLINE	Oral presentation	POLITO	Scientific Community & Industry	70
Feature within Calix general newsletter, April 2021.	19/04/2021	Online	Other	CALIX	Industry & General Public	1237
Youth with Researchers - SCIENCIES	13/02, 04/04/2021	Seville (Spain)	Other	USE	General Public	50
Workshop on Thermochemical Solar conversion	18/05/2021	Seville (Spain)	Oral presentation	USE	Scientific Community	30
ISCRE 2021	7/05/2021	Online	Oral presentation	POLITO	Scientific Community	30
Cambio climático y oportunidades de negocio	20/05/2021	Online	Oral presentation	ZAR	Scientific Community	100
ICheaP 15	23-26/05/2021	Napoli (Italy)	Oral presentation	CNR	Scientific Community & Industry	300
Workshop GECAT. Young researchers	04/06/2021	Spain. ONLINE	Oral presentation	CSIC	Scientific Community	
International Summer School for PhD students	5-9/07/21-	Gliwice (Poland)	Oral presentation	USE	PhD students	30
Speed-Networking für Wissenschaftler*innen aus Bremerhaven	07/08/2021	Online (Bremerhaven)	Oral presentation	TTZ	Scientific Community	15
International Conference on Chemical Reactors	12-17/09/2021	Online	Oral presentation	AUTH	Scientific Community	500
AIChE Annual Meeting 2021	15-19/11/2021	Online	Oral presentation	AUTH	Scientific Community	1000

6 CONCLUSIONS

SOCRATCES has collaborated with several networks and projects to maximise the impact of the dissemination activities. Thanks to this, the co-organisation of workshops or joint newsletters enabled us to reach a wider audience and provide more visibility to the project results.

The network activities have been effective and already enabled to set important synergies. For instance, thanks to the project networking activities, CERTH participates as a subcontractor in a proposal of the Green Deal Call within the topic "LC-GD-9-1-2020: European Research Infrastructures capacities and services to address European Green Deal challenges".

The numerous dissemination activities have permitted to reach more than 20,000 stakeholders. This has been achieved by participating in several activities such as conferences, symposiums, workshops, and networking meetings.

SOCRATCES has pursued engaging a wide network, involving different stakeholders even though those who are not direct end-users of the solutions. This approach responds to the need of disseminating efforts in R&I to the whole society. It is important to disseminate how R&I funds are used and the project's potential benefits in terms of sustainability, environmental protection, job creation, etc. This is especially significant in the young people, as future taxpayers that will underpin R&I public expenditure. For that reason, SOCRATCES has paid special attention to educational activities oriented to young people and has been one of the innovative projects that collaborate with "[Youth with Researchers SCIENCEIES Sevilla](#)" through four editions. Likewise, young students are future professionals with a strong potential to support the use of sustainable solutions and technologies, and it is important they are aware of the latest innovations.

ANNEX I - PORTFOLIO OF RESEARCH & INNOVATION RESULTS PROJECT GROUP



**Portfolio of Research and Innovation Results
Project Group: SOCRATCES**

SERVICE 1 "Portfolio Dissemination and Exploitation Strategy (PDES)"
MODULE A: Identification and creation of the portfolio of R&I project results

Lead Author (Org)	Silvia Raimondi (ICONS)
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Date	13.04.2021
Version	V1

- Dissemination Level
- PU: Public
 - PP: Restricted to other participants of the HRB Project Group (including the Commission)
 - RE: Restricted to a group specified by the HRB Project Group (including the Commission)
 - CO: Confidential, only for members of the HRB Project Group (including the Commission)



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List of Acronyms & Abbreviations

Item	Description
HRB	Horizon Results Booster
PG	Project Group
PDES A	Portfolio Dissemination & Exploitation Strategy - Module A
PDES B	Portfolio Dissemination & Exploitation Strategy - Module B
SWOT	Strengths Weaknesses Opportunities Threat
TRL	Technology Readiness Level
Univ.	University
CSP plants	Concentrated Solar Power (CSP) plants

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1. Executive Summary

SUN Project Group is a cluster of six EU funded projects (SOCRATCES, NEXTOWER, POLYPHEM, SFERA-III, SHIP2FAIR, MUSTEC) addressing secure, clean, and efficient energy policies, technological developments organised under the Horizon Results Booster programme (HRB) of the European Commission.

The group is based on commonalities between the work each group member is doing in this research field.

HRB supports effective transfer of research and innovation project results to policy makers, industry, and society by offering various services as dissemination, exploitation strategy and business plan development to projects supported under the 7th Framework Programme (FP7) or Horizon 2020 funding schemes.

This document, the D1.1 Portfolio of Research and Innovation Project Results of SUN Project Group identifies the collective results of the PROJECT GROUP to be disseminated, their characteristics and the target stakeholders that can benefit from these results and are ultimately the target audience for the Project Group dissemination activities.

The main objectives of the six projects, that will serve in the PG dissemination effort, are:

- Enabling highly competitive and sustainable Concentrated Solar Power (CSP) plants.
- Improving the performance of small-scale CSP plants and their flexibility to generate power on demand.
- Identifying the barriers holding CSP back and limiting its expansion in Europe, in the context of the energy and climate targets of 2030 and beyond.
- Finding the drivers for CSP and the potential niches in which intra-European CSP trade can play an important role for the decarbonisation, stabilisation, and integration of the European power system.
- Proposing concrete policy solutions to overcome the identified obstacles and create the necessary enabling conditions for European CSP growth.
- Reinforcing the sustainability of the activities of the European advanced CSP research infrastructures through networking actions to develop cooperation between research infrastructures and stakeholders, transnational access to all European researchers to singular scientific and technological solar research infrastructures, promote joint research activities.
- Addressing the main market barriers for atmospheric air-based Tower CSP technologies through the development, of innovative materials solutions
- Fostering the integration of solar heat in industrial processes of the agro-food sector.
- Developing a prototype aimed at demonstrating the feasibility of the CSP-Cal integration that uses cheap, abundant, non-toxic materials and mature technologies, reducing the risks of scaling up the technology and solve challenges optimising the operating efficiencies that could be obtained.

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The analysis has identified, in a snapshot, the following most relevant results as part of the Project Group's portfolio of research and innovation results.

Table 1 - Key results for dissemination

Id	Result	Result type	Project(s)	TRL	Delivery date
R1	Commissioning of large-scale prototype	Prototype	POLYPHEM	Large scale prototype, tested in intended environment	06/01/2021
R2	Energy storage system	Prototype	SOCRATCES	Large scale prototype, tested in intended environment	09/01/2021
R3	Calciner reactor	Prototype	SOCRATCES	Large scale prototype, tested in intended environment	09/01/2021
R4	Carbonator reactor	Prototype	SOCRATCES	Large scale prototype, tested in intended environment	09/01/2021
R5	Ceramic Receiver CUPS	Prototype	NEXTOWER	Prototype system. Tested in intended environment close to expected performance	31/12/2020
R6	FeCrAl composite tube	Demo system	NEXTOWER	Demo system. Operating in operational environment at pre-commercial scale	30/06/2020
R7	FeCrAl overlay welding feedstock	Demo system	NEXTOWER	Demo system. Operating in operational environment at pre-commercial scale	30/06/2020
R8	Standardised procedure for ceramic characterisation	Policy document	NEXTOWER	Full commercial application. Technology on "general availability" for all consumers	30/06/2021
R9	Procedures for absorber / receiver testing	Report on methodology	NEXTOWER	Demo system. Operating in operational environment at pre-commercial scale	30/06/2020
R10	Demo-sites with implementation of SHIP	Demo system	SHIP2FAIR	Demo system. Operating in operational environment at pre-commercial scale	31/03/2022
R11	Replication Tool	Demo system	SHIP2FAIR	Demo system. Operating in operational environment at pre-commercial scale	31/03/2022
R12	Control Tool	Demo system	SHIP2FAIR	Demo system. Operating in operational environment at pre-commercial scale	31/03/2022
R13	Guide gathering the lessons learnt and best practices of SHIP implementation in agroindustry	Policy document	SHIP2FAIR	Full commercial application. Technology on 'general availability' for all consumers	31/03/2022

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R14	Roadmap for collaborative CSP development in Europe	Policy document	MUSTEC	Applied research. First laboratory tests completed; proof of concept	31/01/2021
R15	Action plan and policy recommendations	Policy document	MUSTEC	Applied research. First laboratory tests completed; proof of concept	31/03/2021
R16	Research infrastructure improved services	Policy document	SFERA-III	Full commercial application. Technology on 'general availability' for all consumers	31/12/2022

The document is organised as follows:

- Project Group overview
- State of the art analysis
- Field overview and differentiators
- Project Group results
- Positioning in the field
- Multi-dimensional positioning diagram and SWOT analysis
- Stakeholder analysis
- Dissemination channels
- Conclusions and recommendation

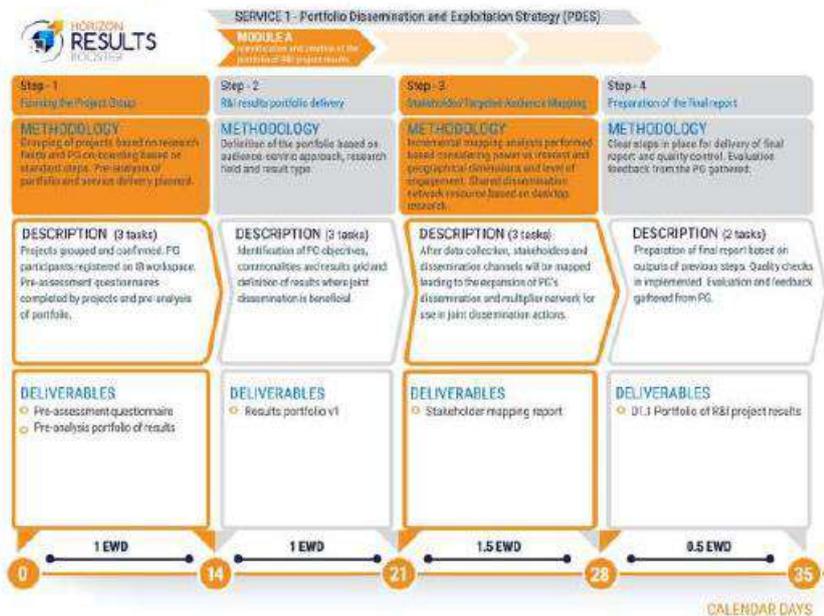
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2. Methodology

Portfolio Dissemination & Exploitation Strategy - Module A (PDES A) identifies and forms groups of projects, or Project Group (PG), in order to create a Portfolio of Research & Innovation Results (D1.1) that can benefit from joint dissemination from the participating projects. A key element of this process is the identification of commonalities between projects in terms of results, areas of research and target stakeholders. This is the foundation for the establishment of cohesive Project Group. The module also includes a mapping of stakeholders/target audiences for joint dissemination actions and an identification of the best dissemination channels.

Figure 1 - PDES 1A Identification and creation of the portfolio of R&I Results



Step 1 Forming the Project Group

The service team identifies projects that could join the Project Group and sends the pre-analysis portfolio of projects and results to the main beneficiary. Following convergence with the main beneficiary the group is confirmed. Projects are then contacted and invited to join the HRB platform. Each project completes the pre-assessment questionnaire the responses to which can be found in Annex B. A first introductory call may take place.

Step 2 – R&I results portfolio delivery

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Using the data collected in the pre-assessment questionnaires and the first versions of the portfolio presented at a conference call, the Service Team elaborates the information to prepare the final Portfolio of R&I results.

Step 3 – Stakeholder / target audience mapping

Step 3 provides the Project Group with a full mapping of stakeholders/target audience referred to the identified Portfolio of R&I results, including specifications on how they should address them through the most effective dissemination channels and dissemination networks to leverage on.

Step 4 – Preparation of the final report

The Lead Expert will resume all results and outcomes in the final report which will include:

1. Portfolio of R&I results
2. Stakeholder mapping report.



3. Results and Positioning

3.1. Proposed Project Group

The first step of HRB Module A is to identify a number of projects that are pertinent to or have similarities with the main beneficiary project in terms of focus, research field and target stakeholder. For practical reasons, in terms of managing the PG and delivery of PDESA and PDESB, a limited number of projects (maximum 10) are proposed.

The table below provides an overview of the projects invited to join the group. The projects were identified and contacted by the main beneficiary (SOCRATCES).

Table 2 - Proposed Project Group

Project	GA No.	Invited to join group	Status	Comment
SOCRATCES	727348	Yes	Joined group	Initial beneficiary
NEXTOWER	721045	Yes	Joined group	-NA-
POLYPHEM	764048	Yes	Joined group	-NA-
SFERA-III	823802	Yes	Joined group	-NA-
SHIP2FAIR	792276	Yes	Joined group	-NA-
MUSTEC	764626	Yes	Joined group	-NA-
ASTEP	884411	Yes	Did not reply	As no confirmation of interest was received, the project was not included in the group

3.2. Clustering features

At the launch of the service, the main beneficiary (SOCRATCES project) expressed the interest in forming a Project Group with six H2020 projects they had identified previously. These projects were selected based on common results, research areas and target stakeholders. SOCRATCES invited them to join the group. All but one confirmed their interest and became part of the group. The group was deemed sufficiently rich to start the activities and no other projects were searched. All projects which accepted to join the group completed the pre-assessment questionnaire for individual projects

The following summary provides the main features of the cluster proposed by the HRB experts.

3.3. Project Group Overview

The table below provides an overview projects included in the PG and the challenges each project is addressing.

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Table 3 - The Project Group

Project Snapshot	Description	Challenges Addressed
<p>SOCRATCES 01/01/2018 to 09/30/2021 Funding Programme: H2020-EU.3.3.2 Funding: € 4.975.402,50 Project Type: European Geo Coverage: European No. of Partners: 14 https://socratces.eu/</p>	<p>The project aims at demonstrating the feasibility of the CSP-CaL integration by erecting a pilot-scale plant that uses cheap, abundant, and non-toxic materials as well as mature technologies used in the industry, such as solids reactor, cyclones, or gas-solid heat exchangers. The global objective is to develop a prototype that will reduce the core risks of scaling up the technology and solve challenges; further understanding and optimise the operating efficiencies that could be obtained; with the longer-term goal of enabling highly competitive and sustainable CSP plants.</p>	<p>Secure, clean, and efficient energy. Climate action, environment, resource efficiency and raw materials.</p>
<p>NEXTOWER 01/18/2017 to 06/30/2021 Funding Programme: H2020 Funding: € 4.999.777,88 Project Type: European Geo Coverage: European No. of Partners: 18 www.h2020-nexttower.eu</p>	<p>The project addresses the main market barriers for atmospheric air-based Tower CSP technologies through the development, integration, testing and validation of promising, innovative, and leading-edge materials solutions to the improvement of CSP systems. The project addresses the next-generation of materials for CSP systems including improved high-temperature receivers, reduced downtime due to thermal fatigue, shock and corrosion issues and incorporation of innovative thermal storage solutions. To increase the marketability of the results, accelerated long-term fatigue testing and standardization activities will be done to reduce the time-to-market.</p>	<p>Secure, clean, and efficient energy.</p>
<p>POLYPHEM 04/01/2018 to 03/31/2022 Funding Programme: LCE-07-2016-2017 Funding: € 4.975.961,25 Project Type: European Geo Coverage: European No. of Partners: 8 www.polyphem-project.eu</p>	<p>The main project objective is to improve the performance of small-scale CSP plants and their flexibility to generate power on demand. To this end, a new technology is proposed: a solar-driven combined cycle with integrated thermal energy storage. The outcomes of the project will allow in the short term to reinforce the competitiveness of this new low carbon energy technology, to favour its integration in the medium term in the European energy mix and to contribute to the mitigation of climate change.</p>	<p>Secure, clean, and efficient energy.</p>
<p>SFERA-III 01/01/2019 to 12/31/2022 Funding Programme INFRAIA-01-2018-2019 Funding: € 9.102.630,66 Project Type: European Geo Coverage: European No. of Partners: 14 https://sfera3.sollab.eu/</p>	<p>The overall objective of this project is to carry on with the work done during the past 8 years in the SFERA 1 and SFERA 2 projects and reinforce the sustainability of the activities of the European advanced CSP research infrastructures through networking actions to develop cooperation between research infrastructures and stakeholders, transnational access to all European researchers to singular scientific and technological solar research infrastructures, promote joint research activities whose sole purpose is to improve the integrated services provided by the infrastructure, the latter being one of the final aim of SFERA III: improving the RI services.</p>	<p>Secure, clean, and efficient energy.</p>
<p>SHIP2FAIR 04/01/2018 to 03/31/2022 Funding Programme: H2020</p>	<p>The project aims at fostering the integration of solar heat in industrial processes (SHIP) of the agri-food sector, by developing and demonstrating at four industrial sites, a set of tools and methods. The validation and fine-tuning of the project results at</p>	<p>Food security, sustainable agriculture and forestry, marine and maritime and</p>

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<p>Funding: €7.996.793,25 Project Type: European Geo Coverage: European No. of Partners: 16 http://ship2fair-h2020.eu/</p>	<p>a set of complementary demo-sites is the corner stone of the project replicability for two main reasons. On the one hand, a demonstration based on the use of tools and procedures guaranties the comprehensiveness and the reproducibility of the obtained results. On the other hand, the demonstration under different real conditions of the agri-food sector ensures the consistency and robustness of the outcomes. Specific project objectives are: Achieving a solar fraction up to 40% of the heat demand; Designing simple solutions easy to install and operate; Ensuring the cost-effectiveness of the investment on SHIP; Carrying out a demonstration program up to TRL 7; Generate a critical mass on SHIP through a capacity building programme, Exploiting the potential of SHIP by reaching 14 industrial sites.</p>	<p>inland water research, and the bioeconomy.</p>
<p>MUSTEC 10/01/2017 to 03/31/2021 Funding Programme: H2020 Funding: € 2.396.526,13 Project Type: European Geo Coverage: European No. of Partners: 9 https://www.mustec.eu/</p>	<p>The project aims at supporting the expansion and trade of CSP in Europe by: 1). identifying the barriers holding CSP back and limiting its expansion in Europe, in the context of the energy and climate targets of 2030 and beyond, 2). finding the drivers for CSP and the potential niches in which intra-European CSP trade can play an important role for the decarbonisation, stabilisation and integration of the European power system, and 3). proposing concrete policy solutions to overcome the identified obstacles and create the necessary enabling conditions for European CSP growth.</p>	<p>Secure, clean, and efficient energy.</p>

3.4. Project Group members

The following individuals have participated in PDES1A. This includes the following type of activities:

- registering on the HRB platform
- participation on conference calls
- completion of pre-analysis questionnaire.

Table 4 - Project Group members

Project	Name	Organisation	email
SOCRATCES	Ángela Magno Malagón	Bioazul	amagno@bioazul.com
NEXTOWER	Fabio Aprà	R2M Solution	fabio.apra@r2msolution.com
POLYPHEM	Marie Prouteau	Euronovia	m.prouteau@euronovia-conseil.eu
SFERA-III	Marie Prouteau	Euronovia	m.prouteau@euronovia-conseil.eu
SHIP2FAIR	Lourdes Lain	EUREC	lain@eurec.be
MUSTEC	Alexandra Papadopoulou	University of Piraeus	alexpapa@unipi.gr

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The following conference calls were carried out with the group

- Introductory call: 15/09/2020
- Convergence call: 29/03/2021

3.5. Collective challenges

The main challenges tackled by the PG are summarised in the following table.

Table 5 - Collective challenges

Type of Challenge	Complementary Challenge and Description
Societal	Secure, clean, and efficient energy.
	Climate action, environment, resource efficiency and raw materials.
	Food security, sustainable agriculture and forestry, marine and maritime and inland water research, and the bioeconomy.
Scientific and Technological	SOCRATCES: CaCO ₃ /CaO (CaL) process for energy storage lies at a low level of maturity (TRL 4). Despite important advances to properly in recent years, the solar calciner (particle receiver) and the high temperature systems to store and convey the particles remain as major technological challenges to guarantee a proper system performance at large scale plants.
	NEXTOWER: The main barriers from the technological point of view are related to the development and testing of materials that must be used in very high-temperature applications (above 700 degrees). Being able to reach higher temperatures in the receiver and keep them high at a storage level, the overall efficiency of a CSP tower plant will be higher. For example, molten lead as fluid to use for thermal storage has good characteristics as good stability and high boiling point, but lower thermal conductivity, more corrosive and it is more expensive than sodium. On the receiver side, the main challenges for coatings are high costs, scalability of synthesis, and durability at high temperatures in oxidizing environments. Lower performances compared to the ones in a testing environment and high costs can be unattractive for the investors.
	POLYPHEM: The project will build a 60-kW prototype plant with a 2 MWh thermal storage unit and will validate this innovative power cycle in a relevant environment (TRL 5), assess its technical, economic, and environmental performances and establish the guidelines for its commercial deployment. The baseline technology consists of an air Brayton cycle as top cycle and an Organic Rankine Cycle (ORC) as bottom cycle. The project broadens this technology by driving the top cycle with solar energy through the development of an advanced technology of pressurized air solar receiver and by including an innovative thermal energy storage unit between both cycles.
	SFERA-III: The project addresses Concentrating Solar Thermal (CST) by integrating key European research infrastructures aiming at offering to the R&D community a new level of high-quality services. The spectrums of research themes are: Thermal Energy Storage for CST plants; Desalination and solar water treatments; Solar fuels production; Materials for solar receivers and CST components; Linear and point CST technologies; The design of an e-infrastructure aiming to provide virtual access to Ris and support the creation of new services.
	SHIP2FAIR: The project main technological pillars are competitive solar thermal technologies, optimal heat integration and tailored control strategies. The solar technologies selected for have already been successfully tested achieving a promising profitability in smaller projects, thus project constitutes a unique opportunity to demonstrate them at industrial level in the EU agri-food sector. The heat integration is designed to maximize the efficiency of the heat transfer from the solar collectors to the processes. An innovative DSS based on a model predictive control is developed to

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	<p>optimise the management of solar production. A tool to perform pre-feasibility studies is being developed to ease the further replication of the project.</p> <p>MUSTEC: The project focuses on the analysis of different policy instruments and the estimation of their impact on CSP development, also through modelling, against other competitive technologies.</p>
Industrial	<p>SOCRATCES: Most of the today's renewable energy plants at large scale lack storage systems, forcing the electric grid operators to remain dependent on fossil fuels. Pumped hydro storage (PHS) is the most developed energy storage system, however, it requires specific locations for implantation. Electrochemical systems, like batteries, present a high cost. Thermal energy storage based on molten salts is for now the most cost-competitive solution on the market. So, it is fundamental to look for other alternatives to provide large-scale storage.</p> <p>NEXTOWER: The main barriers from the technological point of view are related to the development and testing of materials that must be used in very high-temperature applications (above 700 degrees). Being able to reach higher temperatures in the receiver and keep them high at a storage level, the overall efficiency of a CSP tower plant will be higher. For example, molten lead as fluid to use for thermal storage has good characteristics as good stability and high boiling point, but lower thermal conductivity, more corrosive and it is more expensive than sodium. On the receiver side, the main challenges for coatings are high costs, scalability of synthesis, and durability at high temperatures in oxidizing environments. Lower performances compared to the ones in a testing environment and high costs can be unattractive for the investors.</p> <p>POLYPHEM: The power block considered in the project is a combined cycle intended to be used for decentralized small-scale power generation in the range 40 kW to 2000 kW in remote areas. The purpose is to meet the variable demand of energy of a mini-grid. The main challenge is to get economically viable electricity generation for small scale CSP in remote areas.</p> <p>SFERA-III: Considering the nature of these research infrastructures, the use by a multi-disciplinary community should be ensured, especially from the private sector. These infrastructures can host and support not only CTS technology researches but also other high temperature researches such as nanomaterial synthesis (new coatings for the automotive market, electronic components such as LEDs and capacitors, improved biocompatibility of medical implants, energy storage for batteries or hydrogen ...) and high temperature material characterisation for aeronautic, aerospace, nuclear or automotive sectors (thermal barriers, structural components ...). Overall challenge is to liaise with multiple industrial sectors to foster the use of research infrastructure.</p> <p>SHIP2FAIR: Solar thermal can provide a large amount of industrial heat demand; however, the current deployment levels remain low. The challenges tapping its potential are related to SHIP economic competitiveness, relatively low prices of fossil fuels charged to the industry due, in some cases to governmental subsidies, and the complexity of the integration in existing industrial processes. The agri-food industry involves thermal energy consuming processes, therefore, dependent on the increasing and volatile prices of fossil fuels and, in parallel, it is characterized by an average low degree of innovation. Over 60% demand of this sector can rely on solar technologies.</p> <p>MUSTEC: It is a policy-oriented project and is not directly engaged in the challenges faced by the CSP industry in terms of technology. It will support the implementation of CSP projects, through the collaboration of EU member states and the use of the collaboration mechanisms, while it is also promoting the need for recognising the role of dispatchability and flexibility through specific auction design. Both these policy tools are expected to create the framework conditions for the CSP industry to develop within EU.</p>

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3.6. State-of-the-art Analysis

3.6.1. Field overview

The secure, clean, and efficient energy EU H2020 programme¹ supports the transition to a reliable, sustainable, and competitive energy system in the face of increasingly scarce resources, growing energy needs and climate change. Its objectives include reducing energy consumption and carbon footprint, providing low-cost, low-carbon electricity supply, and alternative fuels and mobile energy sources, and building a single, smart European electricity grid.

Concentrated Solar Power (CSP) is among the next generation technologies of renewable electricity and heating/cooling. According to the German Aerospace Centre (DLR), “potential of electricity produced by CSP in Europe is around 1500 TWh/year being the Mediterranean countries those with the highest potential according to their available radiation (over 2000 kWh/year). The global installed capacity could reach 150 GW by 2020, with an average capacity factor of 32 %.”² The technology utilizes mirrors and reflective surfaces to reflect and concentrate a large amount of sunlight and solar thermal energy and convert it to heat which is in turn used to drive turbines or generators for power production.

The core objectives of the project group include to reinforce the competitiveness of this new low carbon energy technology, increase the marketability of the results while proposing concrete policy solutions to overcome the identified obstacles. To this aim, cost reduction is also fundamental, and will become even more relevant as the cost of large grid connected battery systems comes down, allowing variable renewable sources such as PV and wind to offer increasing levels of dispatchability³.

3.6.2. Differentiators in the field

The most relevant differentiators possessed by the Project Group are summarised in the following table.

Table 6 - Most relevant differentiators

Differentiator	Description (order by most important)
Specific innovative technical solutions	SOCRATCES: the project technology is based on the application of the Calcium-Looping process as thermochemical energy storage system provides promising advantages in comparison with batteries or molten salts-based systems. The advantages are : The low price of the raw materials (limestone, dolomite), the abundance of raw materials worldwide, environmental friendly raw materials, high energy storage density/ The space needed to store the energy is quite small (high energy content related to the volume), high turning temperature (able to be integrated with high-efficiency power blocks), huge industrial development of similar processes (cement production), relative safe: no explosive components are used and process works at relative low pressures.
Specific innovative technical solutions	NEXTOWER: the project is the first CSP pilot that is using molten lead as a Heat Transfer Fluid to increase the operating temperature of the plant and therefore increase its efficiency. There are no other examples of such a demonstrator. All the other CSP plants in operation

¹ <https://ec.europa.eu/programmes/horizon2020/en/h2020-section/secure-clean-and-efficient-energy>

² <https://s3platform.jrc.ec.europa.eu/concentrated-solar-power>

³ http://publications.jrc.ec.europa.eu/repository/bitstream/JRC118040/jrc118040_1.pdf

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	use way lower temperatures (around 500 degrees) while the project aims to reach temperature up to 800 degrees.
Specific innovative technical solutions and technology transfer	POLYPHEM: Thermal Energy storage is a decisive advantage that distinguishes CSP plants from highly variable renewable power generation technologies like photovoltaics or wind. With the integration of thermal storage, the project meets the requirements of a local variable demand of energy with a high average conversion efficiency of 19% and a low environmental profile with an investment cost target below 5 €/W. Moreover, the water requirement for cooling purposes is eliminated with the project technology since the novel combined cycle eliminates the needs for cooling. Most technologies on the market cannot offer this water saving solution. Also, the developed technology is suited for heating/cooling purposes or for other applications driven by heat at constant rate, like water desalination.
Innovative service solutions	SFERA-III: The project will bring significant innovation not only arising from the development of novel concepts and from the improvement of the existing services (or creation of new ones), especially through the JRAs, but also from a much stronger and more consistent integration of these services through the NAs that will result in an extended capability of the RIs. The differentiation is the capacity to offers improved services in an integrated research infrastructure network compared to other non-EU RI. The improved services can be offered directly to consumers.
Specific innovative solutions	SHIP2FAIR: The project put forward a complete set of tools and methodologies, to identify, design, commission and operate the solar field installation, including the analysis of the best integration points. The systematic approach and different tools developed will provide an advantage to be able to tackle the needs of various actors along the value chain. In addition, lessons learnt from a non-conventional sector for solar collectors are being gathered.
Roadmap, action plan and policy recommendations	MUSTEC: The project support national and European policymakers in designing sustainable and cost-efficient policy packages for the support of CSP which consider the interaction between different policy areas as well as co-effects of environmental policies. The output will address the key lessons learnt by providing concrete policy recommendations and suggestions for the evaluation, design and monitoring of CSP related policies and regulatory incentives. The recommendations aim to support national and European policymakers in the design of adequate legal frameworks and cost-efficient policy packages that regard the interaction between different policy areas as well as electricity market design.

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3.7. Project Group Results

A synthesis view of the main results from the projects in the Project Group is provided in the table below, as the basis for future service definition and stakeholder mapping.

Table 7 - Dissemination portfolio results grid

Id	Result	Result type ⁴	Project(s)	TRL	Delivery date
R1	Energy storage system	Infrastructure	SOCRATCES	5-Large scale prototype. Tested in intended environment.	09/01/2021
R2	Calciner reactor	Prototype	SOCRATCES	5-Large scale prototype. Tested in intended environment.	09/01/2021
R3	Carbonator reactor	Prototype	SOCRATCES	5-Large scale prototype. Tested in intended environment.	09/01/2021
R4	Ceramic Receiver CUPS	Prototype	NEXTOWER	6-Prototype system. Tested in intended environment close to expected performance.	31/12/2020
R5	FeCrAl composite tube	Demonstrator	NEXTOWER	7-Demo system. Operating in operational environment at pre-commercial scale.	30/06/2021
R6	FeCrAl overlay welding feedstock	Demonstrator	NEXTOWER	7-Demo system. Operating in operational environment at pre-commercial scale.	30/06/2021
R7	Standardised procedure for ceramic characterisation	Application	NEXTOWER	9-Full commercial application. Technology on 'general availability' for all consumers.	30/06/2021
R8	Procedures for absorber/receiver testing	Demonstrator	NEXTOWER	7-Demo system. Operating in operational environment at pre-commercial scale.	30/06/2021
R9	Large scale prototype commissioning	Prototype	POLYPHEM	5-Large scale prototype. Tested in intended environment.	01/06/2021

⁴ Results types are: Blueprint; Commercial solution; Data set / data pool; Demonstrator; Feasibility study; Framework (e.g. software environment, policy document, legal framework); Hardware (e.g. chip, appliance, drone, sensor, system); Infrastructure (e.g. IT infrastructure, transport infrastructure, energy infrastructure, water infrastructure, building etc.); Methodology; Model (e.g. risk model, mathematical model, data model, physical model, business model etc.); Patent (e.g. utility, design patents and plant patents); Policy report; Prototype; Proxy/broker service; Research and/or virtual environment; Scientific publication (Refereed); Scientific publication (Non-refereed); Software (e.g. routine, integrated platform, library, plugins); Standard (e.g. norms, policies); Taxonomy / Ontology; Tool / Toolkit / toolbox; Training (e.g. learning tools, services, modules); White paper or similar publication; Other – please specify.

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R10	Research infrastructure improved services	Infrastructure	SFERA-III	9-Full commercial application. Technology on 'general availability' for all consumers.	31/12/2022
R11	Four demo-sites with implementation of SHIP	Infrastructure	SHIP2FAIR	7-Demo system. Operating in operational environment at pre-commercial scale.	31/03/2022
R12	Replication Tool	Demonstrator	SHIP2FAIR	7-Demo system. Operating in operational environment at pre-commercial scale.	31/03/2022
R13	Control Tool	Demonstrator	SHIP2FAIR	7-Demo system. Operating in operational environment at pre-commercial scale.	31/03/2022
R14	Guide on lesson learned and best practices	Framework document	SHIP2FAIR	9-Full commercial application. Technology on 'general availability' for all consumers.	31/03/2022
R15	Roadmap for collaborative CSP development in Europe	Policy document	MUSTEC	3-Applied research. First laboratory tests completed; proof of concept.	31/01/2021
R16	Action plan and policy recommendations	Policy document	MUSTEC	3-Applied research. First laboratory tests completed; proof of concept.	31/03/2021

3.8. Main actors in the field

This table identifies the elements of differentiations of the results of the Project Group with respect to the main players, similar research initiatives or competitors that are currently working in this field.

Table 8 - Differentiation with key actors in the field

Result ID	Differentiator	Closest Competing/Related Actors
R 1-2-3-4-7-9	Specific innovative technical solutions	SOCRATCES: R&D and companies developing alternative solutions for energy storage, but no names indicated. POLYPHEM: So far, small scale CSP is not much developed commercially. Maturity level of solutions and technologies in the market is still at a very early stage. Companies working in the small scale CSP field: AZELIO, SOLTIGUA, ABENGOA.
R 5-6-8-11-12-13	Specific innovative technical solutions, operational environment, pre commercial and technology transfer	SHIP2FAIR includes in its consortium 2 competitors (for high temperature flat plates, TVP; linear Fresnel, IS and 1 external (for evacuated tube). Innovation in the project is not focused on the product but on the integration in the manufacturing environment. NEXTOWER works on different aspects of a CSP plant (receiver, storage, testing, etc.), some competitors for the entire solution are DLR (for their R&D work in the CSP sector), Aalborg CSP (that can offer turnkey solutions in the CSP sector), Rioglass Solar (which works on tubes and concentrating mirrors).
R 10	Innovative service solutions	There are no competitors in EU. The main competitors are research infrastructures outside the EU: Sandia Lab in US, CSIRO in Australia, Masdar institute in UAE.

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R 14-15-16	Roadmap, action plan and policy recommendations	No competitors.
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3.9. SWOT Analysis

In the figure below, a preliminary SWOT analysis for the PG has been prepared, to support the envisaged PG dissemination activities.

Figure 2 - SWOT analysis for the Project Group

<p style="text-align: center;">Strengths</p> <ul style="list-style-type: none"> • High potential to reach numerous stakeholders • Research-based and science-based approach of all projects make results highly professional and reliable for dissemination and exploitation and to address the market with confidence and evidence • SHIP2FAIR's Replication and control tools are innovative and requested by the market • Decarbonisation of a sector that can be hardly tackled by conventional interventions (i.e. not electricity driven) • The multi-disciplinarity of the technologies and solutions, within the solar sector, proposed by the group, enhance the attractiveness of the group potential joint initiatives such as joint events and exhibitions. • The international character of the projects and partners is an asset to further disseminate toward stakeholders from different countries and with different mother tongues. • Technological state of art • Energy storage is one of the main advantages of CSP, which provided solutions for energy storage that are not offered by other technologies (such as dispatchability and flexibility) • Reducing EU dependance on fossil-based energy • Strengthen the security of supply • Creation of new jobs • CSP technology is not only for electricity production, but also e.g. for heat generation • EU has strong background on CSP technology 	<p style="text-align: center;">Weaknesses</p> <ul style="list-style-type: none"> • Difficult to reach a vast audience and keeping high engagement • Tailor made installations are required • ICT infrastructure is required for a good operation of the whole system • Difficulty creating engagement with industries /plant owners to make them aware about our solutions. • Hard to implement in under-developed countries • Cost of electricity production is higher compared to alternative technologies (if storage is not considered)
<p style="text-align: center;">Opportunities</p> <ul style="list-style-type: none"> • Vast sector in EU with high commitment to the end users and image 	<p style="text-align: center;">Threats</p> <ul style="list-style-type: none"> • Low quality/availability of data • Immature technical departments for advanced technologies

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|--|---|
| <ul style="list-style-type: none"> • Food and beverage sector is characterised by medium to low temperature demand • Solar technologies as designed are simple to operate • High potential to reach a wider network of stakeholders (research, industry, others) thanks to the partners forming the consortium of each project of the group. • The organisation of national/ regional campaigns thanks to the international character of the group and the projects' partners. • Creation of or participation to multi-disciplinary initiatives (events, exhibitions) to showcase how the group's CSP technologies propose cost-effective solutions that give answer to industry, research and citizens needs in a sustainable way. • CSP can play major role for decarbonization of EU power grid if its development is adequately supported in the coming years through tools such as specifically designed auctions • Knowledge and high skills could help implement this technology | <ul style="list-style-type: none"> • Substitution is not considered in first instance but a parallelisation with existing fossil-based technologies • Not reaching enough stakeholders would hinder the replication of the group's solutions and would slow down the penetration of CSP into the market and the impact of its benefits. • Limited interest from many stakeholders due to low TRL • Large share of EU industry may be taken over by non-EU players if adequate support is lacking • CSP Dispatchability and flexibility are not correctly assessed by policy makers compared to other technologies such as PV or wind energy • General public and users not familiar with CSP technology • Policy makers see CSP as a technology from Spain • Who pays for the infrastructure to build a grid for the energy flow from southern to norther Europe? |
|--|---|

Having assessed the above elements, the SUN Project Group should promote its strengths (which will therefore be highlighted in the dissemination activities), mitigate its weaknesses wherever possible, and leverage on the available opportunities while taking into accounts any potential threat.

Positioning Insights

- The group is composed by 6 projects which are conducting research in relation with the current EU policy sustaining secure, clean, and efficient energy production, and with a concrete impact on the European society and on the companies belonging to this sector.
- The potential of the ongoing research is very valuable and up to date, thanks to the professional and interdisciplinary skills of partners involved and the peculiarity of the topics of the research.
- The challenges are linked to strong industrial and social aspects. Nevertheless, companies, governments and citizens need better understanding of the technology and its benefit
- The private sector is not sufficiently informed about CSP and CSP-Cal, but the civil society can be, and is, a valuable supporter and driver of such a change
- Points of strength resulting from this collaboration should be fostered, while limiting the possible threats represented by the low understanding of the how beneficial the topic can be for the European society and industries.
- Examples of benefits must be highlighted, for example the main advantage of energy storage that are not offered by other technologies
- The reduction of EU dependance on fossil-based energy should be highlighted and promoted
- Cross benefits from CSP solutions and practices on other industries and sector of the economy must be put in evidence, such as heat generation for agriculture and much more.

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- The barriers to large knowledge and awareness of CSP are mostly due to a lack of consultations, push backs, low understanding/engagement from decision makers and lobbies.
- The private sector is not sufficiently informed about or interested in such topics, but the civil society can be, and is, a valuable supporter and driver of such a change.
- The competitors are limited, while the topic is very up to date and appealing for a wide audience. Also, it is very concrete and provides new evidence-based results.
- The audiences are broad and mostly high-level and, therefore, not easy to reach and engage, but potentially highly interested in such research and results.
- The specific audience deserve to be targeted with tailored dissemination activities
- Special attention on how to convey the message and the results to specific audience must be paid and this can lead to high interest from all the targets identified.
- The CSP ERANET public-private partnership should be addressed in order to bridge the gap between research and commercial deployment in the Concentrated Solar Power technology.
- In this framework the research conducted by the projects are key to provide evidence-based.

4. Stakeholder Analysis

4.1. Target stakeholders

Stakeholders are parties that will be affected by operations, objectives and results of the PG. Stakeholders that are relevant for each project in the group are categorised and mapped according to several different perspectives including their geographical broadness, domains, type of activity, interest in the portfolio of results, and level of influence.

The information here was collected from the questionnaire results and the conference call with PG. The main primary stakeholders for the SUN Project Group are identified below in order of importance and relevance to the dissemination objectives of the group.

4.1.1. Stakeholder 1

Description	Researcher and Academia
Projects	SOCRATCES, POLYPHEM, SFERA-III, MUSTEC
How stakeholders can benefit from the PG results	Needs to be relatively involved Needs to be informed
Engagement to date	Participation to conferences to demonstrate project results, scientific publications produced, research community involved into projects, setting up of project booths at events, annual communication "campaigns", organisation of public workshops.

4.1.2. Stakeholder 2

Description	Large enterprises
Projects	SOCRATCES, NEXTOWER, SHIP2FAIR
How stakeholders can benefit from the PG results	Needs monitoring Needs to be relatively involved Needs to be informed

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Engagement to date	Project demo-site hosted at Martin & Rossi, invitations to project events, survey among CSP industrial companies, inclusion and invitation to attend conferences and participate to panel discussions.
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4.1.3. Stakeholder 3

Description	Policy makers, Funding Agencies including EU & national digital agencies
Projects	SHIP2FAIR, MUSTEC, SOCRATCES
How stakeholders can benefit from the PG results	Needs monitoring Needs to be relatively involved
Engagement to date	Meetings, stakeholders have joined project conference panellist and or participants, projects newsletters.

4.1.4. Stakeholder 4

Description	Policy Experts & Activists
Projects	NEXTOWER
How stakeholders can benefit from the PG results	Has a decision power
Engagement to date	Invitation to events in which the project has been presented, projects newsletters, feedback on the work developed, invitation to workshops and seminars as speakers.

4.1.5. Stakeholder 5

Description	Start-ups & SMEs
Projects	SHIP2FAIR
How stakeholders can benefit from the PG results	Needs to be relatively involved
Engagement to date	Demo-sites are implemented in their premises.

4.1.6. Stakeholder 6

Description	Innovation platforms and clusters
Projects	SOCRATCES,
How stakeholders can benefit from the PG results	Needs to be informed

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Engagement to date	Participation to the following Innovation platforms: KIC Inno Energy, ETIP PV – European Technology & Innovation Platform on Photovoltaic, ETIP SNET – European Technology & Innovation Platform.
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4.1.7. Stakeholder 7

Description	Other: Network of manufacturers of CSP components
Projects	NEXTOWER
How stakeholders can benefit from the PG results	Needs to be relatively involved
Engagement to date	ETN (European Turbine Network) is part of the project.

4.2. Barriers to dissemination

The table below outlines the main barriers to successful dissemination actions that have been identified and considerations such as possible initial recommendations.

Table 9 - Barriers to dissemination

Id	Stakeholder group	Description	Considerations
B1	Researcher and Academia	Networking with similar projects and research, to collaborate for making synergies on joint results and to carry out joint dissemination activities towards key stakeholders.	Suggestions: to set up a PG presentation with the support of infographics, produce short promotional video for online distribution to be used on social media, websites and e-newsletters but also at workshops and events (to present the Project Group). Focus the messages to be conveyed and the tone voice according to the target audience addressed, highlighting the benefits on society and stakeholders at large. Identify and participate together with attuned projects in thematic conferences and workshops (fostering knowledge exchange).
B2	Large enterprises	Identify and dealing with business approach.	Suggestions: design a short presentation video or a dedicated infographic on Slideshare, be active on LinkedIn (by joining already active and thematic groups to disseminate the Project Group results), invite external experts and/or be invited as speakers at events. Exploit the matchmaking opportunities offered by the CSP-ERANET .
B3	Policy makers, funding agencies including EU	Reaching high level audience to start a dialogue to address solutions.	Suggestions: produce short promotional video on the main projects' outcomes and recommendations, for online and social media distribution. Set up ad-hoc press kits, policy briefs using dataset and highlighting insights.

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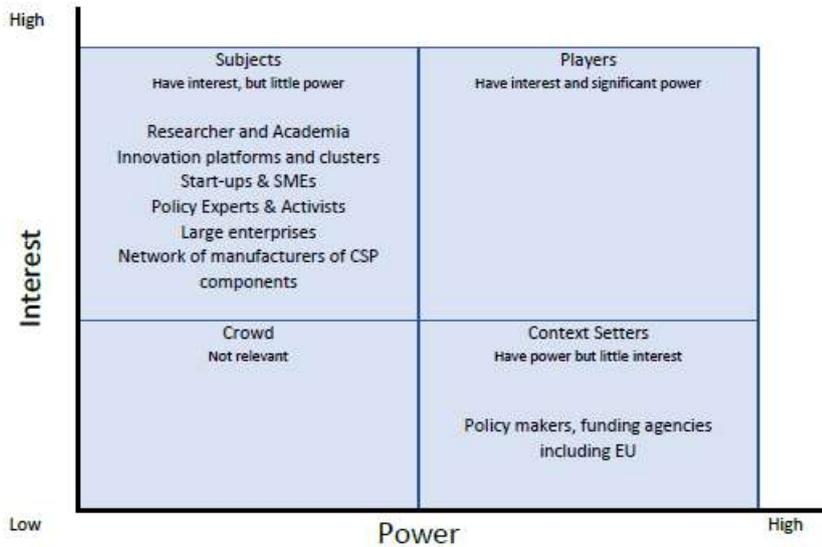
			Produce eye-capturing and memorable for social media interactions and self-explanatory e-presentations (to be published on e-magazines and platforms such as Slideshare).
B4	Policy Experts & Activists	No major barriers.	Suggestions: the same as per the policy makers with an additional care on being active on LinkedIn, by joining already active thematic communities.
B5	Start-ups & SMEs	SMEs wants to develop their own technology, while large organisations require already existing business plans.	Suggestions: to use short video teaser, to invite them as participants at events and workshops. While disseminating, manage to focus on those components of the CSP technology which are close to be standardized, in view of making steps ahead to overcome the latter barrier.
B6	Innovation platforms and clusters	No major barriers.	Suggestions: strengthen online dialogue and exchanges via social media through short videos, campaigns and joint dissemination actions (such as, editorials, NLS, events).
B7	Other: Network of manufacturers of CSP components	No major barriers, the European Turbine Network (ETN) is part of one project. Other association should be interested as well .	Suggestions: design dedicated technical handbooks or info-packs focused providing insights on the technical aspects of the technologies used. Consider to hold training sessions for installers and develop related materials. For online actions, consider to design short tutorial/technical video, to be featured also at dedicated fairs.



4.3. Stakeholder Relevance Analysis

The influence and interest of each stakeholder group is now considered in order to define their strengths in terms of supporting the uptake of the groups result. This will help the Project Group understand where to invest effort to maximise dissemination activities.

Figure 3 - Influence vs interest grid



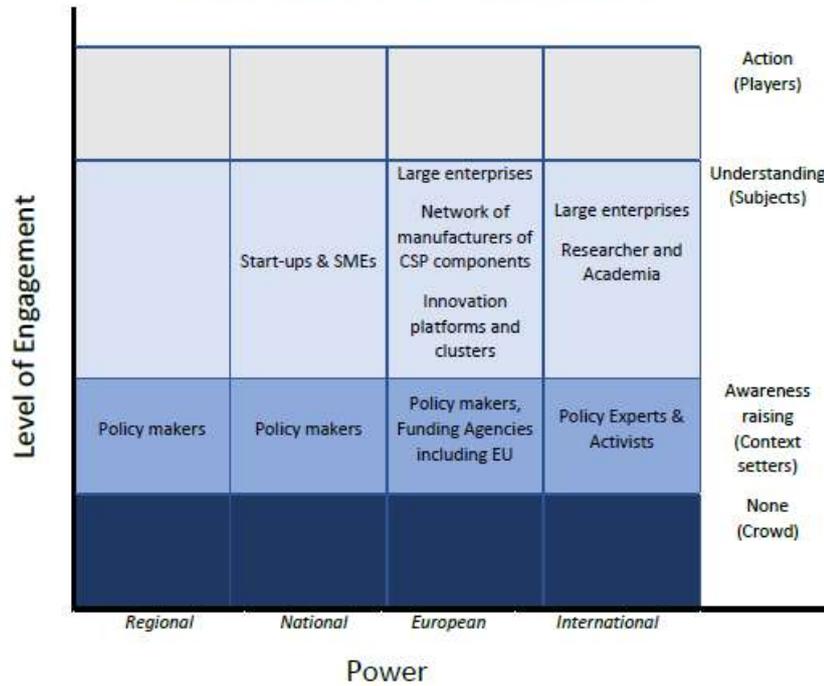
- **Subjects:** the stakeholders falling into this quadrant hold high interest but low power. Within this Project Group, these stakeholders are represented by Research & Academia, Innovation Platforms and clusters, Start-ups & SMEs, Large enterprises, Policy Experts & Activists, Manufacturers of CSP components, who are highly interested into the Project Group results but bear little influence on unleashing the uptake of Project Group’s results.
- **Context setters:** Policy makers and funding agencies (EU, national) positioned as stakeholders setting the context, meaning, they bear high power to spur impact and the represent the key stakeholder setting the framework and its conditions within whom the research and innovation activities of the Project Group are positioned.



4.4. Geographical dimension and level of engagement

In this section we map the stakeholder groups according to geographical dimension and current levels of engagement between the projects in the group.

Figure 4 – Geographical dimension vs. level of engagement grid



With the analysis of the current state of engagement and importance of the stakeholders now known along with new general goals set, the SUN Project Group can now identify the right dissemination channels they can use and can be easily referenced when they draw up their Portfolio Dissemination Plan.



5. Stakeholder & Dissemination Networks Mapping

5.1. Dissemination channels

Based on the desired level of engagement and the dissemination network, the diagram below maps the stakeholders with the most appropriate dissemination channel to use to create the greatest impact.

Table 10 – Dissemination channels

	Researcher and Academia	Large enterprises	Policy makers, funding agencies	Policy Experts & Activists	Start-ups & SMEs	Innovation platforms and clusters	Network of manufacturers of CSP components
Demos and Videos	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Website Pages and Blogs	Yes	Yes	Yes	Yes	Yes		
Newsletters	Yes		Yes	Yes		Yes	Yes
Social: Twitter	Yes		Yes	Yes			Yes
Social: LinkedIn	Yes	Yes	Yes	Yes			
Press Releases and Kits			Yes	Yes		Yes	Yes
Collaterals: Flyers, Banners, Posters	Yes		Yes	Yes			Yes
Events and Workshops	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Presentations	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Infographics	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Datasets and insights	Yes		Yes	Yes	Yes		Yes
Policy Briefs			Yes	Yes		Yes	Yes

5.2. Dissemination network

Based on the analysis on target stakeholders, the HRB service delivery team identified a dissemination network with more than 50 contacts and related social media channels identified across the stakeholder groups. Due to the vastity of the search, a set of “keywords” approved by the SUN Project Group has been followed.

Due to the composition of the Project Group, to the richness of the research conducted by each project, and to the high interest and the wideness of the topics tackled, we provide a broad range of contacts, focusing especially on the “Energy Sector”, components, novel technology and methodology, energy policies, secure

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and clean energy, but also within “Smart Cities”, “New Materials” with specific expertise and connections in these fields trying to enlarge the network as much as possible. The organizations/networks identified are divided according to the main stakeholders’ categories emerged from the surveys. While doing so, we strove for providing high-quality contacts while identifying least known organizations/networks to the projects group and partners, to provide them with interesting contacts nurturing, improving, and enlarging their network.

All information gathered is publicly available. This can serve as an important basis for future dissemination activities.

The full network can be found in Annex 1.

5.3. Insights – Channels to approach your audience

By analyzing your collective target stakeholders, we recommend the following channels to approach your audience:

- **HORIZON Results Platform:**
 - It is strongly suggested for Dissemination purposes that projects upload their respective key Exploitable result on the EC Horizon Results Platform: <https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/opportunities/horizon-results-platform>
 - The platform provides a new resource for projects and their partners to showcase results, network, and forge partnerships, and be discovered by investors seeking opportunities, and where policy makers can get valuable insights.
 - The platform improves project exploitation opportunities, proactively promoting project results and can be a source of opportunities connecting you to new stakeholders.
- **CORDIS Result Packs:**
 - Create an account here: <https://cordis.europa.eu/>
 - Work together to package your complementary results in a way that is easily understandable by professionals in the field of the Solar technologies, Energy efficiency, Heating and cooling, New Materials. There are plenty of examples online here (CORDIS Results Packs): <https://cordis.europa.eu/results-packs/en>. Once the article is ready and checked also by your communication/dissemination partners, publish, and promote it.

Demos and videos: Develop tailored videos and demos that directly address the challenges of the identified stakeholders and show how the PG’s results can benefit them. Consider developing different versions (i.e., shorter video pills for social media, longer ones for the website or events) and consider making joint videos

Website pages: Either create a joint mini-web site that showcases the collective results within the Project Group, or each project should create one page in each of their project websites containing the joint results, who they benefit and how. Make sure to have pages that directly address each stakeholder through special pages or sections and content should be tailored.

Twitter: Identify popular hashtags (both specific to your field such as #EfficientEnergy, #RenewableEnergy #SecureCleanEnergy, #Concentratedsolarpower, #Powerofthesun, #CSP but also more general but related hashtags such as #solarenergy, #cleantech) and exploit them in posts. Consider creating a joint account as a

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Project Group. Each post should have an objective (page visits, signups for registration, download of a report, views for a video etc.).

Press releases: Research the type of news published by the press and media identified in the dissemination networks. See what topics they write often and have a feel for their style or what type of information they like to post then write press releases that cover those. When sending press releases to media outlets, consider offering an exclusive interview with the head of research, business developer, policy expert (depending on what the media outlet's audience is).

Infographics: Design multiple infographics valid for each issue and solution the Project Group addresses and proposes. Focus on interesting statistics and facts. Infographics are meant for supporting explanations. Dimensions of the infographics should make it optimal for sharing online, particularly social media and videos (i.e. think landscape layouts instead of portrait). They can also be used in any communication material and tool as images in website pages, press releases and inserted in videos when appropriate.

Policy briefs: Create a unified policy position or a position paper on Project Group issues and solutions. Be creative in repurposing policy briefs. Even if they are in a downloadable format, they should be introduced by easily digestible content linking to the policy briefs such as blogs, a social media post that has an infographic attachment or a YouTube video.

Newsletters: Do not set up a Project Group's newsletter per se, instead "populate" already existing newsletters with articles the PGs can provide. Offer to the existing newsletter your capacity of reaching stakeholders via your lists (that you keep for you).

LinkedIn: Start by coming up with a list of top 50 Stakeholders that you would like to engage with. After, use LinkedIn to connect with them and message them directly to explore collaborations. Join existing groups that already deal with sustainable transport and smart cities, etc. and initiate discussions and connect with the members there.

Flyers, banners, posters: Develop a joint branding and consider this communication material only as a support to your live events. Consider designing flyers that can also be shared digitally so you can repurpose flyers for social media.

Presentations: Have tailored presentations for each stakeholder group and to the events where the PG members will be active (jointly or separately). Consider uploading into SlideShare. You can also embed them in special web pages that target your stakeholder.

Datasets and insights: If the Project Group members have available and interesting datasets and insights from its activities, consider showcasing them in your websites by embedding them in blogs or website pages. You can also create infographics based on them.

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6. Conclusions and Recommendations

This report provides with an in-dept analysis of the key dissemination features of the SUN Project Group useful to consider in view of designing the portfolio of research and innovation results and boost dissemination impacts of the project group results.

Based on the analysis carried out in the previous chapters, the following conclusions and recommendation can be given:

The HRB service delivery team concludes that:

- The SUN Project Group results delivering innovations in the field of the secure, clean, and efficient energy policies, technological developments organized under the Horizon EU funded program, in particular the group is developing new prototypes, technologies, methods, and tests enabling highly competitive and sustainable Concentrated Solar Power (CSP) plants.
- The core dissemination objective is to "lobby" at a European level with policy makers to push for the credit CSP as a cost competitive and efficient source of energy. The need is to discover other potential stakeholders for CSP projects' results. Creating engagement with industries to make them aware about the PG solutions and the positive impact in their business. Enhance and strengthen the project outcomes in the target audience (policy makers, researchers, CSP industry).
- The Project Group's stakeholders are, by order of priority:
 - Policy makers (and funding agencies)
 - Large enterprises
 - Researcher and Academia
 - Policy Experts & Activists
 - Start-ups & SMEs
 - Innovation platforms and clusters
 - Network of manufacturers of CSP components
- The barriers to dissemination are:
 - Reaching high-level audience (i.e., policy makers) to start a dialogue to address PG solutions
 - Engage with the "civil society" as main supporter of a bottom-up strategy to influence companies and governments
 - Networking with similar projects and research, to collaborate for making synergies on joint results and to carry out joint dissemination activities towards key stakeholders
 - Identifying and dealing with business on sustainability topics
 - Including SMEs that usually wants to develop their own technology, while large organizations require already existing large scale business plans.
 - Involving other (than ETN) network associations
- The recommended dissemination channels to be used by the SUN Project Group to reach its identified common stakeholders are, in order of relevance:
 - Demos and videos
 - Website pages
 - Press releases
 - Infographics
 - Newsletters

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- Social media (Twitter and LinkedIn)
- Flyers, banners, posters
- Presentations
- Datasets and insights

The HRB service delivery team recommends:

- Now the Project Group will start HRB Service 1 Module B Helping projects from the portfolio to design and execute a portfolio dissemination plan. The service will provide direct support to the Project Group to carry out joint dissemination activities including effort from the HRB experts to do this. By working collectively, the projects can leverage each other's results and networks to increase impact. This can also sustain the group at an initial stage and could be the springboard for continued collaboration.
- The Project Group should consider the recommendations in the document and which they would like to take forward in Module B. At the very start of Module B there is time and a call dedicated to discussing the joint activities to plan together.
- To package the result with a focus on your differentiators and so they can be disseminated through the diverse channels now at your fingertips.
- To use CORDIS as a highly effective channel for spotlighting your projects and consider if any of them could be a suitable candidate for the Horizon Results Platform³ under "Publish My Results".
- To consider the provided dissemination network of 62 relevant organisations and influencers in the engagement activities to be drawn up as part of the Portfolio Dissemination Action Plan.

Dissemination networks

Based on the analysis in the target stakeholders and on the discussions had at the Convergence Call hold on 29/03/2021, the HRB service delivery team identified a dissemination network with 61 contacts and related social media channels identified across the main two stakeholder groups that were prioritized during the call by the Project Group, to start engaging with. This can serve as an important basis for future dissemination activities.

Beside this, the EC recently published a "Social media guide for EU funded R&I projects" listing several social media pages and profiles to follow and engage with. The guide is available at http://ec.europa.eu/research/participants/data/ref/h2020/other/grants_manual/amga/soc-med-guide_en.pdf

Associations, agencies and networks, platforms, policy makers and advocates

- 1) ADENE Portuguese Energy Agency
- Website: <https://www.adene.pt/contactos/>
 - Twitter: /

³ <https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/opportunities/horizon-results-platform>.

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- LinkedIn: <https://www.linkedin.com/company/adene/>
- 2) Aegean Energy and Environment Agency
 - Website: <https://aegean-energy.gr/en/>
 - Twitter: https://twitter.com/AEGEAN_ENERGY
 - LinkedIn: <https://www.linkedin.com/company/aegean-energy-environment-agency-aegea/?originalSubdomain=gr>
 - 3) Austrian Energy Agency
 - Website: <https://www.energyagency.at/>
 - Twitter: https://twitter.com/at_AEA
 - LinkedIn: <https://www.linkedin.com/company/austrian-energy-agency/>
 - 4) BRE-NET- (building and Renewable Energies Network of Technology)
 - Website: <https://www.bregroup.com/expertise/energy/>
 - Twitter: https://twitter.com/bre_group
 - LinkedIn: <https://www.linkedin.com/company/building-research-establishment-bre-/>
 - 5) CAN Europe - Climate Action Network Europe
 - Website: <https://caneurope.org/>
 - Twitter: <https://twitter.com/caneurope>
 - LinkedIn: <https://www.linkedin.com/company/can-europe/>
 - 6) CCRE- Council of European Municipalities and Regions
 - Website: <https://www.ccre.org/>
 - Twitter: <https://twitter.com/ccrecemr>
 - LinkedIn: <https://www.linkedin.com/company/council-of-european-municipalities-and-regions/>
 - 7) CEDEC- European Federation of Local Energy Companies
 - Website: <http://www.cedec.com/>
 - Twitter: https://twitter.com/CEDEC_EU
 - LinkedIn: <https://www.linkedin.com/company/cedec-confederation-of-local-energy-companies/?trk=biz-companies-cym>
 - 8) CIGRE- Conseil International des Grands Réseaux électriques
 - Website: <https://www.cigre.org/>
 - Twitter: <https://twitter.com/CIGREWorld>
 - LinkedIn: <https://www.linkedin.com/company/cigre/?trk=biz-companies-cym>
 - 9) CIRED-International Conference on Electricity Distribution
 - Website: <http://www.cired.net/>
 - Twitter: <https://twitter.com/CIREDevents>
 - LinkedIn: <https://www.linkedin.com/company/cired-conference/>
 - 10) COVENANT OF MAYORS FOR CLIMATE AND ENERGY – EUROPE
 - Website: <https://www.covenantofmayors.eu/>

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- Twitter: <https://twitter.com/eumavors>
- LinkedIn: <https://www.linkedin.com/company-beta/2668508/>

11) EASE - European Association for Storage of Energy

- Website: <https://ease-storage.eu/>
- Twitter: https://twitter.com/EASE_ES
- LinkedIn: <https://www.linkedin.com/company/the-european-association-for-storage-of-energy/>

12) EERA - European Energy Research Alliance

- Website: <https://www.eera-set.eu/>
- Twitter: https://twitter.com/EERA_SET
- LinkedIn: <https://www.linkedin.com/company/eera-the-european-energy-research-alliance/>

13) EFIEES - European Federation of Intelligent Energy Efficiency Services

- Website: <http://www.efiees.eu/?lang=fr>
- Twitter: https://twitter.com/intent/follow?original_referer=http%3A%2F%2Fwww.efiees.eu%2F&ref_src=twsrc%5Etfw&screen_name=EFIEES&tw_p=followbutton
- LinkedIn: <https://www.linkedin.com/company/efiees/?originalSubdomain=be>

14) Energy Cities - the European Association of local authorities

- Website: <https://energy-cities.eu/contact-us/>
- Twitter: <https://twitter.com/energycities>
- LinkedIn: <https://www.linkedin.com/company/energy-cities/>

15) ESTELA - European Solar Thermal Electricity Association

- Website: <https://www.estelasolar.org/contact/>
- Twitter: https://twitter.com/ESTELA_SOLAR
- LinkedIn: <https://www.linkedin.com/company/estelasolar/>

16) ESTIF - European Solar Thermal Industry Federation

- Website: <http://www.c-energy2020.eu/eu-networks/estif-european-solar-thermal-industry-federation/>
- Twitter: /
- LinkedIn: <https://www.linkedin.com/company/estif—european-solar-thermal-industry-federation/?originalSubdomain=be>

17) ETIP-SNET - European Technology and Innovation Platform Smart Networks for Energy Transition

- Website: <https://www.etip-snet.eu/>
- Twitter: <https://twitter.com/ETIPSNET>
- LinkedIn: <https://www.linkedin.com/groups/8208338/>

18) ETN - European Turbine Network

- Website: <https://etn.global/>
- Twitter: <https://twitter.com/etngasturbine>
- LinkedIn: <https://www.linkedin.com/company/etn-global/>

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- 19) EU-ASE- European Alliance to Save Energy
- Website: <https://euase.net/>
 - Twitter: <https://twitter.com/EUASE>
 - LinkedIn: <https://www.linkedin.com/company/european-alliance-to-save-energy-eu-ase/>
- 20) EUFORES - European Forum for Renewable Energy Sources
- Website: <http://www.eufores.org/>
 - Twitter: /
 - LinkedIn: /
- 21) EuMaT – European Technology Platform for Advanced Engineering Materials and Technologies
- Website: <https://www.eumat.eu/en#>
 - Twitter: /
 - LinkedIn: /
- 22) EUREC - The Association of European Renewable Energy Research Centres
- Website: <https://eurec.be/about/contact/>
 - Twitter: https://twitter.com/eurec_info
 - LinkedIn: <https://www.linkedin.com/company/eurec-association/>
- 23) Eurelectric
- Website: <https://www.eurelectric.org/>
 - Twitter: <https://twitter.com/eurelectric>
 - LinkedIn: <https://www.linkedin.com/company/eurelectric/>
- 24) Euroheat and Power
- Website: <https://www.euroheat.org/>
 - Twitter: <https://twitter.com/EuroheatPower>
 - LinkedIn: <https://www.linkedin.com/company/euroheatpower/>
- 25) European Partnership for Energy and the Environment
- Website: <https://www.epeeglobal.org/>
 - Twitter: <https://twitter.com/EPEESecretariat>
 - LinkedIn: <https://www.linkedin.com/in/epee-secretariat-53001553/?originalSubdomain=be>
- 26) EUROSOLAR
- Website: <https://www.eurosolar.de/en/>
 - Twitter: https://twitter.com/eurosolar_int
 - LinkedIn: <https://www.linkedin.com/company/eurosolar/>
- 27) FEDARENE – European Federation of Agencies and Regions for Energy and the Environment
- Website: <https://fedarene.org/>
 - Twitter: <https://twitter.com/Fedarene>
 - LinkedIn: <https://www.linkedin.com/company/fedarene/>

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- 28) FUTURED - Technological platform for the development of next generation power grids
- Website: <https://www.bcg.com/publications/2018/power-grid-future>
 - Twitter: <https://twitter.com/BCG>
 - LinkedIn: <https://www.linkedin.com/company/boston-consulting-group/>
- 29) FVEE - German Renewable Energy Research Association
- Website: <https://www.fvee.de/en/contact/>
 - Twitter: https://twitter.com/fvee_de
 - LinkedIn: /
- 30) GEODE- local energy distributors across Europe
- Website: <https://www.geode-eu.org/>
 - Twitter: https://twitter.com/GEODE_EU/
 - LinkedIn: <https://www.linkedin.com/company/unavailable/>
- 31) IEA- International Energy Agency
- Website: <https://www.iea.org/>
 - Twitter: <https://twitter.com/iea>
 - LinkedIn: <https://www.linkedin.com/company/international-energy-agency/>
- 32) IFIEC Europe - International Federation of Industrial Energy Consumers
- Website: <https://www.ificEurope.org/>
 - Twitter: https://twitter.com/ific_europe
 - LinkedIn: <https://www.linkedin.com/company/ifiec-europe/about/>
- 33) IPEEC - International Partnership for Energy Efficiency Cooperation
- Website: /
 - Twitter: <https://twitter.com/ipeec?lang=fr>
 - LinkedIn: <https://www.linkedin.com/company/international-partnership-for-energy-efficiency-cooperation-ipeec-/?originalSubdomain=fr>
- 34) PTE-EE - Spanish technology platform on Energy Efficiency
- Website: <https://www.ptee.org/en>
 - Twitter: /
 - LinkedIn: <https://www.linkedin.com/groups/4010177/>
- 35) SmartEN - SMART ENERGY EUROPE
- Website: <https://smarten.eu/>
 - Twitter: <https://twitter.com/smartEnEU?lang=en>
 - LinkedIn: <https://www.linkedin.com/company/smarten-eu/>
- 36) SolarPower Europe
- Website: <https://www.solarpowereurope.org/>
 - Twitter: <https://twitter.com/SolarPowerEU>
 - LinkedIn: <https://www.linkedin.com/company/enia-european-photovoltaic-industry-association/>

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37) EUGINE - European Engine Power Plants Association

- Website: <https://www.eugine.eu/>
- Twitter: https://twitter.com/EUGINE_EU
- LinkedIn: <https://www.linkedin.com/company/eugine/>

38) IEA - International Energy Agency

- Website: <https://www.iea.org/>
- Twitter: <https://twitter.com/iea>
- LinkedIn: <https://www.linkedin.com/company/international-energy-agency/>

39) AGENCIA EXTREMENA DE LA ENERGIA

- Website: <https://www.agenex.net/es/>
- Twitter: <https://twitter.com/AGENEXORG>
- LinkedIn: <https://www.linkedin.com/company/agenex/>

Enterprises

40) Siemens Gamesa - Renewable Energy

- Website: <https://www.siemensgamesa.com/en-int>
- Twitter: <https://twitter.com/siemensgamesa>
- LinkedIn: <https://www.linkedin.com/company/siemensgamesa/>

41) Efacec Energia

- Website: <https://www.efacec.pt/>
- Twitter: <https://twitter.com/efacecoteltd?lang=fr>
- LinkedIn: https://www.linkedin.com/company/efacec/?trk=company_logo

42) Red Eléctrica de España

- Website: <https://www.ree.es/es>
- Twitter: <https://twitter.com/RedElectricaREE>
- LinkedIn: <https://www.linkedin.com/company/ree/>

43) EDP NEW

- Website: <https://www.edp.com/en/new#about-us>
- Twitter: <https://twitter.com/innovationatEDP>
- LinkedIn: <https://www.linkedin.com/company/edp/>

44) ABB

- Website: <https://new.abb.com/fr>
- Twitter: <https://twitter.com/ABBFrance>
- LinkedIn: <https://www.linkedin.com/company/abb/>

45) AGENCIA EXTREMENA DE LA ENERGIA

- Website: <https://www.agenex.net/es/>
- Twitter: <https://twitter.com/AGENEXORG>

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- LinkedIn: <https://www.linkedin.com/company/agenex/>
- 46) EDF - Energie Nouvelles
- Website: <https://www.edf-renouvelables.com/>
 - Twitter: https://twitter.com/EDF_RE
 - LinkedIn: <https://www.linkedin.com/company/edf-european-affairs/?originalSubdomain=fr>
- 47) Nexans - Bring Energy to Life
- Website: <https://www.nexans.com/company.html>
 - Twitter: <https://twitter.com/Nexans>
 - LinkedIn: <https://www.linkedin.com/company/nexans/>
- 48) STRI AB
- Website: <https://www.stri.se/>
 - Twitter: /
 - LinkedIn: <https://www.linkedin.com/company/stri-ab/>
- 49) Enel
- Website: <https://www.enel.it/>
 - Twitter: <https://twitter.com/EnelEnergiaHelp>
 - LinkedIn: <https://www.linkedin.com/company/enelenergia/>
- 50) ENGIE
- Website: <https://www.engie.be/fr/>
 - Twitter: <https://twitter.com/EngieBelgium?lang=fr>
 - LinkedIn: <https://www.linkedin.com/company/engie/?originalSubdomain=fr>
- 51) Snam
- Website: <https://www.snam.it/it/index.html>
 - Twitter: <https://twitter.com/snam>
 - LinkedIn: <https://www.linkedin.com/company/snam-s-p-a/>
- 52) Luminus
- Website: <https://www.luminus.be/fr/particuliers/>
 - Twitter: <https://twitter.com/LuminusEnergie>
 - LinkedIn: <https://www.linkedin.com/company/luminus/>
- 53) EDP Spain
- Website: <https://espana.edp.com/en/what-we-do-0>
 - Twitter: <https://www.linkedin.com/company/edp/>
 - LinkedIn: <https://twitter.com/EnergiaEDP>
- 54) TURBODEN
- Website: <https://www.turboden.com/>
 - Twitter: https://twitter.com/turboden_orc

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- LinkedIn: <https://www.linkedin.com/company/turboden-spa/?originalSubdomain=it>

55) EDF - Electricite de France

- Website: <https://www.edf.fr/contacts/clients-en-france>
- Twitter: <https://twitter.com/EDFofficiel>
- LinkedIn: <https://www.linkedin.com/company/edf/?originalSubdomain=fr>

56) GENERAL ELECTRIC DEUTSCHLAND HOLDING GMBH

- Website: <https://www.ge.com/>
- Twitter: <https://twitter.com/generalelectric>
- LinkedIn: <https://www.linkedin.com/company/ge/>

57) 3SUN SRL (Enelgreenpower)

- Website: <https://www.enelgreenpower.com/countries/europe/italy/3SUN-factory>
- Twitter: /
- LinkedIn: https://www.linkedin.com/company/3sun-srl/?trk=similar-companies_org_title&originalSubdomain=mu

58) SOLIDPOWER SPA

- Website: <https://www.solidpower.com/en/>
- Twitter: https://twitter.com/SOLIDpower_EN
- LinkedIn: https://www.linkedin.com/company/solidpower_group/

59) BRITE HELLAS SA

- Website: <https://www.xo.gr/profile/profile-907415863/en/>
- Twitter: <https://twitter.com/xrvsosodigos>
- LinkedIn: <https://www.linkedin.com/company/greek-yellow-pages-www-xo-gr/>

60) ALSTOM POWER LTD

- Website: <https://www.alstom.com/>
- Twitter: <https://twitter.com/Alstom>
- LinkedIn: <https://www.linkedin.com/company/alstom/>

61) ENEL GREEN POWER SPA

- Website: <https://www.enelgreenpower.com/>
- Twitter: <https://twitter.com/enelgreenpower>
- LinkedIn: https://www.linkedin.com/company/enel_green_power/

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Project questionnaire responses

At the start of MODULE-A, all participating projects are requested to complete a questionnaire.

All responses can be found at this link:
[\[https://workspace.horizonresultsbooster.eu/system/files/4088/modulea_pre_assessment_questionnaire_for_individual_project.xlsx\]](https://workspace.horizonresultsbooster.eu/system/files/4088/modulea_pre_assessment_questionnaire_for_individual_project.xlsx).

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