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

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1. Introduction

1.1. Objectives of WP2

The aims of Work Package 2 of STAGE-STE (Integrating Activities to Lay the Foundations for Long-lasting Research Cooperation), which is led by CyI, are:

- To monitor national and regional CSP RTD programmes, foster their coordination and thus create a favourable environment for the development of joint RTD activities;
- To develop and continuously update a European research programme for STE, building up on the work of groups such as EERA and on previous efforts, notably by ESTELA;
- To enhance working relations between the STE research community and national research funding agencies, to raise awareness of the importance of STE for the future energy mix of Europe and of the neighbouring regions, to foster the development of coordinated funding programmes for STE research;
- To develop relations with government agencies and other public stakeholders relevant to CSP such as ministries of energy, industry and research, national energy or environment agencies, etc., and to inform them about developments in the field.

Deliverable 2.1 is a **report on national programmes and objectives in STE research**, aimed at fulfilling the first aim listed above, and was compiled as part of Subtask 2.1.2 (Survey and compilation of existing or planned STE RTD programmes at national and regional level), which ended in January 2015. This subtask falls within Task 2.1 (Coordination of national RTD programmes and objectives in STE), which is led by CyI and in which the following partners are involved: CIEMAT, DLR, PSI, CNRS, FISE, ENEA, ETHZ, CEA, LNEG, CTAER, CNR, CENER, TECN, UEVORA, IMDEA, TKN, IST-ID, ESTELA, FBK, as well as CRAN.

1.2. European Context

As part of the EC's Strategic Energy Technologies Plan (SET Plan[1]), an Integrated Roadmap[2] was released in December 2014. Concentrating Solar Power (CSP) is one of the renewable energy sources mentioned in the document, albeit briefly (only one paragraph devoted to CSP), and in terms of research, the following orientations are envisaged:

- **Advanced research:**
  - Develop innovative receivers and heat transfer fluids
  - Increased reliability with improved control and operation tools (also by means of a more accurate assessment of the solar resource)
  - New hybridisation/better integration concepts (e.g. with desalination plants)
  - Innovative storage media and concepts
  - Reduction of water consumption by developing anti-soiling coatings.

[1] SET Plan: http://setis.ec.europa.eu/about-setis/set-plan-governance

[2] Integrated Roadmap: http://setis.ec.europa.eu/system/files/Towards%20an%20Integrated%20Roadmap_0.pdf

- **Industrial research and demonstration:**
  - Develop components such as mirrors and supporting structures
  - Advanced CSP plants of various size and demonstrate hybridisation concepts (e.g. with biomass)
  - Optimise the operation of current storage systems and validate in the field innovative dry-cooling systems, accounting for the status and future perspectives of the EU CSP industry.

- **Innovation and market uptake:**
  - Develop standards (e.g. in terms of commissioning procedures) and options to export electricity as foreseen in the Renewable Energy Directive[3], in particular by targeting the construction of innovative plants that would sell the electricity to another country.

Clearly, if such research is to be undertaken, then countries and regions need to integrate these priorities into their national research programmes. Deliverable 2.1 therefore provides an overview of the different states of integration of these priorities into national research programmes.

2. Approach

In order to collect the information, a survey[4] was sent out in December 2014 to STAGE-STE partners in the eight countries which had signed letters of support to the programme, namely:

- Cyprus
- France
- Germany
- Italy
- Portugal
- Spain
- Switzerland
- UK

Although all partners were involved, certain partners took the lead in their respective countries, namely CNRS in France, ENEA in Italy, PSI in Switzerland, CIEMAT in Spain, LNEG in Portugal, DLR in Germany (while CRAN and CyI were the sole STAGE-STE partners in their respective countries, UK and Cyprus).

In addition to contributing to D2.1, the survey contributes information to two of the three Key Performance Indicators linked to Work Package 2, as laid out in Table 1 below.

[3] Renewable Energy Directive: http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:32009L0028

[4] Link to the survey: https://docs.google.com/forms/d/1rL_ZwtM85vlM18RQQ36af_5NNdArD-uByeaWES287wo/edit

Table 1. KPIs related to STAGE-STE Deliverable 2.1

KPI no.	KPI description	2014 year value
KPI_1	Number of national research programmes contributing to the long-term R&D strategy defined at EU level	
KPI_2	Total budget from national research programmes contributing to the long-term R&D strategy defined at EU level	

3. Results

The results of the survey reveal that support for STE/CSP research is often not explicitly mentioned in national programmes, although often the field can fall under broader thematic categories. CSP was already a minor part of the Integrated Roadmap, and as it turns out, there are no dedicated national programmes in most of the participating countries. It is important to mention that the information given corresponds only to the best estimates of the partners, and especially when it comes to funding issues, the information can only be ranked into broad categories, without great precision.

Table 2. Does your country have a national STE research programme?

Country	Answer
France	Yes
Switzerland	Yes
Italy[5]	Yes
UK	No
Spain[6]	Yes
Cyprus	No
Portugal	Yes
Germany	Yes

It is important to clarify that of the countries which answered "yes", there was not necessarily a dedicated STE research programme *per se*, but rather STE was a component of a wider national energy research programme. For example, in Spain, R&D projects with topics related to STE can be submitted to the Calls of the Plan Estatal de Investigación Científica y Técnica y de Innovación[7] 2013-2016 (National Program for Scientific Research and Technical

[5] In Italy, STE research is included in the "Accordo di Programma Ricerca di Sistema Elettrico"

[6] Although not a dedicated programme, STE research in Spain is included in the overall National R&D Programme

[7] http://www.boe.es/boe/dias/2013/10/02/pdfs/BOE-A-2013-10258.pdf

innovation). This national program is composed of four Categories, which are in turn divided into Sub-programs with specific objectives. The Spanish Government provides funds to R&D projects through the Calls launched within the several Sub-programmes. Since the scope of the Calls of this National Program includes many different subjects (materials, industrial processes, renewable energies) there is no specific Call for STE-related projects, but R&D projects related to STE can be proposed. The four Categories of this National Spanish Program are:

a) Programa Estatal de Promoción del Talento y su Empleabilidad
b) Programa Estatal de Fomento de la Investigación Científica y Técnica de Excelencia[8]
c) Programa Estatal de Impulso al Liderazgo Empresarial en I+D+I; and
d) Programa Estatal de I+D+I Orientada a los Retos de la Sociedad[9]

Program b), which is the most related one to STE topics, is composed of four sub-programs, but nowhere is CSP/STE mentioned explicitly. Indeed, these calls are very general and cover many different technologies (e.g. materials, energy saving, technology improvement, renewable energies etc.). In fact, other renewable energies are also not specifically mentioned. The four sub-programs are:

1) Generation of Knowledge;
2) Development of emerging technologies;
3) Institutional strength; and
4) Scientific infrastructures and equipment

In Italy also, STE features in the "Accordo di Programma Ricerca di Sistema Elettrico" (created by the Ministry of Economic Development) rather than as a stand-alone theme. The 2012-2014 report[10] on this wider national programme, details the broad orientations taken in this respect. This programme includes the following orientations for STE research: Concentrated Solar Power (CSP), Materials for solar receivers and STE components. Beyond the national picture, there is some amount of regional variation. In Italy, the main regions involved in STE are Autonomous Province of Trento, Sardinia, Sicily and Puglia. The topics connected with the STE are present included in the other regional programs where it is present the theme of smart grid. The development of the STE technologies is present also in the "Programma Nazionale della Ricerca" 2011-2013 of the Italian Ministry of University and Research.

In France, there was in 2011 a financing programme by the environment and energy agency (ADEME) for CSP, totalling 19 million Euros spread out over 4 projects. For 2014/2015, ADEME emitted two more calls: one for energy storage[11] and one for hybridisation[12]. All of

8 http://www.boe.es/boe/dias/2013/10/02/pdfs/BOE-A-2013-10258.pdf

9 http://www.boe.es/boe/dias/2013/10/02/pdfs/BOE-A-2013-10259.pdf

10 Italian energy research report 2012-2014: http://www.enea.it/it/produzione-scientifica/edizioni-enea/2014/ricerca-sistema-elettrico-accordoProgrammaMSE-ENEA2012-14

11 https://appelsaprojets.ademe.fr/aap/STOCK_CONV2013-41

12 https://appelsaprojets.ademe.fr/aap/AMIENR2014-21

these calls are under the umbrella of ADEME's financing package for demonstrations and technological platforms for renewable energies/low-carbon/green chemistry, for which an overall amount of 1,350 million Euros has been earmarked. However, as with the other case studies in this report, there is no dedicated budget line for CSP specifically. Rather, CSP competes with other forms of renewable energies. Similarly, the annual calls of the national research agency (ANR) relate to renewables in general, with no specific budget line for CSP.

In Portugal, although there is not a dedicated STE national research programme, STE R&D projects can be submitted to the calls for R&D projects (in all scientific domains) of Fundação para a Ciência e Tecnologia[13] (belonging to the Ministry of Education and Science). Additionally STE applied R&D projects developed with high participation of industry were able to apply to the old QREN programme and to the new Portugal 2020[14] programme. Additionally, the creation of a Research Infrastructure, INIESC, with the University of Evora and LNEG, dedicated to SEC (Solar Energy Concentration), has just been approved. The INIESC programme will set guidelines for R&D within the SEC area and is part of the national roadmap of research infrastructures. The following themes are possible to engage in under the national programme: Concentrated Solar Power (CSP), Thermal Energy Storage, Materials for solar receivers/STE components, solar fuels, CSP + Desalination (co-generation), Linear Focusing STE technologies, Point Focusing STE technologies. All the options ticked are mentioned in the INIESC programme. Solar fuels will be a later concern although they are already referred to in the programme.

Switzerland and Germany, on the other hand, seem to be unique in having a dedicated national research programme on STE. The Swiss programme, from the Swiss Federal Office of Energy (SFOE), on solar-thermal energy research is entitled "Industrial Use of Solar Energy[15]". It focuses on the advancement of solar thermochemistry, solar heat in industrial processes, and concentrated solar thermal power plants. In the field of solar thermochemistry, PSI and ETHZ are jointly researching high-temperature solar-driven chemical processes. The research goals emphasize solar thermochemical production of fuels such as splitting of CO_2 and H_2O for the production of CO and H_2, that is, syngas, which can be utilized for the industrial synthesis of renewable liquid hydrocarbon fuel. The main project supported by SFOE encompasses the development of solar thermochemical reactors for the dissociation of ZnO (10 kW prototype and 100 kW pilot plant, with the latter being successfully tested at the large solar furnace of PROMES-CNRS at Odeillo, France). Other activities include the solar processing of materials, such as carbothermic reduction of metal oxides for the production of metals, integrating solar heat into industrial production processes, and the development of high-temperature materials for use in solar applications. In the field of solar thermal power plants, projects are being developed in accordance with the needs and interests of industry, such as the layout of solar reflectors (heliostats), turbines, heat exchangers, and software and pilot installations. In Germany, CSP falls under the Renewable Energy section of the 6th Energy Research Programme of the Federal Government[16]. The national research programme

13 http://www.fct.pt/

14 https://www.portugal2020.pt/Portal2020

15 http://www.bfe.admin.ch/forschungindustriesolar/02362/index.html?lang=en

16 Renewable Energy Research Programme, Germany: https://www.ptj.de/renewable-energy

specifically includes reference to Concentrated Solar Power (CSP), Thermal Energy Storage, Linear Focusing STE technologies, Point Focusing STE technologies as well as to other renewables.

Whether or not a dedicated national programme exists, STE/CSP research still has a chance of being funded at the national level or using structural funds or other EC mechanisms if it is explicitly mentioned in the Smart Specialisation Strategy[17] (S3) of the country or of the region[18]. In this respect, we see a more positive picture, with four countries responding that this is the case: France, Italy, Spain and Cyprus (Table 3 below). Of course, in most cases, STE is listed as a sub-priority, for example as in Cyprus, where relevant key words such as renewable forms of energy, solar energy, Solar-thermal technology and energy storage/transfer are listed under the "Energy" priority sector[19]. In Spain, CSP is explicitly mentioned, while in Cyprus, the insertion of the actual term "CSP" still needs to be ratified by the Council of Ministers. In other cases, as in Germany and Portugal, where STE/CSP are not explicitly mentioned, there is still scope for research funding under related broader categories (e.g. in Germany, under Sustainable economy & energy > energy research > energy storage and in Portugal under Transversal technologies and applications > Energy), but having STE/CSP explicitly mentioned is clearly an advantage. It is important to note that in Portugal, CSP is explicitly mentioned only in the Regional Strategies for Smart Specialization of Alentejo.

Table 3. Is STE research explicitly mentioned as a priority in the Smart Specialisation Strategy of your country?

Country	Answer
France	Yes
Switzerland	No
Italy	Yes
UK	No
Spain	Yes
Cyprus	Yes
Portugal	Yes[20]
Germany	No

[17] S3 platform: http://s3platform.jrc.ec.europa.eu/home;jsessionid=3GT2JHbQhB61cZQCWvRhn2SvvlLMdxmfztKqW2nzQfGbyCgW2DvQ!-1909119918!1422351168434

[18] Cyprus is a special case in the sense that it is considered both a country AND a region

[19] It is important to add that the fate of CSP under this priority sector in the Cyprus S3 strategy has yet to be clarified by the national authorities

[20] The Portuguese S3 strategy references to STE are at the level of the Regional S3 of the Alentejo region, not the national one

In addition, when funding for research is available, the competent authority varies from country to country. In Cyprus, funding opportunities exist from the Directorate General for European Programmes, Coordination and Development (DGEPCD), the Research Promotion Foundation, with policy and programmatic support for all forms of RES from the Energy Service[21] of the Ministry of Commerce, Industry and Tourism. In Switzerland, Italy, the UK and Spain, the responsibility for supporting this type of research falls under relevant Energy Authorities (Table 4), or indeed is split between different government departments, which may have different priorities, thus making drawing a coherent picture all the more difficult. This also makes the multi-stakeholder National Working Groups, which are being planned or developed as part of STAGE-STE WP2 all the more important, not only in order to promote a more integrated approach to CSP research within each country, but also between the different European countries involved in such programmes. At the national level, these working groups would help to harmonise interests in the spheres of economics, industrial development and research, thus enabling STE to contribute to the knowledge economy of participating countries, as well as encouraging inter-regional cooperation in the field. The exploratory meetings ahead of the creation of these national working groups have helped to create contacts at the government level, and to draw awareness in policy-making circles to the importance of STE and CSP research as a contribution to the sustainable economic development of the countries involved. For example, an exploratory meeting in the UK with the Department of Energy and Climate Change (DECC) not only helped inform them about this relatively unknown field but resulted in a pledge to discuss the possibility of supporting STE/CSP research with UK research funding agencies in future rounds of discussions. Perhaps unrelated, but a significant development nevertheless, the DECC funding for "Energy Technical Specialists Framework" was announced in December 2014 with the inclusion of a request for specialists in Solar Thermal Energy. Within the technical brief was included a need for expert advice in "Large scale concentrated solar systems". This is the first instance of UK funding for Concentrating Solar Thermal activities.

[21] Cyprus Energy Service: http://www.mcit.gov.cy/mcit/mcit.nsf/dmlenergyservice_en/dmlenergyservice_en?OpenDocument

Table 4. What is the competent funding authority for STE research in your country?

Country	Funding authority
France	Agence de l'environnement et de la maîtrise de l'énergie[22] (ADEME) and Agence Nationale de Recherche[23] (ANR).
Switzerland	Swiss Federal Office of Energy[24] (SFOE) and Swiss Federal Office for Professional Education and Technology[25] (SBFI), through funding of the Commission for Technology and Innovation[26] (KTI)
Italy	Ministry of Universities, Education and Research[27] (MIUR), Ministry of Economic Development[28] (MISE), as well as regional administrations
UK	Department of Energy and Climate Change [29](DECC), Engineering and Physical Sciences Research Council[30] (EPSRC), Innovate UK[31] (Technology Strategy Board)
Spain	Ministry of Economy and Competitiveness[32] (MINECO) (R+D) and CDTI (Centre for the development of industrial technology[33])
Cyprus	Directorate General for European Programmes, Coordination and Development[34] (DGEPCD), Research Promotion Foundation[35] (RPF)
Portugal	Foundation for Science and Technology[36] (FCT). Some funds are also available through the Minsitry of Economy (e.g. funds for industrial R&DI through "Portugal 2020")
Germany	Federal Ministry for Economic Affairs and Energy[37]

[22] France ADEME: http://www.ademe.fr/

[23] France ANR: http://www.agence-nationale-recherche.fr/

[24] Switzerland SFOE: http://www.bfe.admin.ch/?lang=en

[25] Switzerland SBFI: http://www.sbfi.admin.ch/

[26] Switzerland KTI: www.kti.admin.ch

[27] Italy MIUR: http://www.research.org.cy/EN/index.html/

[28] Italy MISE: http://www.research.org.cy/EN/index.html/

[29] UK DECC: https://www.gov.uk/government/organisations/department-of-energy-climate-change

[30] UK EPSRC: http://www.epsrc.ac.uk/

[31] Innovate UK: https://www.gov.uk/government/organisations/innovate-uk

[32] Spain MINECO: http://www.mineco.gob.es/

[33] Spain CDTI: www.cdti.es

[34] Cyprus DGEPCD: http://www.dgepcd.gov.cy/dgepcd/dgepcd.nsf/index_en/index_en?OpenDocument

[35] Cyprus RPF: http://www.research.org.cy/EN/index.html/

[36] Portugal FCT: http://www.fct.pt/

[37] Germany: http://www.bmwi.de/EN/root.html

In terms of funding dedicated to STE/CSP, of the participating countries, only Switzerland Portugal, Germany and Spain could confidently state that there is a pool of national funds dedicated by their governments for STE research. Thus, approximately 8 million Euros were set aside for this purpose in Switzerland (average of the years 2011 and 2012). In Spain, approximately 2.5 million Euros of National Funds were estimated for 2014 (it is estimated the same level of funding will continue in 2015). In Portugal, just under €800,000 was allocated between 2007 and 2014 (it is estimated this will expand to approximately €900,000/yr for the next 6 years). In Germany, a more substantial amount (Approx. €8 to 10 million) was allocated in 2014 for STE research, and this amount is expected to remain stable in 2015. In France, as discussed earlier, CSP competes with all other sources of renewable energy for research funding. Similarly, in Cyprus, there is also no explicit funding for STE research *per se*, although the government did provide co-funding for the STEP-EW project [38](Solar Thermal Production of Electricity and Water), an initiative which falls under the Cross-border cooperation programme "Greece – Cyprus 2007-2013" (co-financed by the ERDF and National Funds of Greece and Cyprus), and involving the construction of an experimental solar thermal cogeneration unit in Cyprus. The total project budget was €1.3 million, but only a minority of those funds (20%) were provided by the government of Cyprus. Participants from most of the countries in this study report a neutral or pessimistic outlook for 2015, presumably worsened by the falling prices of oil, which could lead to a further decrease in interest in alternative energies in general, the exception here being the UK, where a new grant scheme by DECC may lead to an increase in STE research funding.

In terms of leveraging structural funds, only Spain (approx. €1 million) and Portugal (<€900 000 between 2007 and 2014) reported having been able to do this in 2014 (approx. 1 million Euros), while only the UK (£500,000 – FP7), Portugal (<€500 000) and Spain (approx. €5 million) seem to have been able to raise significant FP7 funds for STE research in 2014.

The scarcity of funding specifically for STE is reflected also in the low number of research institutions involved in this field. France reports only 2 institutions (albeit the very large CNRS and CEA), while the UK has only one (Cranfield University), Cyprus 2 (CyI and the Cyprus University of Technology). Switzerland reports 6, although we were informed at the last STAGE-STE General Assembly meeting that one of the key Swiss partners, PSI, will be phasing out its Solar Technology Laboratory within the next three years. Similarly, Portugal reports at least 6 involved research institutions actively participating in CSP R&D projects. Only Italy and Spain seem to counter the trend, with a critical mass of 18 institutions involved in Spain, and 10 in Italy.

[38] STEP-EW: http://step-ew.eu

Table 5. How many research institutions are involved in STE in your country?

Country	Number
France	2
Switzerland	6
Italy	>10
UK	1
Spain	18
Cyprus	2
Portugal	>6
Germany	4 (plus partially some universities)

The number of active research projects in STE roughly follows the pattern of institutions involved in each country, except for Switzerland, which has only 6 institutions involved but 35 ongoing projects (at least as of 2013), and Germany, which with only about 4 institutions fully involved was handling more than 40 STE-related research projects in 2013.

Table 6. How many ongoing STE research projects exist in your country in 2014?

Country	Number
France	About 10 maximum (5-10)
Switzerland	35 (2013) incl. Solar Fuels
Italy	About 10
UK	5
Spain	30 (estimated)
Cyprus	5
Portugal	>6
Germany	>40

In the meantime, when a national research programme is made available by national governments for other renewable energy source research, Photovoltaics (PV) is mentioned as a key competitor, although in most cases, there simply are no national research programmes for any specific renewable technology research, rather, they have more general research programmes which allow for any energy research to take place under broad thematic categories. In terms of PV vs. STE, most countries reported that the balance of funding between the two lies somewhere between 0 and 25% for STE, except in Spain (26-50% for STE). In Switzerland, the balance lies 5:1 in favour of PV.

Table 7. Which of the other alternative energy research areas are specifically mentioned in your national research programmes?

Country	Number
France	Wind, tidal, hydro-electric, wave, geothermal, biofuels, nuclear, PV
Switzerland	Wind, Hydro-electric, Geothermal, Biofuels, Nuclear, PV
Italy	Biofuels, PV
UK	Wind, Solar PV
Spain	Wind, tidal, hydro-electric, wave, geothermal, biofuels, nuclear, PV
Cyprus	In the smart specialisation strategy: PV is explicitly mentioned (but other RES may be included in the final draft)
Portugal	Wind, Hydro-electric, Wave, Biofuels, PV
Germany	Wind, Wave, Geothermal, Biofuels, PV

In the overall energy mix, most respondents estimate that funding for STE in one form or another lies somewhere between 0 and 5% of the funding for renewables (and probably on the lower end of that spectrum). Only Germany estimates that more than 5% of funding for renewable energy research might be allocated for STE.

Table 8. Which would you say is the net % of investment in your country into STE research as compared to all other forms of alternative energy research?

Country	Number
France	0-5%
Switzerland	No estimate
Italy	0-5%
UK	0-5%
Spain	0-5%
Cyprus	0-5%
Portugal	0-5%
Germany	6-10%

4. Discussion

The picture painted in this study shows that STE research appears as a small field in Europe in terms of funding, the number of institutions involved, and the number of ongoing projects. However, the picture varies from country to country and region to region, with Germany, Spain and Switzerland emerging as the leaders in terms of efforts to support STE research, and the Autonomous Province of Trento, Sardinia, Sicily and Puglia (Italy) as well as

Alentejo (Portugal) emerging as among the most interested at the regional level[39].

Often STE research is possible under the national research programmes, and allowed by the Smart Specialisation Strategies, not as an explicit field, but implicitly fitting under various broad thematic categories. The decreasing price of oil may further decrease interest in renewable energy sources, including CSP. The industrial base, which could create demand for innovation in STE/CSP, is limited, including in the main driver Spain, where in 2012 a moratorium was declared on further support to renewable energy power plants (including STE)[40]. Moreover, the fragmented nature of the competent authorities with responsibility for STE research makes advocacy for change all the more difficult.

In the meantime, STE researchers will continue to look for financial support outside of the national boundaries, for example the industry-driven EUROGIA[41] calls (a cluster of the EUREKA network), which explicitly refer to CSP under the "Renewable Energies" thematic area. However, EUROGIA does not directly fund projects – rather, it applies to national authorities for funding, which leads back to the same issues mentioned earlier as regards national research programmes. Moreover, out of the 8 countries examined in this document, Cyprus, Italy and Switzerland are not among the supporting countries of EUROGIA. Similarly, the SOLAR-ERA.NET, an FP7-funded European network, has extended calls specifically for CSP as a contribution to the Solar Europe Industry Initiative (SEII), which is part of the SET-Plan. However, once again, the financial support emanates from national and regional funding bodies, and therefore must be in line with the national research programmes described earlier. This leads to a situation where some of the 8 countries examined do not support SOLAR-ERA.NET calls in the field of CSP or do not even take part in the network, for example Italy (although Autonomous Province of Trento, Sardinia, Sicily and Puglia are involved), Portugal, and the UK[42]. Another innovative financing instrument which could theoretically be leveraged are the NER300[43] grants, managed jointly by the European Commission, European Investment Bank and Member States, which subsidise installations of innovative renewable energy technology and carbon capture and storage (CCS), with explicit reference to Concentrated Solar Power. As a result of the second call in the Commission awarded €1 billion to 19 renewable energy projects across Europe, including two of the eight countries covered by this study: Cyprus (€60.2 million) and Italy (€40 million)[44]. However, this funding is geared more towards industrial/commercial installations rather than research *per se*. Nevertheless, this raises the need for deepening cooperation between the academic and commercial sectors.

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39 Cyprus is considered both a country and region for these purposes, and so can be added to this list

40 ESTELA, **2013**. *Set-Plan - Solar Thermal Electricity European Industrial Initiative (STE-EII) - Implementation Plan 2013-2015* (12 December 2013)

41 EUROGIA: http://www.eurogia.com

42 SOLAR-ERA.NET - Transnational Calls - PV3 and CSP3 - Guidelines for Proposers: http://www.solar-era.net/files/1814/2185/9309/SOLAR_ERA_NET_Transnational_Calls3_Guidelines_vs20150121.pdf

43 NER300: http://ec.europa.eu/clima/policies/lowcarbon/ner300/index_en.htm

44 European Commission press release, 8th July 2014: http://europa.eu/rapid/press-release_MEMO-14-465_en.htm

As such, it is all the more essential to establish the National Working Groups on STE which are planned under WP2 of STAGE-STE. The National Working Groups, bringing together academia, industry and national authorities, would be the ideal vehicle for advocating to the authorities the value of STE in the overall energy mix, and therefore the need for further applied STE research, in particular in order to make STE more attractive economically, by following the orientations set out by ESTELA:

- Reduction of generation, operation and maintenance costs
- Improvement of operational flexibility and energy dispatchability
- Improvement of the environmental footprint
- Advanced concepts and designs

In the absence of progress in these four objectives, advocating for more awareness and support for STE research could be an uphill struggle, as exemplified by the slow progress in establishing these working groups, which itself is in part due to the lack of knowledge and/or interest on the part of the national authorities. Yet without support or incentives (e.g. more generous feed-in tariffs), those objectives will be all the more difficult to achieve.