

Socio-political acceptance findings

**Authors: Elisabeth Dütschke, Uta Burghard (Fraunhofer ISI),
Christian Oltra, Roser Sala, Sergi Lopez (CIEMAT)**

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Project Coordinator

CIEMAT, Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas



Work Package Coordinator

CIEMAT, Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas



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ABOUT THE PROJECT

In the light of the EU 2030 Climate and Energy framework, *MUSTEC- Market uptake of Solar Thermal Electricity through Cooperation* aims to explore and propose concrete solutions to overcome the various factors that hinder the *deployment* of concentrated solar power (*CSP*) projects in Southern Europe capable of supplying renewable electricity on demand to Central and Northern European countries. To do so, the project will analyse the *drivers and barriers* to CSP deployment and renewable energy (RE) cooperation in Europe, identify future CSP *cooperation opportunities* and will propose a set of concrete *measures* to *unlock the existing potential*. To achieve these objectives, MUSTEC will build on the experience and knowledge generated around the cooperation mechanisms and CSP industry developments building on concrete CSP *case studies*. Thereby we will consider the present and future European energy market design and policies as well as the value of CSP at electricity markets and related economic and environmental benefits. In this respect, MUSTEC combines a dedicated, comprehensive and multi-disciplinary analysis of past, present and future CSP cooperation opportunities with a constant *engagement* and *consultation* with *policy makers* and *market participants*. This will be achieved through an intense and continuous *stakeholder dialogue* and by establishing a tailor-made *knowledge sharing network*.

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1 INTRODUCTION: SOCIAL ACCEPTANCE AND ACTOR NETWORKS

This deliverable reports on the findings from Task 3.2 which focuses on the socio-political acceptance of the implementation of cooperation projects of the RES Directive to supply electricity from Concentrated Solar Power (CSP) plants in the South of Europe to Central and Northern Europe (for an overview on cooperation mechanisms see Caldés, Lechón, Rodríguez, & del Río, 2018). The objective of this task is to provide a comprehensive picture of the views of the different stakeholders on cooperation mechanisms for CSP. This deliverable builds on earlier work in the project, especially deliverable 3.1 and deliverables from WP4. It will contribute to the implementation of further work in the project, more specifically task 3.3, the survey on public acceptance, and 3.4, the causal mapping exercise, including a Delphi study that will be performed in close cooperation with WP7 on the policy pathways.

As concluded in deliverable 3.1 (Dütschke, Choi, Sala, & Oltra, 2018) both the innovation system of CSP as well as its social acceptance have been heavily underresearched. Thus, the empirical work in this deliverable takes an exploratory approach regarding the social acceptance of CSP. Discussions around the future deployment of CSP point to the relevance of cross-country cooperation (Caldés-Gómez, N., Díaz-Vázquez, A.R., 2018) where CSP might be installed to generate electricity in Southern Europe in order to fulfil needs for carbon free electricity in Central or Northern Europe.¹ This notion is therefore taken as a starting point for the research into social acceptance.

From a theoretical point of view, this deliverable builds on the concepts which were in the focus of deliverable 3.1, i.e. it is informed by literature on socio-technical transitions as well as the technological innovation system (TIS) (Hekkert, Negro, Heimeriks, & Harmsen, 2011). This is combined with a broad concept of social acceptance (Upham, Oltra, & Boso, 2015), which aims at capturing the societal embedding of the CSP system and the implementation of cooperation mechanisms.

Renewable energy cooperation could play an important role in the energy transition in the EU, taking advantage of trade within the internal market, safeguarding security of energy supply, coordinating climate adaptation measures and optimizing the cost-effectiveness of actions (Caldés et al., 2018). It is for these reasons that the EU wants to promote the use of cooperation mechanisms (such as joint projects) between member states, where the resources are most abundant, where the overall system costs would be minimized or where overall social benefits would be maximized (e.g.: increased security of supply, GHG savings, avoided local air pollution, employment effects, innovation effects, etc.) (European Commission DG-ENER, 2018). However, despite the expected benefits of these mechanisms, several barriers and, possible, lack of active support by decision makers and stakeholders have prevented a wide use of the cooperation mechanisms among

¹ See also http://stage-ste.eu/workshop/presentations/1.%20Figueroa_STAGE-STE_Workshop.pdf

member states (MS), as demonstrated by their limited use since 2009 (see Caldés et al 2018 for further details).

CSP is a technological approach to generate energy by concentrating solar energy onto a heat medium. Its potential lies within sunny regions, i.e. in Southern Europe and further South (Caldés-Gómez, N., Díaz-Vázquez, A.R., 2018). It also has the advantage of providing non-fluctuating renewable electricity due to a possible combination with thermal storage. Currently, four CSP technologies compete against each other, partly in different markets. Parabolic trough and solar tower have reached the commercial stage, while Fresnel systems and parabolic dish systems are in earlier stages of development (del Río, Peñasco, & Mir-Artigues, 2018). The installed capacity of CSP within Europe has remained on the same level since 2014 with nearly all installed capacity located in Spain (EurObserv'ER, 2018). Discussions around the future deployment of CSP often point to the relevance of cooperation mechanisms (Caldés-Gómez, N., Díaz-Vázquez, A.R., 2018) where it is assumed that CSP might be employed to generate electricity in Southern Europe in order to fulfil needs for carbon free electricity in Central or Northern Europe.

This deliverable is structured as follows: In the remaining sections of this first chapter, we summarize the conceptual starting point on social acceptance and on relevant actors and close by stating the research question for this deliverable. Chapter 2 outlines the methodology and explains the research design which consists of 53 semi-structured interviews in four countries. Chapter 3 then presents the findings starting with interviews on in Spain as a potential host country for CSP followed by results on Germany and the Netherlands as countries who might be interested in becoming importers. The chapter is then complemented by a discussion on results from France as a country through which the electricity would need to be transported in such a scenario and a European perspective. Finally, chapter 4 comprises discussion and conclusion.

1.1 Social acceptance of CSP and cooperation mechanisms

Social acceptance is defined as “a favourable or positive response (including attitude, intention, behaviour and – where appropriate - use) relating to a proposed or in situ technology or socio-technical system, by members of a given social unit (country or region, community or town and household, organisation)” (Upham et al., 2015, p. 102). To study acceptance it is further helpful to relate to the categorisation by Wüstenhagen et al. (2007) who differentiate socio-political, local and market acceptance as dimensions of acceptance. *Socio-political acceptance* refers to the general societal climate towards a technology or innovation within a society, i.e. it relates to typical discussions about a topic or socially desirable opinions. Socio-political acceptance is shaped and mirrored by opinion leaders, poll data, media and alike. *Community acceptance* is mostly relevant for siting decisions and refers to the attitudes and behaviours exhibited by neighbours of installations or others somehow affected by an innovation or technology without actually using it. *Market acceptance* refers to the acceptance of a technology that is manifested by market actors, i.e. supply and demand side as well as intermediate actors like installers, consultants etc. Social acceptance is manifested in the attitudes, affects and actions of individuals and groups and is

therefore closely linked to both individual and collective actors. Table 1 applies the concept of social acceptance to CSP and cooperation mechanisms and points to potentially relevant actors.

Table 1 Social acceptance for CSP and cooperation mechanisms - dimensions, aspects and actors

Acceptance dimension	Aspects for CSP and cooperation mechanisms	Relevant actors
Socio-political acceptance	For CSP and cooperation mechanisms socio-political acceptance in all countries involved is relevant, i.e. in the countries providing electricity by CSP, the countries through which the electricity is transferred as well as finally in those countries where the electricity is consumed.	The public; voters; opinion leaders from politics, industry and society in general; media
Community acceptance	For CSP, these are inhabitants in sight of a CSP power plant or those living along transmission lines connecting CSP power plants in Southern Europe with more Northern regions. Regarding the cooperation mechanisms, community acceptance is less relevant.	Neighbours / inhabitants of affected areas; local and regional policy makers and administration representatives
Market acceptance	The diffusion of CSP, from a market perspective, includes acceptance by those developing and providing the technology, those actually implementing it and, on the demand side, those using the energy generated. The acceptance of cooperation mechanisms more generally depends on the market structure and price/cost structures of the energy market.	Suppliers (component manufacturers, project developers) including intermediate actors like installers, consultants, but also Distribution System Operators (DSOs) and Transmission System Operators (TSOs) as well as on the demand side utilities and energy consumers including households but also industry

Relatively little literature has looked into the acceptance of CSP and / or cooperation mechanisms or taken a broader systematic view on the stakeholder structure (Dütschke et al., 2018). The few exceptions to this include a paper by del Río et al. (2018) who study the drivers and barriers of CSP in Europe. In their conceptual outline, they discuss *community acceptance* of CSP. Setting up CSP leads to job creation, mainly during project development, i.e. from construction to operation which could trigger positive opinions among citizens by improving quality of (economic) life if this part of the value chain is realised in the same countries as the installations are set up (Caldés-Gómez, N.,

Díaz-Vázquez, A.R., 2018). One of the potential downsides of CSP on the community level are the local environmental impacts, i.e. land occupancy, water availability and impact on the landscape as well as the visual intrusion especially by towers (del Río et al., 2018). So far, most installations are located in relatively "arid and uninhabited zones without much ecological or touristic value" (p. 1025) and no negative local feedback has been recorded. Several incidents of local opposition to CSP have been reported in Italy, but this has not been studied in detail so far. Furthermore, experts surveyed by del Río et al. (2018) regard community acceptance neither as a driver nor a barrier to CSP. The only study that empirically analysed community acceptance of CSP was published by Hanger et al. (2016). They surveyed 232 inhabitants from Ouarzazate in Morocco during the early construction phase of Noor I, a Moroccan CSP-plant and one of the flagship projects in the area. They find overwhelming support towards the installation, mainly due to the perceived positive or neutral effects on the environment.

The literature on acceptance of cooperation mechanisms for renewable energy in Europe is even more limited. Cooperation mechanisms were officially proposed by the European Commission (cf. RES Directive 2009/28/EC) as a possible instrument for countries to reach goals in decarbonising the energy sector and include four types, namely statistical transfers, joint projects between EU member states, joint projects with third countries and joint support schemes. So far, there has been little use of cooperation mechanisms. A recent report by Caldés-Gómez and Díaz-Vázquez (2018) comes to the conclusion that there is some probability that countries like Luxembourg, Ireland, the Netherlands, Cyprus, Germany, Malta, and the UK might be interested in using cooperation mechanisms to fulfil their renewable energy goals as these countries are likely to miss their 2020 goals (Caldés, del Río, Lechón, & Gerbeti, 2019). Currently, negotiations for European regulation on increasing the shares of renewable energy sources beyond 2020 is ongoing. These discussions also comprise additional concepts like the mandatory opening of support schemes for other countries, as well as funding for cross-border RES cooperation as part of the Connecting Europe Facility (Caldés et al., 2019).

A recent expert survey among 19 representatives from EU Member States and a European stakeholder (Caldés et al., 2018; Caldés et al., 2019) points out, that socio-political acceptance is regarded as a crucial barrier in the implementation of cooperation mechanisms. Concerns on "Public reaction in offtaker country (investing taxpayers money abroad)" received the highest ratings on a list of potential drivers and barriers and therefore ranged over and above issues associated with economic, environmental, geo-political, legal², political and technical factors (Figure 1).

² The issue that was perceived as the second most relevant single issue related to legal factors and referred to "Heterogeneous regulated energy prices and support schemes across MS [Member States]".

PUBLIC ACCEPTANCE FACTORS	2009-2020	Post 2020
Public perception of energy security issues	-0,28	0,26
Public perception of environmental benefits	-0,12	0,22
Public perception of pro-European values (cooperation, integration, etc)	0,06	0,47
Public perception of socio-economic benefits (jobs, econ activity, etc)	-0,50	-0,16
Public reaction in host country (NIMBY)	-0,35	-1,06
Public reaction in off-taker country (ingesting taxpayers money abroad)	-1,56	-1,58
Public reaction in transit country (visual impact of electricity grid)	-0,63	-0,94

Figure 1 Expert evaluations of drivers and barriers on cooperation mechanisms concerning public acceptance. Figure slightly adapted from (Caldés et al., 2019)

If the issues rated were added up to factors, respondents indicated that currently political and legal factors are the strongest barrier. For the future, they expect this barrier to diminish and public acceptance to remain as a major barrier while environmental and economic factors will become strong drivers (see Figure 2).

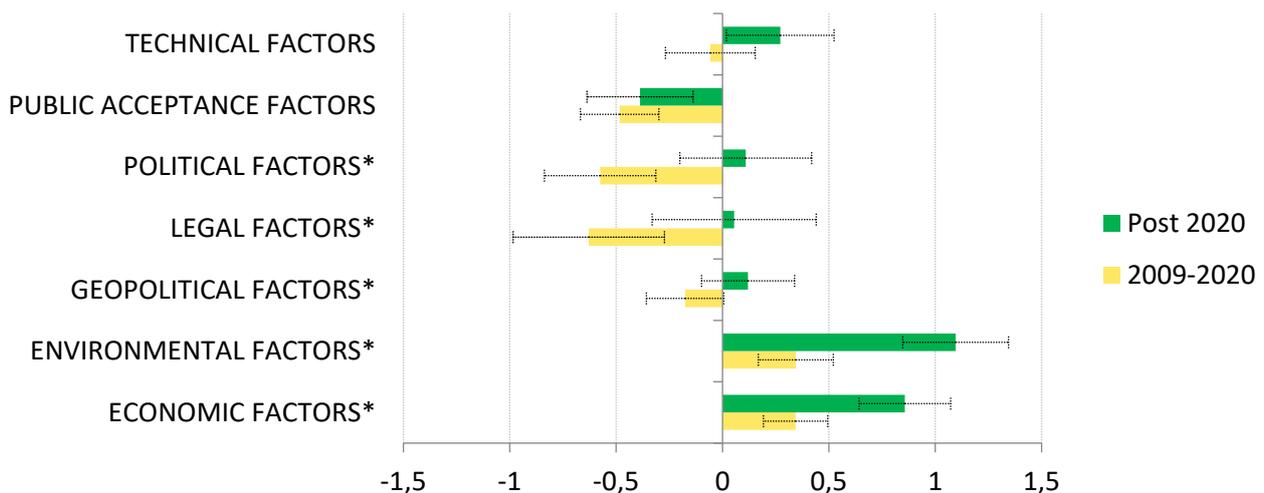


Figure 2 Expert evaluations of drivers and barriers on cooperation mechanisms on seven factors.

Note. Respondents were supposed to rate in how far certain issues, grouped into the factors, have influenced the use of the Cooperation Mechanism in their country on a scale from -3 (very important barrier), 0 (not relevant), +3 (very important driver). * indicate a significant difference between ratings for 2009-2020 and post 2020. Figure from (Caldés et al., 2019).

In how far the concerns stated by the respondents are valid is difficult to evaluate. The only study known by the authors of this deliverable that provides empirical data on this question so far is from Sonnberger and Ruddat (2016). In a representative survey of over 2000 German households respondents were asked to say whether they prefer

- a. Closer cooperation in energy production in the EU, resulting in greater dependence on other EU states, but lower energy production costs.

- b. Less cooperation in energy production in the EU, resulting in lower dependence on other EU states, but higher energy production costs.

The response patterns do now allow for clear conclusions as both options were chosen by 47 % of response rates (6 % choosing ‘neither’).

To sum up, while few academic studies have looked into the social acceptance of CSP and cooperation mechanisms, there are some indications (Caldés et al., 2019) that a closer analysis of this topic is needed. While community acceptance for CSP does not seem to be an issue (however with a diverging view in the recent study by Caldés et al. (2019)), no research has looked into socio-political or market acceptance. For cooperation mechanisms, experts anticipate that socio-political acceptance especially in offtaker countries might be an issue.

1.2 Relevant actors

Studying social acceptance for CSP and cooperation mechanisms relates to studying the attitudes and behaviours of a variety of stakeholders (cf. Table 1). Deliverable 3.1 (Dütschke et al., 2018) drew on work using the concept of the Technical Innovation System (Hekkert et al., 2011) and developed a systematisation for identifying relevant actors in the CSP innovation system (Figure 3).

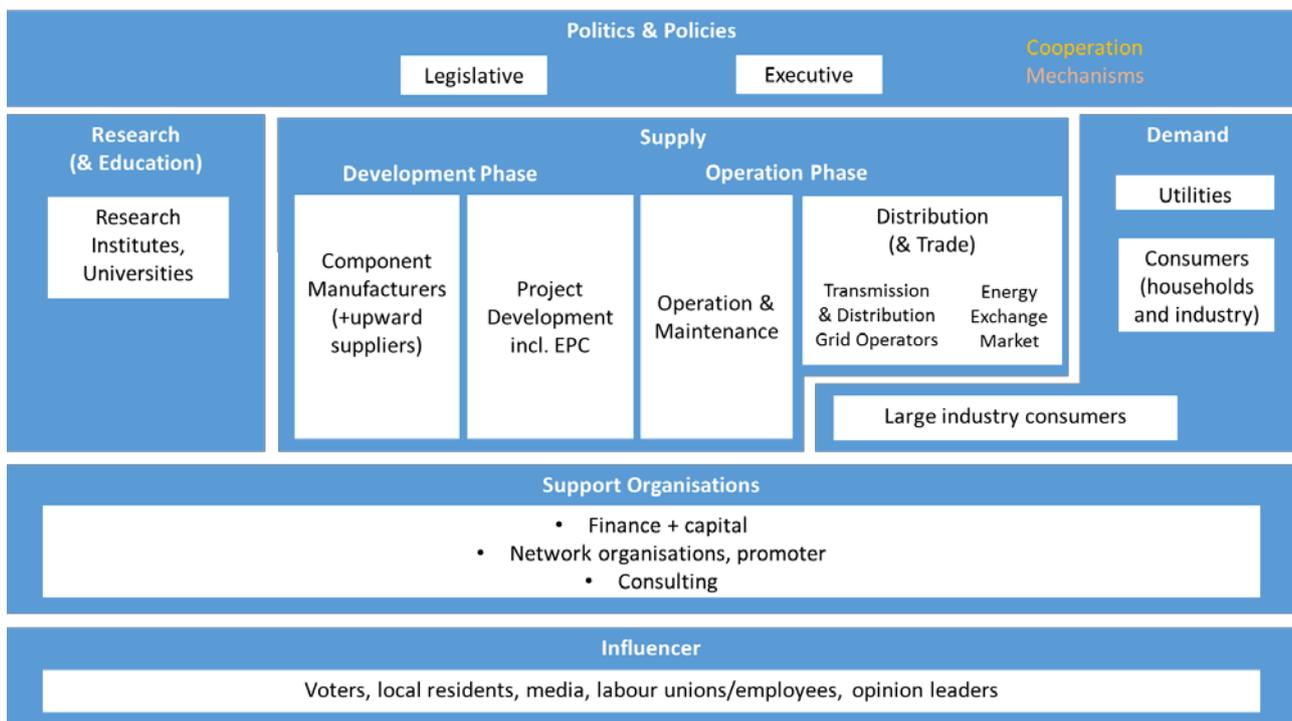


Figure 3 TIS actor systematisation for the CSP innovation system. Source: Own elaboration based on Hekkert et al. (2011)

The upper box refers to the category **Politics and Policy**, which distinguishes between legislative (e.g. national parliaments) and executive bodies (representing ministries and further administration). Relevant stakeholders from the executive side on the national level comprise the ministries for energy and economy in each country and the European Commission on the European level the European Commission, esp. the Directorate-General for Energy (DG Ener) as they enforce and regulate cooperation mechanisms and other CSP supportive policies. Further relevant political institutions are national regulators or grid agencies (like the German Bundesnetzagentur) and ACER, the Agency for the Cooperation on Energy Regulations, as well as the closely collaborating Council of European Energy Regulators (CEER) on the European level.

On the left, the actor category **Research & Education** is depicted. While research plays an important role for CSP regarding both technology development and diffusion, at this stage, it is not possible to tell which role education plays for advancing CSP, e.g. if there are professionals/experts lacking in a certain field. At this point, research institutes and universities, i.e. scientific institutions and their members, are relevant stakeholders in this block. The focus of research lies mainly in the further development of the technology but also deals with questions of suitable support policies.

The **Supply** block is divided into two steps: the **development phase** and the subsequent **operation phase**. The **development phase** includes all steps until a power plant is fully constructed and ready to run. It comprises the project development, including engineering, procurement and construction (EPC), and component manufacturing. The stakeholders on the project development side are usually the initiating project developers and the recruited EPC-partners with expertise in technology development, investment and organisation. According to del Río et al. (2018) those two roles are often covered by the same company. Once the construction of the plant is finished, the **operation phase** begins. The important stakeholders in this phase are the plant owners and the companies responsible for operation and maintenance.

An additional block concerns the **electricity distribution**. This includes energy exchange markets and transmission system operators, who do not classify as either supply or demand side of the electricity market, but are involved in the coordination of both. While energy exchange markets manage the financial side of the trade procedure, transmission grid operators ensure the technical viability. Since the electricity network load always needs to be balanced, the technical viability is especially challenging when intermittent sources are feeding into the grid. As CSP offers the possibility to store energy, it has the potential to be a baseload power source, which could reduce the complexity for grid operators. However, the local distribution grid operators might play a minor role in this distribution of CSP, as it is more a matter of long-distance and cross-border transportation.

Demand includes utilities and regular consumers, including both households and industry. Since large industrial consumers can also make contracts with CSP plant owners directly or implement CSP on site, they were added apart from the distribution organisation. Regarding the relevance of

this actor group, utilities are expected to have more of an impact in the innovation system and for the diffusion of CSP than consumers who buy electricity from utilities. However, the systematisation only roughly touches on the topic of electricity trade, as its complexity is beyond the scope of this deliverable.

The section of **Support Organisations** includes three subgroups, namely finance and capital, network organisations and promoters and consulting. Finance and capital include all investors, such as banks and private investors. Network organisations exist at the national and the European level and aim at promoting the development and adoption of CSP. Consulting can also play an important role for CSP, especially in the supply side. Many companies, who accompany the development and execution of new CSP projects, also offer consulting services for the various steps of the project development, including site selection, technology selection or financing.

An additional category is called **Influencers** and is placed underneath the other categories as a foundation. This group includes civil society as voters, local residents and employees/labour unions, media and other opinion leaders. Media also plays a role in this group by shaping opinions and providing information to the public.

For deliverable 3.1, a research was undertaken to identify as many actors as possible that are associated with CSP e.g. by participating in relevant events, projects or as members of network organisations (e.g. ESTELA). Overall, 278 stakeholders were identified. Despite the efforts to create a comprehensive or at least representative list, it is not to be regarded as complete but rather as a first draft that can be continuously adapted and complemented over the course of the project. Additionally, as all research was lead by Fraunhofer as a German partner in the consortium, there might be a slight bias overrepresenting German companies as well as actors sharing information in English or German. Overall, the majority of identified actors is from the supply side; additionally some research organisations appeared. Hardly any actors from the demand side came up. From a country perspective, the most frequent countries were Germany and Spain.

1.3 Research question and study approach

Social acceptance for a realization of CSP via cooperation mechanisms is likely to be a crucial challenge - at least this is suggested by earlier analyses (Caldés et al., 2019). Within the conceptualization of social acceptance as it is introduced in this paper, questions around socio-political acceptance (by national policy makers, industry stakeholders, influencers and voters) appear to be very high on the agenda. However, as with every energy infrastructure, local acceptance in the regions and communities potentially affected by these projects is also likely to play a role, especially if it does not only include building CSP plants, but also extending transmission lines which are already subject to heated debates. Regarding market acceptance, a first indication is given by the stakeholder research conducted for D3.1 (Dütschke et al., 2018) which was able to identify a network of companies and associations on the supply side but hardly any actors on the

demand side who actively associated with CSP. Overall, empirical evidence on social acceptance of CSP and of cooperation mechanisms is scarce so far. The study reported in this deliverable thus contributes to closing a gap in the literature.

More specifically, the objective of this report is to provide a comprehensive picture of the views, i.e. the social acceptance, of relevant stakeholders by consulting them on the main barriers and opportunities/enablers for the implementation of cooperation mechanisms for CSP. To identify relevant actor groups, the systematization developed in task 3.1 (see Figure 3) is applied.

A qualitative research approach is taken in order to ensure that no relevant issue is ignored which is a risk in standardized quantitative data collection formats. Additionally, as CSP does not seem to be a recent issue with some of the identified actor groups (e.g. the demand side or with influencers) a qualitative approach is more suitable to also integrate actors less interested in this topic.

2 METHODOLOGICAL APPROACH FOR THE INTERVIEW STUDY

2.1 Study design: countries and stakeholder categories

As outlined in chapter 3, the stakeholder study draws on socio-technical transitions perspectives and conceptualisations of social acceptance. Thus, the rationale being is not simply to understand stakeholder opinion per se, but to understand also the implications of that opinion for the success of joint projects to supply electricity from CSP plants in the South of Europe to Central and Northern Europe. A special focus is also on additional perceptions that stakeholders have on the positions of other stakeholders with implications for the different dimensions of acceptance (socio-political, local/community, market). With regard to operationalization, the objective of the study is therefore, from the point of view of operationalization, to grasp stakeholder views in detail from an attitudinal point of view. This also refers to the expectations and perceptions of the actors involved, and particularly in terms of what stakeholders see as the basic rationale for implementing CSP via cooperation mechanisms, and what hinders and what drives such an implementation.

As referred to above, a qualitative study approach is needed. The field under study is just at the beginning of being researched with social science methods and also in practice many stakeholders are not very familiar with the topic. The main strength of qualitative studies is that they enable an in-depth understanding about of complex systems, like the socio-technical innovation system of CSP. To support the free development and uptake of individual opinions from a variety of stakeholders, interviews were conducted. Compared to group formats to study acceptance, this has the advantage that people's perceptions do not influence each other. Additionally, interviews make it easier to integrate people who are less familiar or knowledgeable about the topic under study since they do not need to elaborate on their thoughts in front of others who they might perceive as experts. As the stakeholder analysis in D3.1 produced a focus on the supply system and as the literature seems to be scarce and restricted to expert discussions on a high level, it is very likely that several interviewees are not highly knowledgeable on the scenario under study.

Interviews were conducted in several countries since basic idea behind cooperation mechanisms is, that they are jointly implemented between countries. Crucial elements in such a cooperation mechanism are 1) a host country where the electricity generation takes place, 2) an offtaker country that fully or partly provides or backs up the investment into the facility by importing the electricity and 3) further countries and institutions involved, e.g. such as transit countries through which the electricity needs to be transported, as well as European institutions to support and facilitate the actual implementation. As a host country, the focus was on Spain as because it is the country where the innovation system for CSP is most advanced in Europe with several facilities realised and are in the production stage. As potential offtaker countries, in line with a longer list of potential receivers by Caldés-Gómez and Díaz-Vázquez (2018), Germany and the Netherlands were identified. Both countries will with some probability miss their 2020 goals (Caldés et al., 2019) and have already discussed or actually implemented cooperation mechanisms. As a transit country, France is then the logical choice from a geographic point of view because it would be relevant in both cases. Overall, such specific countries were also chosen as a way to make the discussed concepts more tangible in the interviews, in order to make the idea presented in the interviews more clearly shaped by referred to concrete examples for countries involved.

2.2 Interview guideline and implementation

A semi-structured interview guideline was developed to gather data regarding the specific research objectives of the study (see Annex). The interview guideline is supposed to ensure comparability across interviews, especially across countries and projects and thus also interviewers. However, the questions which are part of the guideline are open questions, i.e. interview partners do not have fixed options for answering them. This gives the interview partners the possibility to freely choose on which aspect they want to put an emphasis or which aspects they want to mention. Furthermore, the interviewer is also asked to spontaneously rephrase or add questions if the answers provided by the interview partner leave too much room for interpretation or are not fully clear. The following table gives an overview of the topics which were part of the interview guideline; the full guideline is provided as part of the annex.

The interview starts with an introductory part where the interviewer introduces her/himself and gives some general information about the objective and structure of the MUSTEC project. This is followed by an introduction to the purpose of the interviews and by ensuring informed consent through explaining procedures of data collection (e.g. recording the interviews), data documentation (interview summaries and transcripts), access to this data (restricted to researchers working on this task) and presentation of results (anonymized publication of findings). It also refers to rights of the interviewee, e.g. that their participation is voluntary, that they might skip questions or stop the interview at any time or withdraw their consent to participate.

- Problem perception: The interview started by asking interviewees what their basic understanding of the rationale behind implementing CSP by the use of cooperation

mechanisms would be - what do they think is the main problem that the implementation of joint projects can help with or is aims to solve? The situation of setting up a generation unit in Spain and importing the electricity to Germany or the Netherlands respectively was introduced to the interviewee as an exemplary case, that was also framed as an example for the interview and not a real development, stressing its fictional and exemplary character.

- Perception of benefits and costs: If interviewees did not have clear ideas what benefits and costs could be, a few examples were given to stimulate their thinking. The point of reference was always first on the national perspective of the interviewee.
- General attitude and conditions of acceptance: Then the interview moved on to elicit a personal evaluation.
- Perception of other societal actors: Subsequently, interviewees' view on their perceptions of other stakeholders were enquired. First they were asked to spontaneously mention relevant groups. If interviewees perceived this as confusing, examples were given.
- Trust and fairness issues: These were also raised if time allowed it. Often these were partly already discussed in the benefits and cost section.
- Preference for alternative options and future expectations were asked for in the last section of the interview.

The interview ended by allowing time for final comments and thanking interview partners for their time.

The interview guideline was developed by the researchers working on this task and reviewed by the coordinator. It was first written and discussed in English and then translated into the relevant languages, i.e. Spanish, German, Dutch and French. and Interviews were also conducted in these national languages by native speakers or speakers with a high proficiency level to keep the requirements for interviewees low and make it as convenient as possible for them to participate. The languages for analysis were German, English and Spanish according to the competencies of the research team. Therefore, additional people were included in the research team for interviewing in the Netherlands and France. The Dutch interviews were conducted by an experienced subcontractor, namely Duneworks. The French interviews were done by an advanced master student joining Fraunhofer ISI for an internship. In both cases, interviewers were intensively instructed about the procedure to ensure comparability across countries.

2.3 Sampling approach and actual sample

2.3.1 Selection of interviewees

Conducting studies with stakeholders requires more effort in recruiting participants than studying public opinion. In contrast, the stakeholder population for a given topic is not officially filed, thus, it

is not generally known how many individuals belong to that population and how it is composed. Our sampling was therefore deliberate and systematic rather than representative in a statistical sense. Interviewees and organisations were selected to reflect a range of positions in the relevant innovation systems. Conceptually, we drew on the work from D3.1 (Dütschke et al., 2018) for categories of relevant stakeholders (see also chapter 1). Regarding the number of interviewees, a compromise was made between practicalities (feasibility of implementation within a given time-frame) and scientific standards (e.g. preferably more than one interviewee per category to allow for a variation of opinions). This led to the following scheme for an intended composition of the sample (Table 2).

Table 2 Distribution and number of interviews intended to be conducted

Stakeholder Categories	Host Country	Transit	Offtaker country	European level	Sum
	ES Planned	FR Planned	DE Planned	Planned	
Policy makers and administration	2	2	2	1	7
Science and research	3	0	3	0	6
Technology providers and project developers (supply side)	3	0	3	0	6
Electricity grid operators (TSOs, DSOs)	1	2	1	0	4
Electricity consumers (incl. utilities, companies) (demand side)	0	0	2	0	2
Investors and support organisations	0	0	0	0	0
Influencers: other societal actors (e.g. NGOs, media, labour unions)	4	4	4	3	15
Local stakeholders and the local public	3	0	0	0	3
<i>Sum</i>	<i>16</i>	<i>8</i>	<i>15</i>	<i>5</i>	<i>58</i>

Specific interview partners for the categories were identified by drawing on the lists of stakeholders created in D3.1 (Dütschke et al., 2018). People to be contacted were chosen to ensure heterogeneity if possible (e.g. from science or industry) or due to their official function (e.g. in case of policy makers working in the relevant department of a ministry). Additional background information and contact data on promising interview partners was also retrieved from consortium partners.

2.3.2 Procedure

Arranging the interviews was usually predominantly done in the following way. At first, the stakeholder was contacted by sending him/her an e-mail. In this e-mail, the interviewer informed the (potential) interviewee on the objective of the study and on the interviews planned (duration, conducted by phone, confidentiality). If needed, (potential) interviewees were reminded by phone or email up to two times. If this did not lead to a response, the researchers looked for a replacement where possible.

Interviews were recorded to ensure quality and preciseness. This also enables the interviewer to focus on questioning and listening during the interview while nothing gets lost. If recording was not possible, as many notes as possible were taken during the interview and completed directly afterwards. This applied only to very rare cases, namely two. For some countries (Spain and Germany), full transcripts of the recording were done, for other countries (France, Netherlands) where for the purpose of analysis also translations of the interviews into English were needed, English interview summaries were used. These were written up by the respective researchers who conducted the interviews in these countries while listening to the recordings. An interview summary template in English was provided to these interviewers for this task. The structure of this document follows the interview guideline. The main answers on the relevant topics were to be summarised; direct quotes to be added on interesting or important parts.

2.3.3 Interviewee sample description

Table 3 Overview on interviews obtained according to stakeholder category and country

Stakeholder Categories	Identifier	Host Country	Transit	Offtaker country		EU	Sum
		ES	FR	DE	NL		
Policy makers and administration	Pol#no-#country	2		2	2	1	7
Science and research	Science#no- #country	1		4	3		8
Technology providers and project developers (supply side)	TechProv#no- #country	3		4	3	2	12
Electricity grid operators (TSOs, DSOs)	Grid#no-#country	1		1	1		3
Electricity consumers (incl. utilities, companies) (demand side)	Cons#no-#country	0		2	2		4
Investors and support organisations		0		0	0		0
Influencers: other societal actors (e.g. NGOs, media, labour unions)	SocInf#no- #country	4	5	2	4	2	17
Local stakeholders and the local public	Loc#no-#country	2		0	0		2
Sum		13	5	15	15	5	53

This section describes the basic characteristics of those actually interviewed, in terms of interviewee category and country. This is not a stratified, probability-based sample, but a purposeful sample focusing on different actors in the relevant innovations system. In sum, 53 actors from the relevant stakeholder groups were interviewed (Table 3). The final sample retains the typical characteristics of a qualitative study: it provides in depth information relative to a probability-based survey, here albeit on a relatively large scale, but the reader should be cautious about over-generalising when

drawing inferences. This said, where themes recur repeatedly across respondents, one can at least assume that they merit attention.

As shown in the table (Table 3), the actual participants in the interviews are nearly as planned (cp. Table 2). The main deviation emerged in France where it was not possible, in spite of considerable efforts, to recruit interview partners on the grid and / or political perspective. Table 3 also lists the identifiers that will be used in the results section to refer to specific interviews. Investors and support organisation were not included as they are the major target group of another interview study in the MUSTEC project (Del Río & Kiefer, 2018).

2.4 Coding and analysis

This section describes how the qualitative data has been coded with MaxQDA, software intended for the purpose. Coding is a key technique of content analysis, a broad approach used in the social sciences to interpret qualitative data such as interview transcripts. The coding approach used here is both quantitative and qualitative. While the conceptual framework was pre-determined, in that the frame mirrored the basic structure of the interview guideline, the analytic design also allowed for open coding – i.e. for new codes arising from the data to be added. In the analyses, numerical incidence is used as an indicator of relative salience and hence thematic prominence, helping to structure the presentation of results below. However, the focus is on a thematic analysis that tries to capture and describe lines of arguments and networks of topics from the point of view of the study participants and thereby trying to identify patterns that lead to overarching conclusions.

3 FINDINGS

The presentation of findings will start with Spain as a potential host country, followed by and then the findings on Germany and the Netherlands as potential offtaker countries are following. The analysis is structured similar to the interview guideline and starts with the problem perception. Next, perceived benefits and costs are displayed, followed by attitudes on the overall notion of CSP through cooperation mechanisms. As far as possible, it is outlined for the interviewees if their overall opinion is positive, negative, neutral or conditional. Afterwards acceptances conditions as outlined in the interviews are following, before a summary of the perceptions of the views of other actors are summarized. The last subsections refer to preferences for alternative options and future expectations.

3.1 Spain as a potential host country

Problem perception

One first dimension in the configuration of stakeholders' acceptance of cooperation projects to supply electricity from CSP plants in the South of Europe to Central and Northern European countries is the perception of the problem that these mechanisms aim to solve. The interviewees in

Spain differ in their perception of the initial problem that cooperation mechanisms aim to solve. The majority of interviewees clearly identify the need of decarbonising the European economy and improving the exploitation of renewable energy generation in Europe as the main problems to be solved. Other interviewees focus on the problems facing the CSP industry in Europe, and others question the problem that these mechanisms seem to solve.

The majority of the interviewees identify the need to reduce CO₂ emissions, to decarbonise the European economy, as the main target of cooperation mechanisms of the RES Directive. Interviewees usually consider this a very relevant problem for Europe. As one interviewee from an environmental group states: “We agree with everything that promotes renewable energies” (SocInf6-Es). Another interviewee from the industry outlines the need to decarbonise the European economy at an affordable cost. S/he perceives that cooperation mechanisms as a global solution that can optimize the cost of decarbonisation. Interviewees tend to link cooperation mechanisms to a problem that they perceive needs to be solved.

The need to strengthen electricity interconnection in Europe and the European electricity market is another problem identified by the interviewees. Some interviewees perceive the need to integrate European energy grids as an important issue. One representative from an environmental group states that: “We are in favour of a better integration of electric networks at the European level” (SocInf5-Es). For others, the need to promote the interconnection between Spain and other European countries is a critical issue. It is perceived, that the interconnection of the grid in Spain is weak and that the EC objectives of grid interconnection are not going to be met. A member of the public administration states, in this context: “Spain is almost an island. We have a very weak interconnection. The objective for 2020 is for a 10% of interconnection. We are in a 2.8 in Spain” (Pol2-Es)

For other interviewees, the main problem is the lack of development of CSP technology in Europe. Cooperation mechanisms are framed as an opportunity for CSP technology to advance in its development and implementation in Europe. A member of the Spanish CSP industry discusses the need to promote CSP, as s/he perceives that there is no demand for electricity generated from CSP in Spain (see Table 4). Other interviewees also share this view: cooperation mechanisms of the RES Directive are a clear opportunity to solve the problems facing the CSP industry in Spain. A representative from a regional energy agency in Spain states that the interest about in cooperation mechanisms in their region was raised initially by the CSP industry.

Finally, one interviewee rejects the importance of the main problem that s/he perceives these cooperation mechanisms aim to solve. S/he thinks that the EC wants to balance the system, so the excess in renewable energy generated in one country is sent to another country. In his/her opinion, the main problem facing Europe is the transition to a locally based renewable system, and the integration of the European electricity system. In this sense, s/he feels that joint projects for CSP are not the solution.

Table 4 Problem perception from the Spanish interviewee perspective

Problem	Extract
Need to transition to a renewable system	<p>“The main issue is the development of clean energy sources to fight against a climate change, so if it can be done even faster, I think this is great” (SocInf1-Es)</p> <p>“In short, everything that contributes to raising the objectives of renewables in the European Union...this is a great instrument” (SocInf4-Es)</p>
Need to improve electricity interconnection	<p>“Spain is almost an island. We have a very weak interconnection. The objective for 2020 is for a 10% of interconnection. We are in a 2.8 in Spain” (Pol2-Es)</p>
Need to promote CSP technologies	<p>“Joint projects would allow moving more quickly in the development of solar thermal technology in the sense that solar thermal technology can satisfy the demand of green electricity from other countries that Spain does not have today”. (Sup1-Es)</p>

Perceived benefits

There are two main benefits of using Cooperation Mechanisms for CSP according to our interviewees in Spain (Table 5): first, the local socio-economic benefits derived from the construction of CSP plants in the host country; second, the promotion of CSP technology. Other relevant benefits include the decarbonisation of the offtaker country, the reduction in the costs of renewables and the contribution to the European energy integration.

The majority of the interviewees highlights the potential local and regional socio-economic benefits of using cooperation mechanisms for CSP. Interviewees believe that the use of the mechanisms would involve the construction of CSP power plants, which, in turn, would foster economic development and employment generation in the regions hosting the power plants. One representative of a local electricity generation company states that the building of a thermosolar power plant generates not only direct job creation, but also an indirect local economic development through the creation of auxiliary small companies (TechProv2-Es). Various representatives from environmental groups and the industry also perceive that the main benefit of promoting these mechanisms are job creation and regional economic development due to the installation of CSP power plants. One representative from a research organisation states that even if the local job creation associated with the building of a CSP plant is limited, there are indirect economic benefits associated with the generation of a new and more advanced industrial local sector.

Another benefit of cooperation mechanisms for CSP is, according to the interviewees, the promotion of CSP technology in Spain and Europe. The majority of interviewees have a positive attitude towards CSP technology and think that cooperation mechanisms could foster its development and adoption. Interviewees associated with the CSP industry believe that these mechanisms can allow the “re-birth” of the CSP industry in Spain, weakened after 2013 when the renewable support schemes were changed. Some interviewees state that cooperation mechanisms are a critical opportunity for CSP technology to keep developing in Europe. In general, the interviewed non-industrial experts agree that cooperation mechanisms would foster the European leadership in the CSP industry. Furthermore, as one interviewee argues, everything that fosters the development of renewable energies is, in principle, positive. Technology leadership in renewable generation is generally considered a critical benefit of cooperation mechanisms.

Other benefits linked to cooperation mechanisms for CSP are the reduction of CO₂ emissions in the electricity generation as well as the possibility of fostering European integration and European energy security. Two interviewees refer to helping in the decarbonisation of the offtaker country as a relevant benefit of cooperation based on CSP. If CSP plants are built in Spain and electricity is sent to Germany, interviewees argue that this would help reducing emissions in Germany in particular and in Europe in general. These interviewees also refer to the idea of fostering the European integration as well as energy security by cooperating between European countries and regions. However, overall, interviewees focus on the potential benefits for the host country and CSP technology, and pay less attention to the potential benefits for the offtaker country and Europe as a whole.

Table 5 Perceived benefits from a Spanish perspective

Benefit	Extract
Local socio-economic benefits in host country	<p>“CSP plants create an industrial network around them...there are a lot of auxiliary companies, many subcontracted companies. In areas that are not so industrial because in the end these plants need land and the land is usually found in more rural areas. It begins to form small auxiliary companies, insulation, electrical, mechanical maintenance and such, to provide service. For example, each thermo solar plant of 50 MW has contracted between 40 and 50 fixed people. Within renewable energy technologies is one of the employment-intensive technologies. And then, in addition, the type of these contracts are highly qualified and specialized. In the period between 2009 and 2012, which was where most of the plants were built, almost 50% of the engineers who left the school worked directly or indirectly for this sector. This has very important benefits” (Po1-ES).</p> <p>“There are also gains, for example, in terms of plant development in Spain, we have seen that the surrounding villages do win in technology, they do</p>

develop a whole network of more specialized industry, with greater added value or greater specialization, then there is a gain. It is true that they are not very intensive in employment, either... there is not much employment in the building of the plant. But in terms of maintenance, is true that there is an influence around higher quality in supply for maintenance, maintenance of more sophisticated machinery and other indirect benefits associated with almost any industrial process” (Science1-ES).

Promotion of CSP. Technological development.	<p>“The main benefit that the thermo solar industry stays here in our country, right? So, currently, due to certain circumstances, thermo solar installations are not being carried out in Europe, they are being carried out in other countries of the world and, logically, with all this technological innovation, they are moving to other places where the hegemony in this research was lost a bit”. (Pol1-ES)</p> <p>“A clear objective would be the development ... the leadership, the technological leadership of the European Union, to me these transnational projects seem vital, to me it seems vital”. (SociInf4-ES)</p>
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European integration	<p>“If we think about Germany, that is making a debatable transition in these years...we can provide solutions from Spain to make the German model cleaner, it seems essential to me. And above all if thanks to these projects we reinforce, we densify the European project, you have, let's say, that complementary benefit that I think is especially sensitive at the moment” (Cons1-ES)</p>
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Decarbonisation of off taker	<p>“For Spain I think it is clear, this could be the main instrument for rising the objectives for renewable generation in Spain” (SociInf4-ES)</p> <p>“Germany is getting clean energy from Spain and this has no inconveniences” (Cons1-ES)</p>
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Perceived costs

When the Spanish interviewees discuss the potential impacts and costs of cooperation mechanisms for CSP, they refer mainly to the potential local environmental local impacts of CSP plants, the need of for new grid infrastructure and the increase in the cost of electricity costs for the offtaker country (

Table 6). Other less mentioned costs include the potential increase in the cost of adoption of new renewable energy projects in the host country, a reduction in the consumption of renewable electricity in the host country, the dependence of offtaker countries on host countries, the possibility of creating a renewable bubble in the host-country, and the payment of subsidies in the host country for the generation of an electricity that will be exported. Limitations or costs associated with the mechanisms per se (in terms of design or their characteristics as a regulation) are less mentioned by the interviewees. Some of these issues will be covered in the section on conditions of acceptance.

Interviewees generally refer to the increase in the cost of electricity for the offtaker country as a main drawback of cooperation mechanisms for CSP. One interviewee from the regional administration (Pol1-ES) refers to the additional cost that the off taker would need to pay as a consequence of the higher price of the electricity generated by CSP as compared to electricity generated by conventional sources. S/he considers the need to study other mechanisms (e.g. public subsidies by the EU) to cover the additional costs. But s/he also believes that this might be a cost that the offtaker country should assume if the country wants to reach the renewable targets. For other interviewees, the additional cost should not be considered a major drawback of cooperation mechanisms given that producing clean energy has an additional cost but allows achieving renewable energy targets. However, generally, interviewees agree that this is a significant drawback of cooperation mechanisms for CSP.

The need for new grid infrastructure is also perceived as a main cost of fostering cooperation mechanisms for CSP. One representative from the public administration and one representative from an environmental group consider that it would be necessary to repower the entire high voltage power grid so that the transport of energy would be viable. And that this would mean an important investment that citizens in the host country would need to pay. One of the interviewees argues that the limited interconnections in the host country (s/he is referring to Spain) increase the need of back-up power generation that in turn increases the cost of the renewable electricity generation. As s/he states:

"... if this is not articulated and included it in the directives, then the effect that would occur is that Spanish consumers would be paying a lot, they would be paying for the integration of renewable electricity that would correspond to German consumers, in the case that it was a German investment. For that same level of investments, if the interconnections were higher the costs are reduced enough" (Pol2-ES)

Interviewees perceive that this (the difficulties in adding new interconnections to the existing electricity grid in Spain) is a drawback of the implementation of cooperation mechanisms.

Table 6 Perceived barriers from a Spanish perspective

Dimension	Extract
Increase in the cost of electricity for the off taker	“On the one hand, solar thermal generation today has higher costs than any other type of technology, in fact, and even than other renewable technologies. Then of course, this extra cost of generation would have to be assumed by the offtaker country, considering that the country is interested having renewable energy. This is an extra cost to generate with renewable energies, which makes the approach a bit difficult. Logically, the country that generates energy cannot lose profits or reduce the cost for the other to buy it cheaper” (Pol1-ES)
Impacts in the local environment	“Environmental aspects that always have to be taken care of, we have to monitor them and treat them in detail. Because of the large occupation of the land or the use of chemical products, right? It is one of the main risks we understand that it would have” (Sup1-ES)
Need for better interconnections	“In order for this energy to be transferred from Spain, the entire transport network must be upgraded so that it has the capacity to transport energy to France” (Pol2-ES)
Costs for consumers in the host country	<p>“What this implies is that the Spanish consumer would have to assume the costs to integrate renewables if you do not have interconnection, as the sun and the wind vary a lot, you need to have backup technologies, prepared to work on its own” (Pol2-ES)</p> <p>“Could it end up having an effect on the electricity bill of the final consumer or not? [...] Not necessarily. If things are done well, no ... Perhaps there could be one ... a quantification of the additional losses that that energy would imply in the national transmission networks that could be directly associated also with that energy dedicated to export. It would not necessarily have to suppose a higher cost in the electricity bill in the host country. There could even be cases where surpluses of that energy could also be used in the Iberian market if the shift demand was not "matched" in real time. Then it could even involve discounts on the Iberian market price” (TechProv1-ES)</p>
Cost for the energy system in Spain	“This will cause Spain to have difficulties to reach its own renewable targets if the more advanced sites with better resources, with better characteristics, participate in foreign auctions” (Pol2-ES)

Interviewees with more experience in the CSP industry refer to the potential environmental impacts derived from the installation of CSP plants. Two interviewees refer to the production of wastes from CSP power plants (linked to potentially severe environmental impacts), the problems associated with the use of land, and water consumption. Nevertheless, interviewees generally think that these are small and manageable impacts if properly handled by promoters and properly explained to the local populations. They argue that, overall, CSP plants have limited environmental impacts.

Other costs identified by the interviewees include the limitation in the penetration of renewable electricity in the host country. One interviewee (Pol2-ES) states that there is a risk that CSP plants built in the host country focus only on producing electricity for an offtaker country, reducing the renewable electricity available in the host country. Linked to this is the potential increase in the price of electricity for the citizens in the host country. Another interviewee argues that citizens in the host country could end up paying subsidies for an electricity to be exported, but also paying the need of back-up power and the cost of the infrastructure to improve the interconnection. In a sense, for some of the interviewees, cooperation mechanisms could produce an additional cost for taxpayers in the host-country. However, not all the interviewees agree on this. One representative from the industry (TechProv1-ES) states that if future cooperation mechanisms are well designed, they should not produce an increase in the cost of electricity for the citizens in the host country. S/he believes that the host country could even achieve a reduction in the cost of generating electricity via the participation in a joint project with CSP.

Attitude

Overall, the majority of the interviewees (12 of 13) in Spain have a positive attitude towards cooperation mechanisms for CSP. This positive attitude is grounded in various reasons (see Table 7): a positive view of cooperation between EU countries for the promotion of renewable energy, the expectation of local socio-economic benefits of developing new CSP projects, and the expectation of significant benefits for CSP technology.

For some interviewees, cooperation between countries in renewable energy is a good policy idea in itself, with many associated benefits in terms of decarbonisation and European integration and, therefore, worth promoting. A representative from an environmental group, for instance, states that:

"I think this is an absolutely necessary initiative for the three objectives that I mentioned earlier, the European Union's emission reduction commitments of 40% ... achieving that goal of renewables in 2030, throughout the European Union, makes these projects necessary. This type of initiatives would be essential and then if we aspire to make the European Union a world leader in renewable energy...this technological development is not it is possible if there are no transnational initiatives. " (SocInfl4-ES)

Other interviewees evaluate cooperation mechanisms as a good opportunity for the CSP industry. In a sense, any mechanism that potentially helps fostering the CSP industry and technology is

perceived as a very good option. This attitude is represented in the following excerpt from a representative of the CSP industry:

"We see these projects as an opportunity. Within the value chain of these CSP projects, we are a contractor that is trying to use the latest technologies within the construction of CSP plants and this an opportunity to expand the business and building plants dedicated to markets that are not necessarily where they are located (...) We are totally in favour, I think this is a very interesting opportunity." (TechProv1-ES)

Not all the interviewees hold a positive attitude towards cooperation mechanisms for CSP. One of the interviewees (Pol2-ES) expressed a neutral attitude towards cooperation mechanisms. S/he would accept the development of a cooperation project between Spain and Germany, but identifies a number of limitations to its development that limits his/her support for cooperation. Although not covered in depth in this report, the perception that there are significant barriers to the development of cooperation mechanisms seems to limit the support of some interviewees to joint projects. Another interviewee, an expert from a foundation linked to renewable energies, expressed a more negative attitude towards cooperation mechanisms, based on a preference for alternative solutions to cooperation between countries. S/he firmly believes that cooperation mechanisms are not the way to decarbonise Europe.

Table 7 Attitudes towards CSP with cooperation mechanism (Spain)

Interviewee	Attitude	Reasons
Pol1-ES	Very positive	Potential socioeconomic benefits for the region. S/he thinks that the local industry is very interested in CSP.
Science1-ES	Positive	S/he thinks it is a good idea to generate electricity in the countries where there is more radiation and then transport it to countries with less solar resources. S/he believes cooperation mechanisms are beneficial for both countries, a win-win situation.
Cons1-ES	Very positive	S/he thinks it is potentially beneficial for the off taker (decarbonisation) and the host country (promotion of renewable energies and socio-economic development).
Sup1-ES	Positive	Positive attitude as the mechanisms will allow demonstrating the value of the CSP. But his/her attitude is conditioned to the existence of political support.
SocInf1-ES	Positive	It favours a global vision of Europe. It does not matter where electricity is generated if it is renewable.

<i>Interviewee</i>	<i>Attitude</i>	<i>Reasons</i>
TechProv1-ES	Positive	It is a business opportunity for the CSP industry. S/he thinks the industry is trying to use the latest technologies within the construction of CSP plants and this is an opportunity to expand the business and build plants dedicated to markets in other countries different from the host country.
TechProv2-ES	Very positive	S/he thinks that Spain has the solar resource, the land and the water needed to promote CSP. S/he thinks that Extremadura is very positive about the installation of CSP power plants. It will benefit both the host and the off taker countries.
SocInf2-ES	Negative	It is necessary to favour the transition of each country towards renewable energies with the local resources available (there is biomass, hydraulic, wave energy). Local generation is the way, and not to make interconnections throughout Europe with the problems that this entails (losses, costs)
SocInf4-ES	Positive	Cooperation mechanisms can favour the development of renewables energies in Spain. S/he only fears the generation of a solar energy bubble.
SocInf5-ES	Positive	It is favourable to the integration of electricity networks at the European level, the generation of energy from renewable sources and to the exchange of energy between countries. Any mechanism that encourages the development of CSP is a good initiative
Pol2-ES	Neutral	He views a series of problems (difficulties) that have to be solved so that cooperation can be a reality. S/he considers that it is difficult to implement cooperation projects with the existing limitations.
SocInf6-ES	Positive but preference for alternative options.	S/he is in favour of the promotion of cooperation mechanisms for CSP if CSP power plants are installed on lands with no ecological value. His preference is for distributed generation.

Acceptance conditions

There are various conditions that the interviewees consider relevant for the acceptance of a joint project for CSP in Europe. They often refer to issues such as the existence of a real need for renewable electricity in the off taker country, the equal distribution of benefits and costs between

the offtaker and host country, the existence of political support, the impacts of the project on the local environment of the project and the technological design. Somehow, they refer to the three areas of potential importance for acceptance in a broader way than identified in our initial protocol:

- Participating member states. Only two interviewees refer to this condition. Generally, the interviewees are aware of the importance of this condition and assume that joint projects between countries with a common border are easier to implement. However, overall, they do not consider this as a critical condition for acceptance.
- Project parameters. The interviewees refer to a number of elements such as if there is a case for physical import of the electricity, the type of technology, implications for infrastructure/interconnectors and potential environmental impacts. Generally, issues related to project parameters are discussed as relevant by the interviewees.
- Risk sharing between the project parties. The balance in the distribution of costs and benefits between the host country and the off taker is considered of critical importance by some of the interviewees.

In Table 8 we have listed the conditions mentioned by each of the interviewees. The data from the interviews clearly show that conditions of acceptance vary significantly according to the type of stakeholder. Representatives from the industry tend to emphasize the need of stable regulatory regimes, political support and bilateral agreements between member states and, but also of good technological designs and a proper integration of CSP technologies in the electricity network.

Representatives from influencer groups refer to the need of an equal distribution of costs and benefits between the off taker and the host country, the existence of low environmental impacts, the avoidance of further costs for consumers in the host country and community engagement. They also refer to the existence of a real need in the offtaker country and a real integration of the European electricity grid. Some interviewees also consider the physical import of the electricity as an acceptance condition the physical import of the electricity. One interviewee, for instance, states:

"What is the contribution of a statistical transfer? We take the money from the Germans to make a plant here and the electricity is consumed here? And what is the benefit for the Germans? (...) We believe that it is much more interesting if there is physical transfer" (SocInf5-ES)

However, this view is not shared by all the interviewees.

Members of the public administration consider the existence of bilateral agreements between member states, the fact that the project does not introduce distortions in the electricity network in the host country and the consideration of potential costs for the consumers in the host country to be critical conditions. In this context, one interviewee states:

“...perhaps the most prudent thing to do is to start opening the instruments little by little, so we don’t cause serious problems, and that they are always be based on bilateral agreements, so the extra costs for the Spanish consumer is somehow considered...” (Pol2-ES).

Table 8 Acceptance conditions for CSP with cooperation mechanism (Spain)

Interviewee	Conditions of acceptance
Pol1-ES	<p>The host country is able to meet its renewable energy targets first.</p> <p>The project is based on a power plant with enough installed capacity</p> <p>The project does not introduce distortions in the energy network in the host country</p>
Science1-ES	<p>A good technological design. S/he considers that often CSP project do not meet the best standards</p> <p>Low environmental impacts of the CSP plant in the host-country.</p>
Cons1-ES	<p>Equal distribution of costs and benefits between the host and the offtaker countries</p> <p>Greater involvement of the local population in the projects.</p>
Sup1-ES	<p>Financial and institutional support</p> <p>Participation of companies from the offtaker country</p> <p>Leadership by the public administration</p>
SocInf1-ES	<p>Sensible design</p> <p>Equal distribution of costs and benefits between the host and the offtaker countries</p>
TechProv1-ES	<p>Stable regulation</p> <p>Existence of bilateral agreements between member states</p> <p>Innovative design in terms of the design of the power plant that allows further innovation</p> <p>The project is based on a power plant with enough installed capacity</p> <p>Real integration of the CSP power plant as a main element of the electricity network</p>
TechProv2-ES	Favourable and stable regulatory framework

<i>Interviewee</i>	<i>Conditions of acceptance</i>
SocInf2-ES	The offtaker country has a real need of renewable electricity from other countries; there are certain deficiencies in the offtaker country (lack of local resources).
SocInf4-ES	The project has to be adapted to a very specific need in the offtaker country. S/he is concerned about speculative projects.
SocInf5-ES	Based on physical transfer Improvement of current electricity grid interconnection Economic costs should not be assumed by the citizens in the host country Public consultation
Pol2-ES	Physical import of the electricity Existence of bilateral agreements between member states Consideration of potential costs for the consumers in the host country
SocInf6-ES	Low environmental impact in the host country Existence of an integrated European electricity market Benefits for consumers in the host country

Equity

The balance in the distribution of costs and benefits between the host country and the off taker is of particular importance for some of the interviewees. However, while some interviewees perceive that cooperation mechanisms for CSP will provide equal benefits for the offtaker and the host country, others are unsure about this. The excerpts in Table 9 reflect these considerations.

The interviewees report several concerns regarding the distribution of benefits and costs between countries. First, the idea that the offtaker countries will have to pay a higher cost for the electricity generated in the host country is mentioned. This is considered a limitation of cooperation mechanisms for CSP for some interviewees, but not for others. Generally, all the interviewees agree that this is an issue that needs to be addressed and that is not easily solved. Some interviewees consider that the offtaker country should accept paying a higher price for the electricity - given that it is renewable and it is generated in another country (“It is a cost they have to pay to meet their renewable objectives” Pol1-ES). Others consider that there should be mechanisms (e.g. public subsidies) to ensure that both countries benefit from the cooperation. Another relevant idea is

related to the potential costs for the host country derived from the need of new grid interconnections, the management of the electricity grid, etc. One interviewee mentions that both countries should share the indirect costs of cooperation mechanisms for CSP. Finally, other interviewees mention that the involvement of the industry in the offtaker country is needed for a fair distribution of costs and benefits between both countries.

Table 9 Distribution of costs and benefits between the host and off taker countries (Spain)

Dimension	Extract
Equity	<p>“Do you think that the benefits and costs would be distributed equally between the host and the offtaker country? I think these projects should be carried out in fair conditions. But to know this we would need to see the nature of the project, that is, once the projects details are known...but I believe that it has to be a fair cost in any case.” (Scolnf4-ES)</p> <p>“From my point of view, it's a win-win. The two parties can win. Especially in Extremadura. Extremadura wins in regional development, as there are investments, there are jobs, there are. And Germany also wins. Germany also wins because a part of the technology in this case is German...it depends on what kind of technologies you choose...we all win if we push renewables, but especially the dispatchable ones”. (Pol1-ES)</p> <p>“I think you can get a balance, absolutely. I believe that you can define an income distribution or a sale price that could be advantageous to Germany, at the same time that it is advantageous to the promoters in Spain. The only thing is that I do not know if we are still at a level of maturity of the technology that allows it to be competitive per se. If we do not define economic compensations that reflect the positive externalities of the project, it will not be the same (...) we will have to see if there is no public economic support... I insist, we have to take into account the externalities and the potential of energy independence that that technology can provide us, because otherwise I do not know if the numbers come out. (Cons1-ES)</p>

Perception of other actors

Most of the interviewees believe that societal actors in Spain would have a positive attitude towards cooperation mechanisms for CSP. However, some sources of potential opposition are identified.

Regarding the *industry*, the interviewees feel that some organisations may oppose cooperation mechanisms for CSP. They refer to stakeholders perceiving that cooperation mechanisms will increase the costs of electricity in the host country; companies consuming higher amounts of electricity and concerned about the increase in the cost of generation of electricity by CSP; and

electricity companies feeling that the best locations would be occupied for building infrastructure to generate electricity for another country. Regarding the CSP industry, the interviewees from generally feel that this industry has a very positive attitude towards cooperation mechanisms and is willing to participate in any future joint project between Spain and Germany.

Regarding *policy makers* in the host country, interviewees mention that they would not be opposed, in principle, to cooperation mechanisms for CSP. Some interviewee feel that policy makers in Spain are not very interested in this type of projects. For another interviewee, the lack of current political support is a critical issue in the development of these projects.

The potential opposition by the *local population* is discussed in some of the interviews. This opposition is linked to the community acceptance of a CSP plant. This is a relevant concern for representatives of the environmental groups that expect some local opposition to new infrastructures. One interviewee from an environmental organisation proposes that a good engagement campaign, stating the local benefits of these projects, and rental agreements with the owners of the lands, have to be implemented to improve local acceptance. Along the same lines, an interviewee mentions the need to consider the benefits and costs for local communities of cooperation mechanisms, to consider potential compensations. Overall, interviewees feel that local communities with solar resources and CSP installations such as Extremadura and Andalucía would welcome new CSP projects for cooperation mechanisms.

Only one interviewee refers to the potential opposition by consumers in the host country. In her/his opinion, cooperation mechanisms for CSP might produce an increase in the price of electricity in the host country and this would foster public opposition to the project. No other interviewee referred to the potential public opposition to cooperation mechanisms. However, the increase in the cost of electricity is a potential drawback of participating in cooperation mechanisms for some interviewees.

Preference for alternative options

Even with the majority of the interviewees accepting the development of cooperation mechanisms for CSP, some express a preference for a distributed generation model. We find two main positions among the interviewees: those who prefer a distributed generation model but consider that some combination of local generation and cooperation between countries would be optimal and those who consider that member states should prioritize local and distributed generation. Two interviewees from two environmental groups refer to the need of combining distributed generation and cooperation mechanisms. They both consider distributed generation a priority, but feel that combining distributed generation with physical transfers can be positive for Europe. The following excerpt represents this view:

“We support distributed generation. So, instead of making large plants, large production centers, and then transport the energy (you have losses in the transport network) it is probably more interesting to build small plants nearby, close to the point of consumption. So, you do

not have to make so many investments in transport and electric infrastructures (...) But I believe that distributed generation with a transfer of electricity to other European countries could be combined... the idea should be to produce and consume for our own consumption and then transfer the surplus...you cannot store it, so yes, you can export it, but in principle you should cover the internal energy demand for renewable electricity and then transfer the surplus to other countries. (SocInf6-ES)

Only one interviewee considers that all efforts should be focused on local generation. In her/his view, European countries should favour a transition towards renewable energies with the local resources available in each country (biomass, hydraulic, wave energy) and should avoid new interconnections throughout Europe that generate additional problems. This interviewee considers cooperation mechanisms for CSP unacceptable:

“We need to favour the transition of each country towards renewable energies with the local resources available (biomass, hydraulic, wave energy, etc.). That is the way and not to make interconnections throughout Europe with the problems that this entails (losses, costs ...).” (SocInf-2-ES).

Future expectations

The interviewees are divided regarding the future of cooperation mechanisms for CSP. While some interviewees are optimistic about the development of joint projects for CSP in Europe, others feel that the barriers for cooperation are still strong and others feel that it is very unlikely that joint projects are developed in the coming years (Table 10). Four interviewees anticipate that cooperation projects for CSP will be undertaken in the coming years. These interviewees hope that joint projects with CSP will develop in the coming years in Europe.

Other interviewees are unsure about the future implementation of cooperation projects for CSP and believe that these projects will be undertaken only if the barriers for cooperation are reduced. The balance of barriers and opportunities will determine the future of these projects. Interviewees generally refer to the need of reducing the cost of electricity production with CSP, the need for public support for these projects, the equal distribution of benefits among participating countries and the existent regulation. Somehow, existing barriers and acceptance condition will determine the future of joint projects, according to these interviewees. An interviewee refers to the barriers derived from the regulation and the distance between Spain and potential offtakers.

Finally, some interviewees feel that joint projects for CSP will not succeed in the short or medium term. Asked about the future of cooperation mechanisms, two interviewees feel that the lack of public support and the cost of electricity generated by CSP limit the potential of joint projects. Another interviewee considers that perhaps some projects are developed in the short term, but that it is very unlikely that they will continue in the medium term.

Table 10 Future expectations (Spain)

Dimension	Extract
Optimistic view	“I think we will see various joint projects in the near term. I hope so. I hope we can see many” (SocInf5-ES)
	“I think we will see these projects go ahead. Perhaps a small number. Perhaps we will see some pilots. For small potency to try things out. I believe that there will be projects, but they will be very limited in scope " (Pol2-ES)
Neutral	“We would be delighted, of course. However, there are many factors that can influence. Imagine that the government opens a special auction line to boost solar thermal in Spain. Maybe this kind of project does not make sense anymore. If also opens the possibility of cooperation mechanisms through PPA because it would not make much sense because if a large industry can already be supplied with a plant that is placed next to it, it is much more efficient and much more interesting. Therefore, I think that here the legislation can define the need or not of this type of projects [...] basically we are placed a little unfavourable because the agreements that have already been signed are between countries that are closer geographically...the main problem would be the transport of energy (Pol1-ES)
Pessimistic view	“My expectations are negative. No, because of the lack of political support. They have to clearly perceive the benefits of CSP in terms of storage, of manageability, the ability to cover a specific need” (Sup1-ES)
	“I cannot see these projects in the future...the CSP industry is frozen...we have not seen a reduction in the costs of electricity” (Grid1-ES)

3.2 Germany and the Netherlands as potential receiver countries

3.2.1 Germany

Problem perception

The problems to which implementing CSP in combination with cooperation mechanisms could be a solution encompasses from the point of view of the interviewees from a national perspective, to an energy system perspective, and finally a European idea (Table 11). Starting with the last topic, some interviewees emphasized the idea that such a concept could strengthen the European Union - not only or primarily as a political institution, but also as contributing to the idea of European cooperation (TechProv2-DE, TechProv3-DE). Another topic emerging is referring to promoting and pushing forward renewable energies in the wake of climate change, and the fulfilment of climate goals, and the preference to use options that cost less (Science2-DE, Science3-DE, Science2-DE, Science3-DE, Science4-DE, TechProv3-DE).

“Because we have to fight coal. (...) all the alternatives that can be made available, that can really be used and that are affordable should be used, and we must use them, not just in terms of climate policy and politics, in order to bring the countries a little bit closer together.”
TechProv3-DE

These two topics - bringing Europe closer together and the energy system perspective - are connected in some of the statements that more strongly frame the energy transition or the energy system as a European challenge (e.g. Pol2-DE).

Finally, more pragmatic notions are also voiced by referring to specific challenges for Germany who is seen as running into missing its 2030 targets and losing its frontrunner status (Science1-DE) or as having a strategy relying on energy imports (Pol2-DE).

Table 11 Problem perception from the German interviewee perspective

Dimension	Extract - reference to interview partner
German challenges	
Germany as an importing country	Pol2-DE
(Crucial) contribution to reach 2030 climate goals in Germany.	Science1-DE
Lack of German national strategies to reach goals and to keep role model status.	Science1-DE

<i>Dimension</i>	<i>Extract - reference to interview partner</i>
<i>Energy system and its transition</i>	
Generating energy from renewable sources at low costs/ higher efficiency.	Science2-DE Setting up installations in most suitable locations to increase efficiency of generation. Science3-DE Science4-DE Strengthen alternatives to fossil fuels (and maybe nuclear) TechProv3-DE
Dispatchable energy source.	SocInf1-DE, Science4-DE
Extending the energy system on the international level and not only restrict (German) activities to technology development.	Science1-DE
Development of a more integrated European electricity grid which allows for more flexibility with less investment into storage.	„ In my view, this is the main reason or incentive for the massive expansion of renewable energies, I will simply say in 'Northern Europe', no matter where that is, that you achieve balance through the grid.” Science2-DE
Energy system as a European task and challenge	„The energy supply is a European supply.“ Pol2-DE
<i>Unifying Europe</i>	
Contribution to a stronger European Union	By unifying common projects (in the face of populism and disaggregation); „Schengen für grüne Elektronen.” TechProv2-DE By a common market within Europe; Enhance employment opportunities and reduce hostility; TechProv3-DE
Contributing to the economic strength of Southern Europe.	Science3-DE

Perceived benefits

Economic benefits were the benefits most often mentioned by German interview partners (namely 9) followed by the fulfilment of climate goals as the second most often frequently mentioned (8). Employment was the third issue (7), five interviewees referred to services to the energy market and grid stability. Smaller groups of respondents mentioned technological development (4), and that such projects are able to improve the cooperation within Europe (2).

The discussion around economic benefits included arguments of more cost-efficient fulfilment of climate goals in the wake of challenges to realise them nationally. Additionally, the expectation of cheaper electricity was voiced. Furthermore, chances for Germany as a technology provider and economic gains through this were discussed as well as local value creation in the host country.

Furthermore, one interview partner mentioned the benefit of the efficient exploitation of land that has few alternative economic utilities and another chances to economically profit from by-products or the integration of further industrial processes. A strong emphasis was put on employment, which is therefore singled out as an additional factor in Table 12.

(Easier) fulfilment of climate goals was also repeatedly mentioned as a benefit. This discussion also related to decarbonisation scenarios with a reliance on electricity for different sectors, e.g. including transport. Furthermore interview partners referred to the timeframe, expecting that cooperation might become more interesting to for countries, the more inevitable it seems that they miss their goals.

The discussion around employment opportunities referred to employment in Spain or the respective host country, but also to Germany due to relevant industry in technology development and supply or, taken together, the expectation of positive employment effects all over Europe along the value chain.

Arguments on the energy market and grid stabilization mentioned CSP as a dispatchable energy source, also in combination with integrated thermal storage and also as an alternative to importing electricity from nuclear or coal.

“So I'm talking about a calm night or something. Then there's only import, isn't there? And Import-. From where? Well certainly not desired from French nuclear power plants or coal plants from Poland. That cannot be the solution.” SocInf1-DE

Opportunities for technological development and its positive consequences were also discussed, e.g. by involving German industry and research institutions, leading to employment. Further aspects of this topic are positive effects for the development of the CSP technology, e.g. cost depression. With regard to positive effects within Europe, which were already extensively discussed in the *problem perception* section, these reappear as part of the benefits.

Table 12 Perceived benefits from a German perspective

Dimension	Extract - reference to interview partner
Economic	Grid1-DE Current challenges and costs to reach targets for renewables on a national level make it more attractive to look to Spain - Science1-DE Chances for German industry as technology providers -Science1-DE, TechProv2-DE, TechProv4-DE Value creation in Southern Europe - Science3-DE, Science4-DE, SocInf2-DE, TechProv4-DE Cheaper electricity TechProv2-DE, TechProv3-DE Efficient land-use TechProv3-DE

Dimension	Extract - reference to interview partner
	Use of co-products from CSP like cold, water desalination, possibly also solar chemistry for industry as an additional advantage for the industry in the producing country - Science2-DE
Fulfillment of climate goals / avoiding adaptation	<p>“It would be important for D in any case, if a corresponding commitment is made, that this is also included in the renewable energy balance for Germany.” Pol1-DE</p> <p>Lower challenge of fulfilling climate goals Science1-DE</p> <p>Future demand for electricity is extremely high in certain decarbonisation scenarios Science2-DE</p> <p>Cooperation mechanisms are likely to be more attractive if 2020 targets are (likely to be) missed Science3-DE, Science4-DE</p> <p>Perception that the challenge to meet targets nationally might become too high SocInf2-DE</p> <p>Support decarbonisation of German energy sector TechProv2-DE, TechProv3-DE</p>
Employment	<p>Investments in Spain (or respective producing country) would lead to local employment Grid1-DE, Science2-DE, Science3-DE, Science4-DE, SocInf2-DE, TechProv2-DE, TechProv3-DE</p> <p>Employment in Germany through technology development SocInf1-DE</p> <p>Employment in Europe through cooperation and technology development SocInf1-DE</p>
Serve energy market / stabilize grid	<p>CSP as a dispatchable energy source in combination with PV Science1-DE, SocInf2-DE, TechProv3-DE</p> <p>Combination with (thermal) storage Science2-DE, TechProv3-DE</p> <p>Alternative to imports from nuclear or coal SocInf1-DE</p>
Technological development	<p>Research and Development through investments will lead to employment Grid1-DE</p> <p>Involvement of German industry and research institutions SocInf1-DE</p> <p>Development has already led to lower costs for CSP Science4-DE</p> <p>Storage capacity is positively developing TechProv4-DE</p>
Connecting project for / balance within Europe	<p>Common electricity market TechProv2-DE</p> <p>More balanced economic development TechProv3-DE</p>

Perceived costs

The dominating topics regarding costs or downsides of CSP combined with cooperations that are brought up by the interview partners relate to political barriers (12 interviewees). Prices and financial questions as well as concerns about the infrastructure are mentioned by seven interviewees each. Six interview partners talk about lack of information or legislative issues. Further topics stated by several interviewees include the actual implementation of cooperation (5), the economic risk (4), technical aspects (3), but also social acceptance (3), local need for RES (2), and environmental impact (2). From one interview partner respectively arguments around economic barriers, the reliability of supply, and the financial impact on society were mentioned.

Political barriers are displayed in a separate table (Table 13) as they were mentioned so frequently. Three dominant subtopics emerge: National interests, lack of reliability of politics and weak enforcement of climate goals. Several interviewees perceive policy strategies to be strongly shaped by a focus on national interests and benefits that hinder cooperation. Exemplary citations outline the arguments given:

“To find solutions in one's own country [are preferred], because one believes, so to speak, that it might be possible to do it faster, more effectively, to benefit one's own economy more and other things. Perhaps your own economy will benefit a little...” Science4-DE

“And then I think it's just so, yes, that somehow so far I think politicians have always thought nationally, say, if there's any new project there, I want to have it in my electoral district, there I get more out of it than if I do it in Europe. What they did not notice is that Europe is slowly falling apart, so to speak.” TechProv2-DE

At the same time, lack of stability and reliability is complained about. The Spanish turn in supporting renewables plays a relevant role. However, other host countries like Italy are also mentioned as lacking stability.

“...even if there were money in theory, there would be a tariff for electricity, but if you don't know if it will really be paid after two, three, four, five, ten years [referring to Italy]” TechProv3-DE

The weak enforcement of climate goals is also discussed as a barrier. Several interview partners have doubts if missing the goals will lead to consequences; thus the goals are not able to create pressure towards more cooperation.

Table 13 Perceived barriers from a German perspective: Political issues

Dimension	Extract - reference to interview partner
National interests	Priority for national interests and strategies Science1-DE, Science4-DE, TechProv2-DE, TechProv3-DE Policy makers focus on local/national industrial actors TechProv1-DE Energy provision as a national security issue TechProv2-DE
Reliability of politics	Political stability and reliability of supply Science2-DE Political stability and reliability: change in Spanish support for renewables SocInf1-DE, TechProv1-DE, TechProv4-DE Future national strategies are unknown TechProv1-DE Political stability and reliability of tariffs TechProv3-DE
Weak enforcement of climate goals	Lack of (political) pressure if climate goals are missed Science4-DE Lack of ambition to fulfill climate goals SocInf2-DE no punishment for missing goals SocInf2-DE Climate goals not sufficiently binding SocInf2-DE No incentives to cooperation mechanisms / no punishment for missing goals Science3-DE
Further political issues	State involvement is going to hinder big investments, e.g. by trying to influence pace of development Grid1-DE The principle of reciprocity cannot be combined with CSP in a cooperation mechanism Pol1-DE Dogma / Ban of thinking Science1-DE Taking away electricity that is locally needed Science2-DE Impact on French electricity market Science3-DE Resistance by France TechProv2-DE Geopolitical resistance Science3-DE Securing jobs in Germany SocInf1-DE Priority for other countries which are geographically nearer SocInf1-DE Short term orientation of policy makers TechProv3-DE Weak position of EU level TechProv3-DE

Further political issues include, among others, concerns about too much regulation by the state, a violation of the principle of reciprocity, which is part of the cooperation mechanisms as they are currently implemented, but also the perception that certain ideas are below a ban of being further explored. The political position of France is also critically discussed as a potential challenge.

A long list of further barriers was discussed in the interviews. These include that further cost decreases for the CSP-technology are a precondition to a broader diffusion, but also some challenges in the industry in relation to costs, e.g. in the cooperation with research institutes.

Another major barrier is the insufficient design of the European electricity grid to actually implement the proposed concept. A special weak point are the interconnectors between Spain and France and their slow extension. However, it is also doubted whether it makes sense to transport electricity on such long distances. Generally, CSP is a technology that is relatively unknown and currently also not subject to recent debates. Related to this, interview partners acknowledge lack of information in the public and with other stakeholder groups. Other barriers are related to legislative issues and the incomplete integration of the European energy market.

“Schengen for electrons. Free mobility for green electrons.” TechProv2-DE

The actual implementation of a cooperation project is also perceived as challenging as it adds complexity to the current complexity e.g. regarding necessary contractual agreements etc. Further barriers comprise risk perceptions for companies due to a volatile market in the field of CSP technology supply and unstable policy frameworks. Other aspects refer to technical aspects and development, social acceptance, local need / potential for RES, environmental impacts, economic barriers, the reliability of supply and the financial impact for society. Specifications and examples are provided by Table 14.

Table 14 Perceived barriers from a German perspective: Further issues

Dimension	Extract - reference to interview partner
Price / financial issues	Cost decreases needed for CSP Grid1-DE, Pol1-DE, Pol2-DE, Science3-DE, TechProv3-DE, TechProv4-DE Either cost decreases are needed or a high level of demand from a CSP plant which is difficult to rely on Science4-DE Cooperation between research organisations and industry challenging due to budget issues Pol2-DE No money for project developers TechProv4-DE
Infrastructure and transport of electricity	Sufficient grid connection is missing SocInf2-DE Slow grid extension Grid1-DE Missing interconnectors between Spain and France Pol1-DE, SocInf2-DE, TechProv2-DE Missing interconnectors between Spain and France also due to lack of local acceptance Science3-DE Energy losses in case of long distance transport SocInf1-DE Missing interconnectors between Spain and France combined with the missing possibility to reserve capacities on the long run Science4-DE Long distance transport of electricity is challenging Science4-DE, SocInf2-DE
Lack of information / no recent impetus	Discussion is not on the agenda Science2-DE Costs-Benefits are not clear Science3-DE

Dimension	Extract - reference to interview partner
	<p>Lack of technical data to identify promising sites for CSP TechProv1-DE</p> <p>Information and transparency of competencies of market actors is needed TechProv1-DE</p> <p>Positive cost developments are not known TechProv2-DE</p> <p>CSP as an unknown technology TechProv3-DE</p> <p>Misunderstandings about potential for CSP and CST and size requirements TechProv4-DE</p>
Legislation	<p>Reduction of Feed-in-Tariff in Spain Grid1-DE, SocInf1-DE</p> <p>Feed-in-Tariff restricted to installations within the relevant country Science2-DE</p> <p>Enforcement of climate goals on a national level needed Science4-DE</p> <p>Open regulation for electricity trade across Europe, also direct contracting TechProv2-DE</p> <p>State guarantees for companies participating in consortia in other countries TechProv4-DE</p>
Implementation of cooperation	<p>Complexity of cooperative project development Pol2-DE, TechProv3-DE</p> <p>Sharing of costs and benefits Science3-DE</p> <p>High efforts for implementation Science4-DE</p> <p>Complex to implement under current conditions Science4-DE</p> <p>Conflict between long-term timeline of CSP-projects and short term orientation of policy makers and other regulatory possibilities (statistical transfer) SocInf2-DE</p>
Risk perception (business)	<p>Volatile market development for CSP providers; protection for European industry needed TechProv1-DE</p> <p>Industry concerned about political stability TechProv3-DE</p> <p>Risk for investment higher than for other investment opportunities TechProv4-DE</p>
Technical aspects and development	<p>System serviceability is not provided by Spanish CSP plants Pol1-DE</p> <p>Lack of reliable weather data TechProv1-DE</p> <p>Low standards by some actors in the CSP industry due to too fast development TechProv1-DE</p> <p>Lack of sufficient skilled consultants TechProv1-DE</p> <p>Difficulties in acquiring sufficient land TechProv3-DE</p>
Social acceptance	<p>Reservations that German citizens have to pay for installations in other countries Grid1-DE</p> <p>Lack of social acceptance in host countries as green electricity is taken away instead of fulfilling local demand Science2-DE</p>

<i>Dimension</i>	<i>Extract - reference to interview partner</i>
	Lack of local acceptance in host country due to high water demand Science4-DE
Local need / potential for RES	Unclear if Southern countries wouldn't need more renewable energy for themselves Science2-DE, Science3-DE Germany likely to generate sufficient renewable energy by itself Science2-DE
Environmental impact	Water use Science2-DE Competition with areas for farming TechProv3-DE
Economic barriers	Protection for German wind industry TechProv2-DE Less benefits for German wind investors TechProv2-DE
Reliability of supply	No recent need for flexibility Grid1-DE
Financial impact for society	Already paying a high share of electricity costs for the energy transition Grid1-DE

Attitude

The majority of respondents, overall eight, voiced a positive attitude towards the proposal of fostering CSP via cooperation mechanisms, one of them clearly stated a negative attitude. The remaining four interview partners did not give a clear opinion, often they voiced conditional acceptance. One of them provided contradictory statements and was therefore classified as 'undecided' in Table 15. The conditions discussed will be analysed in the next section.

Of the eight enthusiasts six were very positive about the notion, the other two relatively positive or clearly more positive than negative. The reasons given for their respective attitudes evolved around the European idea and cooperation within Europe, excitement for the CSP-technology and / or strong support for a quick transition to a renewable energy system. Those sceptical or undecided were concerned if the time is ripe for it, that the implementation might not be realistic or referred to the long-term perspective connected to such an arrangement.

Table 15 Attitudes towards CSP with cooperation mechanism (Germany)

<i>Interviewee</i>	<i>Attitude</i>	<i>Reasons</i>
Science1-DE	Very positive	So it's good overall. And if we then set up more European cooperation there and thereby essentially expand the whole and lay the foundations for future, more European energy cooperation, energy systems, ...
Science2-DE	Very positive	So since I personally would say that this would be a very relevant strategy (...) because of the many advantages the CSP has. (...)many don't see this overall concept of CSP, they just think I compare CSP electricity with photovoltaics and storage. (...) And if there is enough

<i>Interviewee</i>	<i>Attitude</i>	<i>Reasons</i>
		space in Southern Europe (...) So from my point of view I would prefer that to anything else.
Science4-DE	Very positive	In this respect, you will not be surprised (...) that we are convinced that this technology can play a role in the future.
TechProv1-DE	Positive	I'd probably be [in favour] of the project as a whole being acceptable (...) if many things are quite inconsistent, and this often creates hurdles that aren't necessarily predictable, and more effort to overcome them.
TechProv2-DE	Very positive	I have always advocated this idea and (...) we are actively committed to bringing this topic forward.
TechProv3-DE	Very positive	Of course I think it makes sense. That is why we are here and I am also in Spain at the moment (...) everything that goes in the direction of renewable energy and makes sense, in southern Europe or worldwide, yes, I can only actually support.
TechProv4-DE	Very positive	To answer your question: Electricity, Southern Europe, yes please and please immediately. Spain, Italy, Greece and a little bit of Southern France. Whatever is possible, we should do it.
Cons1-DE	Positive	Rather, we are working with a broader focus, demanding that renewable energies be expanded. That there should be equal consumer rights for all consumers, including at EU level, on renewable energies. (...) So basically I think it is to be welcomed if barriers are dismantled and cooperation is strengthened through these corporate mechanisms.
Grid1-DE	Negative	So, where I said that it is not yet time, it is now that we in Germany are actually starting to provide project funding for projects in other countries as part of our renewable funding. That is what the EU Commission always wants, but nobody else wants. (...) And that leads to completely crazy results.
SocInf2-DE	Undecided	I think basically nothing speaks against it at first. (...) Specifically, cooperation mechanisms I have described as, so now. So I did not consider them as realistic and therefore I did not deal with them specifically. (...) Yes, I am personally sceptical, yes, quite honestly, that these cooperation mechanisms... And CSP projects in particular are probably quite long-term.

Acceptance conditions

While a majority voiced support for the notion of combining CSP with cooperation mechanisms, respondents also listed several conditions for acceptance. The interview partner from the political administration argued based on three principles (Table 16). Others emphasized the importance of local knowledge and value creation and that it is important that a real cooperation of equal partners develops and that the investor does not have a dominating role. This topic was brought forward by scientists and industry. One interview partner also proposes a pathway where the cooperation comes in later:

(...) that one only just begins to build up CSP plants [in the South], for electricity but also heat and desalination and cooling, integrative uses. To start with it for the next ten years while the industry builds up, the whole infrastructure builds up and in parallel the export to Central and Northern Europe develops. (Science2-DE)

Table 16 Acceptance conditions for CSP with cooperation mechanism (Germany)

Interviewee	Acceptance conditions
Pol1-DE	The basic principles are 1. reciprocity, 2. physical import, 3. Cooperation Agreement; the basis for this is the opening of the EEG within the framework of the negotiations on the state aid procedure. (1) and (2) are indispensable, (3) self evident
Science1-DE	Local capacity building and value creation Negotiations at eye level
Science2-DE	Pathway for implementation by setting up installations and related industry locally in the South and later apply cooperation mechanisms Ensure local value creation and local benefits
TechProv1-DE	Overcoming negative experiences with RES support schemes in Spain Increasing trust and transparency Using window of opportunity for CSP
TechProv2-DE	Common European project Willingness of and sympathy between high rank policy makers
TechProv3-DE	Socio-political acceptance Local value and knowledge creation
Cons1-DE	No additional costs for consumers
Cons2-DE	No additional costs for consumers Energy security and reliability Accountability for German climate targets
SocInf1-DE	Costs must not be too high (economically valid)

However, another stream of conditions evolves around securing the benefits for the offtaker country, i.e. that the electricity is accountable for the climate goals of the investing country and at

the same time does not lead to higher electricity prices than domestic solutions (Consumer representatives and Societal influencers):

But we take the perspective that we are saying that this should not impose higher costs to consumers. (Cons1-DE)

Equity

As outlined in the last paragraphs on acceptance conditions, respondents have had thoughts about a fair distributions of costs and benefits between host and offtaker country and maybe also transit countries. However, relatively few interview partners explicitly stated how this could be implemented. One of them referred to the relevance of negotiations that would take place in such a case and that they would be aimed at finding a distribution (SocInf2-DE). One of the Technology Providers (*TechProv3-DE*) argues about creating welfare in the host country as a matter of fairness.

Well, it can't mean: "We buy electricity and then we get some of it in Germany or Northern Europe", but something has to flow back. On the one hand, money can flow back in order to create jobs, but perhaps also another type of cooperation. We take electricity from you, you get something else from us. (TechProv3-DE)

Perception of other actors

One part of the interviews discussed the perception of other actors regarding moving forward with implementing CSP through cooperation mechanisms. The discussion focused on how far certain actor groups are perceived to be active in this field or to become active in case an initiative were put forward. And if they were expected to become engaged, in how far respondents anticipate them to support or actively resist this idea. In the German interviews, the groups most frequently discussed was industry, mentioned by 10 of the 15 interviewees (Figure 4). Several of them also mentioned the society or the public in general (9), local communities (8), societal actors (7) and policy makers (7). Grid operators, scientist, support organisations, and investors were rarely mentioned.

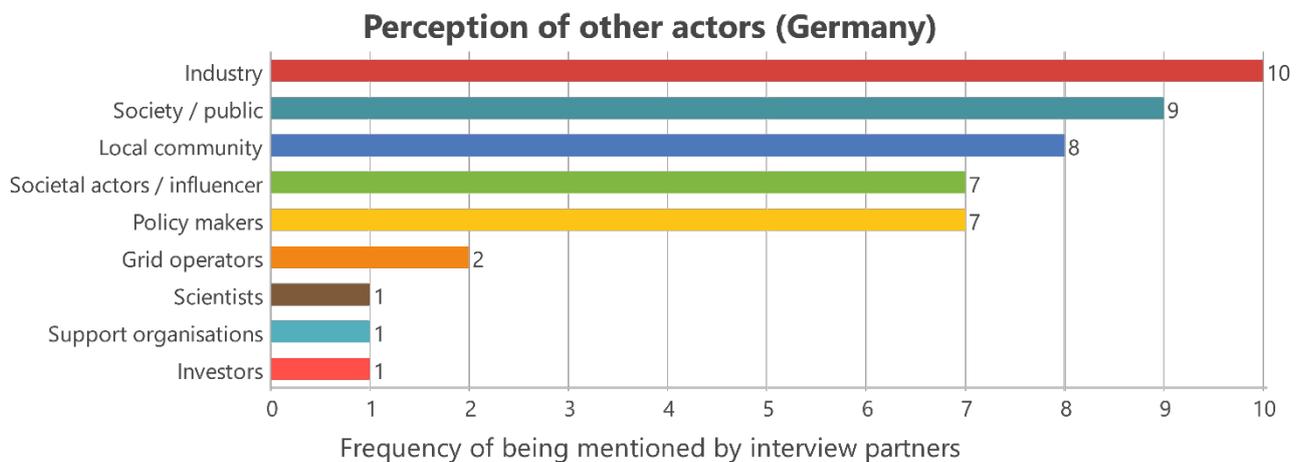


Figure 4 Perceptions of other actors potentially interested in CSP and cooperation mechanisms (frequency of actor groups mentioned by German interviewees)

It is important to note that references to the industry category subsumes different types of *industry*, mostly from the supply side for CSP, or potential investors. One respondent referred to industry as the demand side for electricity produced from CSP. From an attitudinal perspective, most of the statements are positive, i.e. interviewees expect industry to support the implementation of CSP via cooperation mechanisms; however, a few see this support as conditional ('Industry as a technology provider will support it in case they see a business case', TechProv1-DE) or see industry as a neutral/passive actor (e.g. the reference on the demand side from Cons2-DE, no visible current engagement of energy companies/ utilities SocInf1-DE) or sceptical actor ('Renewable energy industry is already sceptical regarding current opening of support scheme' Pol1-DE). Active resistance is expected from one interviewee from the fossil fuel industry (TechProv3-DE). However, as outlined above, most perceptions of industry positions are positive and it is expected that plant manufacturers and technology developers from both renewables and the fossil fuel sector will support the development as they should see potential gains for themselves (Pol2-DE, Pol2-DE, Science2-DE, Science3-DE, TechProv3-DE). German utilities are expected to be interested as well (Cons1-DE) - it is not fully clear in which role, probably as investors.

No strong positive impetus is expected from the *public*, but also no strong resistance. Most expectations stated by the respondents about public reactions in the sense of socio-political acceptance are either neutral or slightly positive with two respondents (Pol1-DE, SocInf2-DE) expecting negative reactions. The negative concerns refer to a preference for local or national investments. Several statements (e.g. the TechProv interviewed) point out that the level of knowledge is low. Those expecting (slightly) positive reactions see a cooperation within Europe as a development that is perceived as a trustworthy option, in line with the generally supported energy transition and anticipate appreciation for an efficient implementation (e.g. SocInf1-DE, Science4-DE, Cons1-DE).

Regarding the *local public*, no strong opposition is anticipated - due to past positive experience (TechProv2-DE), the fact that CSP is usually installed in less densely populated areas (Science3-DE), that a variety of benefits are brought by the technology (Science4-DE). Potential negative perceptions are more likely to be connected to additional high voltage lines (Pol2-DE) or more generally due to visual impacts (SocInf2-DE, TechProv1-DE) or a preference for more decentralized systems (Cons1-DE).

Societal actors and influencers are mainly seen as neutral on the topic, not heavily engaged so far. If employment can be created from strengthening the technology, unions are expected to be supportive (e.g. Pol2-DE). More interviewees than not share the view that environmental NGOs should be positive as it advances the turn to renewables, however despite the argument that they might be sceptical due to a preference for exploiting local potentials to generate energy.

The attitude of *policy makers* is perceived as ambivalent with some preference for national solutions (e.g. Cons2-DE), or a preference for perceived voters' preferences, or favouring solutions that bring most advantages for German industry. Further, it is stated that the political administration lacks knowledge on CSP (Pol2-DE).

The remaining groups that were rarely mentioned were perceived as neutral (scientists and support organisations by the interviewed TechProv) while the reaction of grid operators was perceived as dependent on whether this would mean additional strain on the grid.

Preference for alternative options

Interview partners discuss a long list of alternative options they see to implementing CSP via cooperation mechanisms (Table 17). Some of them also refer to a further development of the policy framework, e.g. the implementation of a gap filler mechanisms³ or in a capacity market. However, the topic that emerges most frequently is the notion of a more decentralized energy system which draws more strongly on PV, and wind, and local demand side management and which is seen as a counterpart to CSP installations. Respondents wonder if public and political support is in conflict with the notion behind CSP and bilateral cooperation and would therefore lack acceptance - also as it offers less opportunities to households to directly participate in the transformation. A second alternative that is shared among a number of interview partners is a free and less regulated energy market; they expect that such a market would be more efficient and lead to lower prices and a portfolio which could or could not include CSP without any bilateral cooperation mechanisms. Further ideas evolve around cooperation in technological development instead of cooperation to achieve climate goals, carbon pricing as an effective measure, or joint projects as a later option. One respondent more generally points out, that there are abundant alternatives.

³ Currently it is discussed what happens if future goals on renewable energy are missed and if e.g. the countries missing these goals have to make investments into a European fund which will then set up additional renewable energy generation sources.

Table 17 Alternative options (Germany)

Alternative options - categories	Interviewee	Extracts
Decentralised energy system	Science3-DE	...there is a bit the case with some actors, that this desire for this decentralization and a bit of autarchy, that it can drive something, where I'm not sure whether what's the case with CSP and these large systems, it just doesn't fit together.
	Science2-DE	We are setting everything up in a decentralized way, PV and wind. This is a approach contrary [to CSP]...
	Pol2-DE	In Germany, we are currently discussing decentralized energy supply, especially in neighbourhoods. But that will not be a magic bullet.
	Science4-DE	...my personal impression is that policy makers are increasingly [relying] on decentralised solutions to prevail in the end.
	Cons1-DE-DE	Decentrally, I would say, [one] has more opportunities to participate in the energy system transformation.
	SocInf2-DE	So what I meant is that there is basically more debate about centralised, decentralised, and with CSP (...) and there is a strong opinion that we should do a lot first at home.
Free market	Grid1-DE	
	Pol2-DE	And if there is a common energy market, the question would no longer be so explicit. (...) Why shouldn't we buy electricity from solar thermal power plants in the South? And I am firmly convinced that above all, if you remain open to technology, can only be of use.
	Cons2-DE	We favour auctions that are open for different technologies, also on a cross-national level, as long as it counts for Germany.
Cooperation in technological development	Pol2-DE	Technological cooperation along all steps of the value chain to enable mutual learning.
New regulation (gap filler / avoider)	Pol1-DE	Gap filler mechanism could be interesting for supporting the expansion of CSP

Alternative options - categories	Interviewee	Extracts
Carbon pricing	Cons1-DE	This year we have positioned ourselves with a paper for consumer-friendly CO ₂ pricing. (...) An incredible number of stakeholders have spoken out in favour of CO ₂ pricing. (...) It is very foreseeable that climate protection targets will not be achieved in 2020. This means that additional measures are needed to achieve these climate protection targets. (...) Of course, we are most likely to support a solution at EU level.
Capacity market	Science4-DE	...is the question of a European capacity market. If there should be one, then you have to think about what the rules of the game are, what possibility is there for CSP and how could [it] be part of the game.
Joint projects as a later option	Science4-DE	I know only such scenarios, (...) ambitious climate scenarios (...), in Germany or in Europe, there is, so to speak, for the CSP technology, from 2035, 2040 a window, where one could say, yes, it could fit somehow quite well - [instead of expensive storage].
Preference for alternative options	TechProv3-DE	There are many alternative options - it depends on what you want to achieve.

Future expectations

Usually at the end of the interviews, respondents were asked to outline their future expectations, referring to likely or realistic scenarios for implementing CSP via cooperation mechanisms. These views were categorized on a continuum from positive to negative (Table 18). One respondent has clear positive views setting hopes on Italy where a CSP-friendly regulation is in place. Two further interview partners are slightly positive as they see some chances for political development, i.e. explorations into auction design and discussions on the EU level on gap filler mechanisms and seeing a chance for change in France. It is important to note that while these expectations were categorized as slightly positive, they, obviously at best, see long-term scenarios for realizing CSP through political cooperation in Europe. Two German respondents take the position that further developments of CSP are most likely, however not necessarily highly probable, in a liberalized European electricity market. This implies a realization of CSP without bilateral cooperation mechanisms.

Table 18 Future expectations (Germany)

Expectation	Interviewee	Extract
Positive	TechProv4-DE	I think CSP will definitely play a role, as there are no cheaper possibilities to have energy storage. I do not believe that we will have enough natural resources to do this by battery. Hopes are on Italy who implemented a promising CSP legislation which, however, hasn't triggered any major developments so far.
Slightly positive	Pol1-DE	Recent pilot project on innovative auction designs may lead to new insights; Discussions around gap filler and gap avoider could maybe change the picture in Europe
Slightly positive	TechProv2-DE	France has been the main barrier, blocking electricity transfer across the Pyrenées. To protect their nuclear electricity. And maybe there is now a political chance with Macron to change this.
Neutral	Grid1-DE	And I think all this research is absolutely great, when Europe puts research money into it.
Neutral	Science4-DE	CSP might find its place in a liberalized European energy market (driven by costs). Higher expectations for CSP to develop in countries where there is need for electricity which can then be sustainably fulfilled.
Neutral	TechProv3-DE	There are many research projects which are equipped with a lot of money. But they can't change the picture as long as the framework conditions are not suitable. As soon as they change industry will invest and research is not needed anymore. The technological competition for CSP is coming from cheap storage options not from alternative ways to generate electricity.

3.2.2 The Netherlands

Problem perception

Essentially, Dutch respondents focused on two topics with regard to the problems that can be solved by implementing CSP with cooperation mechanisms (Table 19). These include the achievement of national, i.e. Dutch, climate targets and generating energy from renewable sources at low costs due to higher efficiency. This last issue was most frequently mentioned. One respondent also mentioned the issue of CSP as a dispatchable energy source. In contrast, two interviewees explicitly explained that they do not see any problem mitigated by the concept.

Table 19 Problem perception from the Dutch interviewee perspective

Dimension	Extract - reference to interview partner
No problem solved	Science3-NL “I see problems created rather than solved, with the import of that electricity from Spain.” Grid1-NL
Dispatchable energy source.	Science1-NL
Achievement of national targets	SocInf4-NL, Pol1-NL “Well if we look at the 2020 timeframe – with national state binding targets – we see the difficulties to increase the amount of RES, which relates to public resistance, lack of financing, connecting it to the grid...etc. Lots of issues complicate the achievement of these targets.” Science2-NL “We aim for 70% renewable in our electricity in 2030, that is already in 12 years and it is going to be a huge challenge.” SocInf2-NL “Joint projects can be helpful if a particular member state is not able to achieve its goals. In such a case the cooperative mechanism can enable import. And this will be statistical rather than physical import, as the latter is quite difficult to organise.” SocInf3-NL
Generating energy from renewable sources at low costs/ higher efficiency.	Science1-NL, Science2-NL, SocInf1-NL, Pol1-NL, Pol2-NL “So hydropower from Norway, don’t start with that in NL or Belgium, for that would be highly expensive and no generate much power. So generate wind power where it is windy and solar power where there is a lot of sun.” SocInf2-NL “Basically, it is not very relevant for us where the electricity comes from. (...) However, we do aim for making our industry more sustainable. (...) and we prefer to do that as ‘green’ as possible. And actually, then it does not matter too much if it has been produced in the Netherlands or elsewhere, as long as the costs for infrastructure remain low.” Cons2-NL

Perceived benefits

Perceived benefits encompass a range of categories (Table 20). Most frequently mentioned by interview partners are benefits referring to the economic domain (6 respondents) or the contribution of such a project in connecting Europe or improving the balance within Europe (6). This is followed by a number of interviewees (5) referring to serving the energy market that such a project may have. Fewer respondents, namely two per topic, see benefits in fulfilment of climate goals, employment, technological development or environmental advantages. One interviewee refers to the availability of space for CSP facilities in Spain.

Economic benefits mainly refer to the understanding that it is more efficient to install solar energy generation infrastructure in countries with more sun, i.e. in this case in Spain. Some of the respondents concluded that the costs for grid extensions do not change the picture, while others were more sceptical about this part. The arguments related to advantages due to a closer collaboration within Europe beyond economic aspects referred to issues like “friendliness” (Science2-NL), taking “a European perspective” (SocInf1-NL), “collaboration” (SocInf3-NL) or “a truly European vision” (Pol1-NL). It also encloses the perspective of balance within the power system (SocInf4-NL) but also between countries of varying socio-economic status (Cons2-NL). A further stream discussed grid stabilization and balance in the energy system also emphasizing that storage is easily integrated with CSP. The further topics discussed were less frequently mentioned and partly also remained a bit vague, e.g. the reference of Cons2-NL to the chemical industry as a potential environmental advantage.

Table 20 Perceived benefits from a Dutch perspective

Dimension	Extract - reference to interview partner
Economic	<p>“...but the idea to apply the Ricardian principle mentioned before, would indeed mean that we move on with wind offshore (we are also good at that). (...) realizing that in Spain, land is less costly and scarce compared to the situation in the Netherlands.” SocInf1-NL</p> <p>"In general if you harvest renewable energy in the places which are most suitable the price is at lowest. Transport costs are not an issue from South Europe to Germany, 1 ct/kWh (...) alone with wind and solar from one country it's impossible without huge storage" SocInf2-NL</p> <p>“In principle, the advantage of the cooperative mechanisms is that it allows for a cost-efficient generation of RES.” SocInf3-NL</p> <p>“If the market works well, you can then invest where the cost price of RES is lowest. So the advantages relate to the fact that investments are geared towards the geographical locations that are most suitable for RES generation.” SocInf4-NL</p> <p>“The main benefit would be cost reduction due to optimal conditions for generation and optimal use of the network.” Cons2-NL</p> <p>“With one Euro I can generate more solar power in Spain than in the Netherlands.” Grid1-NL</p>
Connecting project for / balance within Europe	<p>“The collaboration might bring countries closer together, and increasing friendliness between countries.” Science2-NL</p> <p>“So when you look at it from a larger-than-national scale, e.g. the energy provision for the northern part of Western Europe, it becomes clear that while NL may be able to attain large part of its target with offshore wind, this is not the case for other</p>

<i>Dimension</i>	<i>Extract - reference to interview partner</i>
	<p>neighbouring countries. But we tend to see that then as ‘their problem’ while we should in fact look at it from a European perspective.” SocInf1-NL</p> <p>“And indeed, it can improve collaboration between countries.” SocInf3-NL</p> <p>“Another advantage could be that richer countries invest in Mediterranean countries which helps the latter to also achieve their increase in RES.” SocInf4-NL</p> <p>"So we need to organize a proper power balancing differently in the future." Cons2-NL</p> <p>“...then it could become part of a truly European vision (...). This would be in line with the Energy Union. (...) I think we should look for possibilities to get these types of projects running in a proper manner. The thought behind this is that in Europe we can better achieve a common goal if we collaborate compared to when everyone is trying this on his own.” Pol1-NL</p>
<p>Serve energy market / stabilize grid</p>	<p>“It provides us [the Netherlands] with more adjustability due to an additional source that can e.g. be used during peak hours. (...) So perhaps not very soon, and it will remain difficult for some decades perhaps, but these networks will develop.” Science1-NL</p> <p>“So indeed the strong point of CSP is that it allows for storage” SocInf1-NL</p> <p>“As for other benefits such a project could have for the host country is stabilising the network. (...) And we in the Netherlands will become more dependent on wind and solar, so we will need some form of stabilisation and CSP from Spain can offer just that.” SocInf2-NL</p> <p>“More important is that you can balance. Security of supply needs to be guaranteed so that is why you need a system that is integrated at the EU level.” Cons2-NL</p> <p>"With electricity, it is important when the exchange takes place, as well as the possibility to store and/or have multiple sources that can complement one another (e.g. wind in winter, and solar in summer). (...) Unlike PV, CSP offers the possibility for short-term storage, which can contribute to the stabilization of the grid.” Pol1-NL</p>
<p>Fulfilment of climate goals / avoiding adaptation</p>	<p>“In addition, postponement of RES project development is also costly and could be prevented if projects are developed elsewhere.” SocInf3-NL</p> <p>“(...) the administrative contribution to our RES targets” Grid1-NL</p>
<p>Employment</p>	<p>“It generates more employment (...)” SocInf1-NL</p> <p>“Most employment would be generated for Spain.” SocInf2-NL</p>

Dimension	Extract - reference to interview partner
Technological development	<p>“The technology is simple and easy to use also for less developed countries who can easily develop and build it themselves.” SocInf1-NL</p> <p>"The question would be: what could be the business case for CSP (vs PV) coupled to H2 production on a large scale. Perhaps CSP is more interesting, when you integrate it to an electrolyser and perhaps the storage option that CSP offers is helpful here to." Cons2-NL</p>
Environmental advantages	<p>“The energetic pay-back time is much shorter compared to PV.” SocInf1-NL</p> <p>“But important is that it also could contribute to make the chemical industry more sustainable (using it as feedstock).” Cons2-NL</p>
Availability of resources (land-use)	<p>“And of course in Spain, there is more space available compared to the Netherlands.” SocInf4-NL</p>

Perceived costs

Political issues and national interests are mentioned most often by Dutch respondents (i.e. 8 respondents) when referring to barriers (Table 21). The issue second most prevalent is the topic of infrastructure (7) followed by a discussion around local need / potential of renewable energy sources (6). Four interviewees each refer to the challenges of the implementation of cooperation and social acceptance, three to lack of information / impetus and technical aspects while two mention price / financial issues. Finally, legislation, economic barriers, reliability of supply, financial impact for society, disagreement with a European energy market and knowledge barriers are mentioned once each.

Among the political barriers, interview partners most often mention a preference for national strategies, e.g. by keeping positive effects like employment within the country, and voice a the perception, that money invested abroad is lost money.

An overview on the further barriers discussed is provided by Table 22. The concerns about the infrastructure refer to needs for grid upgrades and extension which are expensive to implement and often subject to a lack of local acceptance. A specific emphasis lies on the connection between France and Spain. Furthermore, respondents are not sure if the Netherlands do need additional renewables from outside the country and if Spain really could provide surplus renewable energy or would need to fulfill its own targets first. The actual implementation of the cooperation is seen as complex due to a lot of contractual and regulatory issues - a topic that is again raised as part of legislative barriers. Social acceptance issues are expected around socio-political acceptance in the Netherlands and local acceptance in Spain. Furthermore, in the current situation, PV is seen as more developed and therefore likely to become the subject of cooperation. This view is in line with the

perception that there is no recent discussion or impetus around implementing CSP via cooperation mechanisms.

Table 21 Perceived barriers from a Dutch perspective: Political issues

Dimension	Extract - reference to interview partner
National interests	Priority for national interests and strategies SocInf2-NL, Pol2-NL Priority for national interests and strategies: Money invested abroad is lost Science3-NL Priority for national interests and strategies: less positive economic effects at home SocInf3-NL Priority for national interests and strategies instead of searching for most efficient solution Grid1-NL
Reliability of politics	Political stability and reliability of supply on the EU level Pol1-NL
Weak enforcement of climate goals	Climate goals not sufficiently binding SocInf3-NL
Further political issues	Political implications need to be considered: Sociopolitical acceptance and missed employment in the Netherlands need to be considered Science2-NL Political challenge at the EU level SocInf1-NL

Table 22 Perceived barriers from a Dutch perspective: Further issues

Dimension	Extract - reference to interview partner
Infrastructure and transport of electricity	Need for grid upgrades Science2-NL, SocInf2-NL, SocInf4-NL Challenge of interconnectors between France and Spain and unclear if France is interested in acting as transit Cons2-NL, Pol1-NL, Pol2-NL Heavy grid extensions needed which are expensive and difficult to implement due to local acceptance issues Grid1-NL
Local need / potential for RES	Local potential for renewables is sufficient in the Netherlands to reach targets Science3-NL Local potential for renewables is sufficient in the Netherlands to reach targets including offshore wind SocInf1-NL, SocInf4-NL Using local potential in NL is challenging, but preferred, including offshore options and CCS SocInf3-NL Sustainable renewable energy has to come to 80 % from the Netherlands Cons1-NL Spain needs the electricity for achieving its national RES targets Pol1-NL-n
Implementation of cooperation	Complex contractual arrangement to organisation physical export/import Science2-NL National implementation is easier, but complex enough Science3-NL

Dimension	Extract - reference to interview partner
	ComTechProv3-NL Physical import is not possible Grid1-NL-n
Social acceptance	Political sensitivity: critical discussion around investment in Romanian wind farms in the past SocInf3-NL Difficult to provide transparency to the voters that an actual increase in renewables is achieved Cons1-NL Sceptical if economic pragmatism can win over national economic interests Grid1-NL Local acceptance issues in the host country Pol1-NL
Lack of information / no recent impetus	No recent impetus, e.g. no research or consulting activities Science3-NL Lack of belief SocInf2-NL Lack of discussion SocInf4-NL NGO-attention on other topics in the field SocInf4-NL-n
Technical aspects and development	More likely to cooperate on PV which is more developed Science3-NL German CSP market maybe too small to develop SocInf1-NL Keep technical innovation within national targets SocInf3-NL
Price / financial issues	Competition for sites between CSP and PV with currently lower costs for PV Science3-NL Costs for CSP currently too high also in comparison to PV Pol1-NL
Legislation	Dutch scheme to support renewables is open for cooperation but does not apply to further regulation which would need to be similar to the host country Pol2-NL
Economic barriers	Employment effects should be within NL if Dutch money is used Pol1-NL
Reliability of supply	Flexibility from dispatchable sources is not needed due to demand side management Science3-NL
Financial impact for society	High investments would be needed SocInf3-NL
In disagreement with a European energy market	Bilateral agreements in contradiction to a European market which would weaken this European market Grid1-NL
Knowledge	NL does not have technical knowledge to offer Science2-NL

Attitude

Six respondents, and thus a slight minority, stated a clear positive attitude towards CSP via cooperation mechanisms, three respondents rejected the idea. One respondent judged himself to be neutral on this question. For five interview partners their final attitude was not clear from the interviews, often they voiced conditional acceptance or discussed benefits and barriers without

committing themselves clearly to one direction. The positive statements mainly underline a faster progress towards renewables or a more efficient use of renewables. One interview partner relates the positive opinion to potential gains for the company that s/he is representing. Of the two respondents holding a negative opinion, one has doubts if this idea is realistic; the other does not see advantages for the Netherlands. An overview is provided by Table 23.

Table 23 Attitudes towards CSP with cooperation mechanism (Netherlands)

Interviewee	Attitude	Reasons
Science1-NL	Very positive	Yes I would respond positively to that indeed.
SocInf1-NL	Positive	Well, all these economic activities should be moved to the South. Not as a rejection of solar PV fields but it would be good if at the same time a large part of the companies active in this area, would also take up activities in Spain, whereby the cost per generated kWh will be much lower (...) But for the public good, that would be better.
SocInf2-NL	Positive	The motivation is combatting climate change, but it all takes too long. The idea is that the cheaper options are also easier and faster. Our association also propagates this principle.
TechProv2-NL	Positive	In favour of any development that helps the market for CSP grow and (...) that there is a place for CSP, also because it generates electricity for the night.
TechProv3-NL	Positive	In principle, yes we could be supportive. (...) So commercial projects is what we need (...) If it would contribute further to the development of this market segment, then it would be something we support.
Grid1-NL	Positive	It contributes physically to the installed capacity of Renewable energy generation as well as the amount of renewable energy generated in Europe, so that is positive in principle.
Science2-NL	Neutral	I am quite neutral. There is clearly a benefit from economic point of view... but when you then consider all the transaction costs....
Science3-NL	More negative than positive	I will not say that it is not going to work out well ever, but stating that CSP has so many advantages is too easy.
Pol2-NL-n	Negative	Advantages for the Netherlands: in theory only
SocInf4-NL	Negative	Although in principle it is a good mechanism and we can think of advantages, it is not needed nor desirable at this point in time.

Acceptance conditions

Interview partners elaborated on a list of aspects that they perceive to be a precondition to the installation of a cooperation mechanism for CSP. An important topic that emerges in the Dutch interviews refers to ensuring that the implementation of such an opportunity would really save costs for the Netherlands. At the same time, respondents also underline that they find it important that the project is locally implemented according to standards valid in the Netherlands and also refer to local value creation. A full list of conditions is provided by Table 24.

Table 24 Acceptance conditions for CSP with cooperation mechanism (Netherlands)

Interviewee	Acceptance conditions
Science1-NL	Demonstration project in the Netherlands
Science2-NL	Local benefits beyond energy generation
Science3-NL	Cheap/er electricity The focus should be on making the whole system of electricity provision more sustainable (not focus on a single technology).
SocInf4-NL-n	Not compromise efforts to meet the targets domestically first Keep standards regarding codes of conduct, i.e. participation, attention for the environment, sustainable materials etc.
Cons2-NL-n	Low costs for infrastructure Reliable electricity supply Compatibility with H2 infrastructure
Pol1-NL-n	Cost efficient contribution to reach climate goals Transparent and correct use of investment and creation of additional positive impact in NL (employment) Efficient implementation of cooperation, in line with support scheme

Equity

Similar as in the German interviews, fairness and equity were a minor issue in the Dutch interviews. One of the social influencers touches upon this issue vaguely stating that s/he expects that certain conditions need to be met and that Dutch investment is a requirement for counting the electricity for the Dutch balance (SocInf2-NL). Similarly, one of the policy makers sees the relevance of a fair distribution also considering the ability of each partner:

“...and of course you then also search for a win-win. That will differ for each project and also across time.” Pol1-NL

Perception of other actors

Interviews referred to observations and evaluations of the perspectives of other actors regarding CSP and cooperation mechanisms. The group most often mentioned by Dutch interviewees are policy makers (9) (Figure 5). Other groups frequently referred to are societal actors (7), society or

the public in general (6) and industry (6). Local communities and scientists were discussed in three interviews. Grid operators, support organisations, and investors were rarely mentioned.

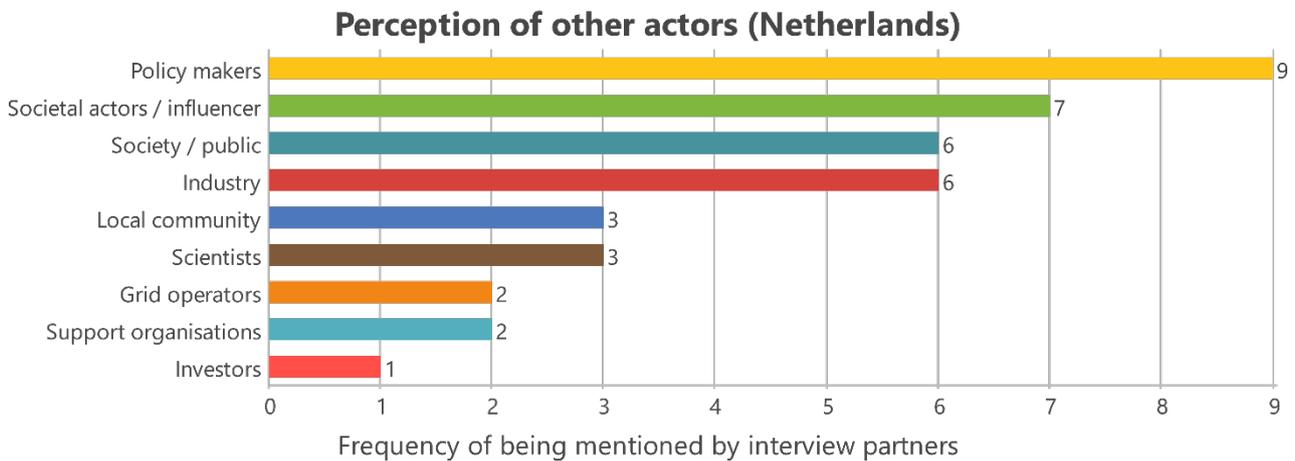


Figure 5 Perceptions of other actors potentially interested in CSP and cooperation mechanisms (frequency of actor groups mentioned by Dutch interviewees)

Respondents' perceptions of the opinions of Dutch *policy makers* ranged from a slightly positive to a negative opinion on CSP and cooperation mechanism. More positive perceptions were expected in case that achieving climate goals might become difficult (SocInf2-NL) or depending on a favourable narrative framing of the idea (Science1-NL). Others, more expecting a neutral or negative opinion, referred to a low presence of the idea in current discourse and a mixed perception of a recent discussion of cooperating with Romania (Pol2-NL). The little presence and little interest lead other interviewees to state neither positive nor negative perceptions (Science2-NL, SocInf1-NL, SocInf3-NL). Two (Grid1-NL, Pol1-NL) expect negative attitudes from policy makers either due to doubts on political feasibility or a sensitivity on investments abroad and a preference for cheaper options.

In the Dutch interviews, statements about *societal influencers* all referred to environmental NGOs and ranged from positive to slightly negative. One impression is that they are not very interested (SocInf1-NL, SocInf2-NL, Science1-NL) and focusing on other topics, are sometimes critical on new transmission lines, and/ or prefer national and more decentralized approaches to fulfil national targets. and sometimes critical on new transmission lines.

Public opinion is expected to be neutral or more or less negative. This expectation is justified by the complexity of such a construct, also due to the long distances involved and the fact that money is invested abroad (Science2-NL, Science3-NL, Cons1-NL). Neutral perceptions mostly refer to the fact that CSP and / or cooperation mechanisms are not an issue that is often discussed (Science1-NL, SocInf2-NL, SocInf4-NL).

The perceived *industry* view is neutral to positive with either paying little attention so far (e.g. Science1-NL, SocInf3-NL) and maybe some interest from the electricity sector and consultants (Science2-NL).

The opinions associated with the remaining groups reach from slightly negative to positive and refer to a variety of arguments, e.g. positive perceptions of the idea if grid operators support it. Local community attitudes are seen as manageable and positive in the past (SocInf1-NL, SocInf2-NL). From researchers, little interest is seen in the topic (Science3-NL) and SocInf2-NL states:

“Science and research. (...) has a bit of a blind spot for CSP....they have the feeling that it won’t play a significant role, so they do not do much research in this area.”

Similarly Similar opinions are expected from support organisations, however, as there might be a chance for consultants to profit, this subgroup might be “very eager” (Science2-NL).

Preference for alternative options

An extensive list of alternative options are brought forward in the interviews - options that are either preferred by the interviewee or evaluated as more likely to be realised (Table 25). The most frequently mentioned is around other renewables, mainly wind in the case of the Netherlands, but also PV. The expectation is that they will be sufficient to reach climate targets. Another alternative is the idea that cooperation mechanisms will only be of relevance in later phases. Further options were mentioned by two respondents each: The first one also implies the idea that it might come later, i.e. with new regulation (gap filler / avoider) for 2030 and beyond. The concept of a free market as soon as renewables are ready to diffuse without subsidies is mentioned, and finally instruments like statistical transfer, carbon pricing, and also a strategy that focuses more on energy efficiency & sufficiency as an alternative. Finally, one respondent points to alternatives outside Europe (CSP in the Sahara region).

Table 25 Alternative options (Netherlands)

Alternative options - categories	Interviewee	Extracts
Other renewables	Science1-NL	I think wind – the new applications that we work on that are likely have higher social acceptance – could help. In general we should not aim for one but for a diverse pallet of solutions.
	Science3-NL	For electricity, we need wind and sun. It is clear what the options are there. Around 60% and 70 % wind and solar should be possible.
	SocInf4-NL	So as for reaching an increase in RES, we first favour domestic increase in installed capacity and that would be wind offshore to a large extent in the Netherlands.

Alternative options - categories	Interviewee	Extracts
	Cons1-NL	Calculate first what the possibilities are with offshore and onshore wind, biomass, geothermal energy,...
	Grid1-NL	We should perhaps focus mainly on offshore wind in the North Sea, and do that together with the relevant surrounding countries (GB, DK, NO, DL).
Joint projects as a later option	SocInf3-NL	[We] think that perhaps in the longer term it might be a good idea, but not at the moment.
	SocInf4-NL	It is more something for the long term, when H2 production using electrolysis becomes mainstream because for that we will need a lot of RES... ..
	Grid1-NL	And in a later phase, we can take a broader view, but addressing it at the regional level first is most feasible.
	Pol2-NL	In the long run, if the supply of RES increases enormously, and if not only CO ₂ but also cost-effective and stable energy provision are goals, then it might be that other choices are going to be made.
New regulation (gap filler / avoider)	Science2-NL	As for the next decade 2020-2030, things could happen. All countries need to get a clear picture to what they have to contribute towards EU wide targets.
	SocInf4-NL	At the EU level: it could be an idea to have the EU support countries that face more challenges in developing their RES capacity.
Free market	SocInf4-NL	Next: many RES are (almost) competitive (...) And then you can let the market take care of it.
	Pol2-NL	So the renewable electricity sector will soon have to be able to further develop and grow on its own, without further subsidies.
Statistical transfer	SocInf2-NL	I am in favour of such projects. As for the division of costs and benefits: since I don't think that the electricity will be transported from Spain to NL any time soon, it is probably more a way to cheaply achieve the national targets (statistical transfer).
	SocInf3-NL	And this will be statistical rather than physical import, as the latter is quite difficult to organise.
Carbon pricing	SocInf4-NL	Next: many RES are (almost) competitive, so what becomes important now is to have an EU-wide CO ₂ price. That is the final thing RES need to end up as the logical best and

Alternative options - categories	Interviewee	Extracts
		cheapest choice for investors. And then you can let the market take care of it.
	Pol2-NL	As for alternative options, we will focus more on CO ₂ , for which we have a well-functioning ETS instrument. The CO ₂ price is currently rising and this ensures higher incentives to reduce CO ₂ in energy generation and in industry.
Energy efficiency & sufficiency	Science2-NL	...more attention to energy saving an energy efficiency would be important. All renewables have local environmental consequences, so we would really need to look more into the energy savings and energy efficiency potentials.
	Cons1-NL	Calculate first what the possibilities are with offshore and (...) - very important! – energy saving and efficiency.
Outside Europe	Pol1-NL	As for CSP: with Southern Europe there is the advantage that there is more sun, but in the Sahara even more so. In the Sahara there is also more land available compared to Spain.

Future expectations

This section summarizes what respondents stated what they see as probable or realistic scenarios for the future. Seen from the perspective of implementing CSP via cooperation mechanisms, these statements are categorized on a continuum from positive to negative. Three respondents, however, voiced opinions that were not that clear on this continuum, but referred to a long-term perspective with developments starting towards 2030, thus they are in a separate category in Table 26.

Two respondents who have slightly positive expectations develop arguments of connecting CSP with a hydrogen economy where they see CSP as more promising than the alternative of relying on wind surpluses. The great benefit they associate with this scenario is that it would open up a variety of usage scenarios also for a range of industries.

One of the policy makers takes a neutral position in as far as s/he does not elaborate on the implementation of cooperation mechanisms but more on rising chances for CSP in a liberalized energy market. On the negative end, the policy maker considers other developments are seen as more likely, i.e. combining PV and storage or statistical transfer as the only likely possibility.

Finally, three interview-partners developed thoughts around new policy mechanisms implemented for or between 2020-2030 and beyond which could trigger new developments. However, no firm expectations are stated whether or in how far these new developments could increase the chances for CSP and cooperation mechanisms.

Table 26 Future expectations (Netherlands)

Expectation	Interviewee	Extract
Slightly positive	SocInf2-NL	Well I think we need to use the sentiments that are apparent now: so for instance using hydrogen for storage: everyone is enthusiastic about that. H2 as alternative for grid enforcement. An expensive H2 plant for irregular surpluses of wind power is not a good idea. But a H2 plant to use constant abundance of CSP electricity in a location where that electricity is not needed, that can be really attractive. And that allows you to make various other substances, especially if you also have CO ₂ at your disposal (e.g. ethanol, methanol).
Slightly positive	Cons2-NL	The reason for CSP is sustainability, decrease in CO ₂ . The price of CO ₂ has risen but only since very recently... So if we want to get to a 95% reduction in CO ₂ , from the perspective of industry: we cannot exclude options, we need all options (wind, solar, biomass, CCS, perhaps nuclear). All options have disadvantages as well, even wind and solar. So basically we are technology neutral as long as we get to the CO ₂ reduction. So then CSP can form part of the combination of options, however, when it is generated elsewhere we best turn it into H2. And then we have the added advantage of an additional feedstock for our chemical industry.
Neutral	Pol1-NL	If it becomes and interesting business, then you won't need a mechanism to encourage it. But if you do all this based on political motives and there is no business case, then you keep on struggling. When the Energy Union gets shape, the business case is going to get better as well.
Slightly negative	SocInf1-NL	So we can solve the day-night problem using PV in combination with CSP. Or with PV and battery storage. Or, what I expect a combination of the two However, if the development of CSP stagnates, which is possible, because the market is still too small, we are going to see large scale combinations of solar PV & battery storage, in neighbourhoods, households and in energy plants.
Negative	Science1-NL	Currently, expectations in the Netherlands are CSP are really low (both when we implement the CSP plant here and when we do that abroad) so this is all not going to take off anytime soon.
Negative	Pol2-NL	Only statistical transfer is likely to occur. Even though that would result in some political loss of face.

<i>Expectation</i>	<i>Interviewee</i>	<i>Extract</i>
Long-term perspective	Science2-NL	As for the period until 2020: If the Dutch panic at the end of the day they might look for ways to cover the gap. NL government has already done some exploration into excess renewable 'green value' – (e.g. Estonia, Bulgaria, Rumania) Joint support scheme: would not be feasible in short time frame until 2020, not would joint projects. So the only option is using the statistical cooperative mechanism, and it may well be that the government has something up in its sleeve. Moreover, there are some countries that have already established statistical transfer agreements to learn from. As for the next decade 2020-2030. Things could happen. All countries need to get a clear picture to what they have to contribute towards EU wide targets. So that would be the first step, before starting to think about using cooperative mechanisms.
Long-term perspective	Science3-NL	For 2030 there will be common (EU) targets and in time the cooperative mechanisms may become more relevant, but at this moment this is not yet the case.
Long-term perspective	SocInf4-NL	So a nice vision this could be: start domestically with as much RES as possible, next you start with imports of H2 and after that this high voltage infrastructure could get shape in the EU context (2030-2040).

3.3 France as a potential transit country and the European perspective

This section briefly summarises the results of interviews conducted with French and European level actors, mostly analysts and members of civic and industry associations dealing with energy issues. These interviews were not analysed in the same depth as those for host and offtaker countries as the involvement of the transit country or the EU level is also more peripheral. This was also mirrored by the content of the interviews where the respective interviewees tended to answer sometimes a bit more superficially.

Overall, we find a diversity of positions. Interviewees from France report an ambivalent position towards cooperation mechanisms for CSP. While some support the general idea and goal of joint projects, some others report serious doubts about the potential development of these projects. Representatives of EU level actors, on the other hand, show a very positive attitude towards cooperation mechanisms for CSP, but are aware of some of the barriers to the development of these mechanisms as well as of some critical issues for their acceptance.

Interviewee 1 (France), a representative of a federation of local municipalities and specialized in energy issues, considers him/herself ambivalent about a potential joint project between Spain and Germany. S/he is positive about the idea of fostering European cooperation to favour the energy transition. Therefore, s/he thinks cooperation mechanisms are a good idea. Asked about a potential joint project between Germany and Spain, s/he refers to the lack of local benefits in the countries where the energy travels through, if there is a physical transfer of electricity between the host and offtaker countries. S/he thinks this could generate local opposition: *“If there is any high-voltage line to develop or to reinforce and if that represents a cost for the community, we would have a hard time explaining the citizens that it will be used to transmit energy to feed the northern neighbours and from which we cannot get any direct benefit”*. S/he summarizes his/her position as *“Ambivalent. I would say that it all depends on the conditions of the local benefits. Not a bad idea in keeping with the European cooperation necessary efforts in favour of energy transition, but there should be local benefits for the countries the energy travels through and the green light to develop French own facilities. It would be difficult to defend the interests of a project like this than a project directly between Spain or Italy and France”*.

Interviewee 2 (France), a representative from a renewable energy association in France, considers that countries should first try to achieve the objectives for renewable energy generation with their own resources instead of relying on physical or statistical transfers. S/he clearly states that: *“First, I would like that each country defines achievable objectives and that deploys the corresponding resources and policy measures. I don’t think that today in Europe there isn’t a single country that cannot achieve the objectives with its own renewable resources, even Germany. I think this cooperation is the way of releasing many European countries from their obligations”*. S/he does not perceive many benefits from a joint project between Spain and Germany: *“I don’t see many advantages. Besides, a high-voltage line across France would need to be built, 1000 km to transport the electricity... um... it’s either virtually, exchange of certificates or guarantees of origin, whatever it is. But if it was about a physical transfer, then we would rewind to DESERTEC, what I call a “delirium”. I don’t know if you know France’s situation, but we have social opposition against wind turbines installation. Then imagine what it’d be with a high-voltage line or even with the reinforcement of the current ones. If there weren’t people, regulations and local culture, it’d be easier. As it’s not the case in Europe, it is just impossible. There are already issues inside Germany to connect the north to the south...”*. Other potential barriers and costs are outlined by the interviewee: *“Then it is not only a problem of social acceptance, but it is also a problem of costs and of delay. I participated in the regulatory analysis during the preliminary project of high-voltage lines reinforcement in my regions, in the Alps. I can say that it would be very difficult to build one across France”*. On the other hand, s/he perceives there are potential benefits of physical transfers between countries sharing borders. Overall, his/her position is that: *“I am in favour of cooperation between countries, for example, between Germany and Denmark or between countries sharing borders. The resources exchange between neighbours is very effective. I don’t have anything against it... if it allows us to have access to German wind energy tariffs...or if France can support with a*

project, that would be fine. But it should not be a pretext to avoid each country's homework. It would be better to really sanction the countries that don't meet the goals".

Interviewee 3 (France), a renewable energy analyst, is positive about the idea of cooperation mechanisms in Europe. S/he thinks a potential joint project for CSP between Spain and Germany would not have any negative impact for France. S/he mentions that physical exchanges of electricity are carried out daily across many countries in Europe. A joint project between Spain and Germany would not be different: *"An exchange between Spain and Germany would not be different, it would not have anything exceptional. If it leads to a saturation in the electricity transport, well, in that case, this project should not be treated specially. It is necessary that the electricity stemming from the Spanish site is introduced to the flux that is already managed between France and Spain and if there is a lack of capacity, this would be managed as a whole. There should not be a preferential treatment for this project and it should follow the classical energy exchange among countries, including the payments assigned to them".* S/he also adds that: *"In any case, the European network of transmission is already integrated. There are electricity exchanges already in place. In this matter, this project wouldn't change anything".* S/he refers to the benefits of these mechanisms for CSP and both for the host country and the off taker. S/he refers to two conditions for acceptance: the offtaker country, the German operator, should financially participate in the grid reinforcement or line expansion in case the new energy cannot be transferred by the current infrastructure and the importance to show the local benefits first in terms of employment, the benefits that are not exported to Germany. In his/her view, it is key to explain the nature of the partnership and all the advantages for the inhabitants. S/he summarizes his/her position: *"I am rather in favour. It is a beautiful example of European cooperation. We know very well the need for a strong cooperation in the energy sector, particularly in the period of 2020-2030, because the objectives should be shared seeking the slightest affectation".*

Interviewee 4 (France), a representative from an association of renewable energy companies, mainly refers to statistical transfers, as s/he considers that there is no need for a physical transfer. S/he believes that the main goal of cooperation mechanisms is the reduction in the cost of renewable electricity generation for offtaker countries. S/he states that: *"The main advantages of these mechanisms lay in the cost. For countries with small capacities in their territories or for those who have nationally invested but would like to find capacities that are less expensive elsewhere. But as I told you, we see the decrease of national costs or RE development all over Europe".* In this context, s/he does not expect France to participate in a joint project or to invest in CSP developments. Asked about a proposal for a joint project between Germany and Spain based on CSP technology, s/he considers him/herself agnostic. As s/he reports: *"I think we would be rather agnostic. We would not be in favour or against it. In your example, neither the French public system nor the grid are involved. So, I don't see the reasons for opposition from France. A statistical transfer, that follows an investment, is completely possible".*

Interviewee 5 (France), an energy analyst, thinks that there are significant barriers to the implementation of joint projects with physical transfer in Europe. In fact, s/he does not see how a physical transfer of electricity generated by a CSP plant in Spain could be realised to Germany. S/he considers statistical transfers as useful and proven. But, as s/he mentions: *“The statistical transfers seem to be useful and proved. Then, the physical transfers would be much more complicated, I don’t see how it should be very appropriate. That is my personal opinion”*. S/he also considers that joint projects should be based on the most competitive technology and not necessarily on CSP. In general, s/he is ambivalent about cooperation mechanisms with physical transfer for CSP: *“Again, there is the mix of topics that are not linked. I don’t really see the sense of the project. The cooperation projects are not the best way to promote the technology (CSP)”*. S/he does not perceive any potential cost or benefit for France. Regarding the need to build new interconnections, s/he mentions that *“there is an ongoing plan to develop interconnections in Europe, that includes a cost/benefit evaluation. There are, of course, projects of interconnection between France and Spain. Some of them seem promising, others seem too costly. The construction of new lines should be limited by the economic benefit”*.

Interviewee 1 (EU) at the EU level considers the exchange of renewable electricity from different sources in different regions as a key element for the decarbonisation of the European economy. S/he perceives various benefits from cooperation mechanisms for CSP such as the contribution to the energy security of Europe, the exploitation of abundant renewable resources in countries such as Spain and the development of the CSP industry. S/he is fully in favour of the development of these projects: *“The idea itself seems very interesting to me. The mechanisms have not worked until now and it has to be studied why they have not worked. In other words, if they have been implanted for almost ten years since 2009 and are not being used, why are they not used? You have to influence there. We have to revise how we are trying to implement these projects because it is not working”*. S/he refers to different barriers to implementation such as the different interests of the European commission, the member states and the regions, the cost of the electricity generated by CSP, or the lack of grid interconnections.

Interviewee 2 (EU) is concerned about the lack of implementation of joint projects for CSP in Europe. S/he is aware of the barriers involved in the development of joint projects for CSP (capital costs, lack of interest in some countries, etc.) and s/he considers these projects as a key element for the decarbonisation of the European economy. S/he outlines that these projects are supported by the European legislation, can help countries to meet their renewable energy target, help support the European leadership in CSP technologies and take advantage of the various situations of the European countries in terms of renewable resources. S/he is aware of the lack of interest in these projects in some offtaker countries, and outlines the need for a broader perspective, one that goes beyond the short-term national interests and understands the benefits for the energy transition in Europe but also for the member states cooperating (e.g. s/he mentions the benefits of involving the industry in the offtaker country in the development of CSP plants in the host country). S/he also

considers that creating a large market for CSP will allow the reduction in the costs of the electricity generated.

Interview 3 (EU) at the EU level considers that cooperation mechanisms can play a critical role in relaunching the market of CSP in Europe. S/he thinks cooperation mechanisms have three advantages as compared with other mechanisms: they are flexible to cover the diversity of needs and intentions, as they allow a diversity of agreements, they enable a cooperation that goes beyond the cooperation that is currently in place in Europe (cross-border cooperation) and they allow the involvement of industries from various countries. S/he is aware of some of the barriers to the use of cooperation mechanisms: lack of trust in cross border investments, lack of trust in the renewable targets in some member states, lack of effective sanction mechanisms, and lack of immediate political use of CM. S/he is particularly concerned about governments prioritizing decentralized generation but not about cooperation. S/he considers that a critical condition for the acceptance of future joint projects is to design a project that produces a balance of risk and benefits for the countries. In this sense, s/he mentions that: *"It will not work if the only beneficial is the Spanish industry. From scratch, it should be visible that there is a shared benefit. Demonstration of win-win situation"*. Another critical issue is the adequacy of the design to a specific need. S/he states: *"We need to analyse carefully the need over a timeline (...) we need to demonstrate the shared benefits of these projects over a timeline (...) it is not only about a reduction in the cost of electricity"*. S/he considers that the EU does not need any new piece of regulation. S/he finally reflects: *"It is a matter of conviction. But we need to convince member states to use something that exists"*.

Interview 4 (EU) was conducted with a representative from an environmental organisation. S/he refers to technical barriers for implementation, such as the lack of grid interconnections, especially between Spain and France. In addition, due to the long distances, losses are another challenge. Thus, the network infrastructure in the countries have to be expanded, e.g. high-voltage DC lines that can transport electricity relatively loss-free over a long distance. To expand interconnectors, a co-financing by network operators in both countries is necessary. Thus, EU co-financing offers itself, i.e. a more closely interwoven European energy market. Besides these technical challenges, there are also political barriers: France, for example, wants to protect its own energy industry and thus they take measures that regulate the flow of renewable energies from abroad. Barriers from the perspective of a host country can be the wish to first cover a large part of its own needs before it can think of exporting: *"When I think of Spain, for example, there is still a lot to be done to compensate for the fortunately imminent loss of coal and nuclear power."* In terms of benefits of such projects the interviewee mentioned the argument of storage. The possibility to store the energy can open up groups of stakeholders for renewables who might otherwise be very sceptical, like regulators or people in economics ministries. In addition there can be positive effects for the local economy in the host country, however, these effects are often quite temporary, like construction jobs. S/he concludes: *"I believe, in principle, (...) that the energy system transformation is a European project, and you have to see that in the end every country with its specific geography*

possesses an important raw material, if you like, which is not dug out of the ground, but which can be harvested freely, namely in the form of the sun."

Interviewee 5 (EU), a representative from a European association of technology providers, is in favour of the idea of cooperation mechanisms in Europe. S/he also perceives a benefit of the technology in the possibility to store the energy, especially if renewable energies are further expanded in the future: *"So with thermal storage and that's something that might not be needed at the moment. But when we then have more variable renewables, i.e. wind, PV, we will have even more."* Challenges for CSP are the further development and improvement of turbine technology for CSP projects in order to achieve a higher efficiency and - related to this - cost reductions. These challenges can be addressed by large-scale or one-of-a-kind projects to achieve scalability. Thus, more funding for technology development is necessary.

4 DISCUSSION AND CONCLUSION

4.1 Starting point and summary

This deliverable applies a broad concept of social acceptance in order to analyse the socio-political acceptance of cooperation mechanisms of the RES Directive to supply electricity from CSP plants in the South of Europe to Central and Northern Europe. The latter are a political instrument included in recent European regulation to enable bilateral cooperation between EC member states as part of their climate change efforts and the transition towards a more renewable energy system. Socio-political acceptance in this deliverable is seen as enacted by a variety of societal actors and stakeholders within a technology innovation system. Furthermore, in addition to socio-political acceptance other dimensions of social acceptance, namely market acceptance and community acceptance are integrated in the research.

So far few academic studies have been published on social acceptance of CSP and cooperation mechanisms. Those available point to challenges around socio-political acceptance in offtaker countries (Caldés et al., 2019). A first study did not identify issues around local acceptance (Hanger et al., 2016), however, within Europe community acceptance has become a relevant issue. Regarding market acceptance, no studies have been published. An earlier deliverable (Dütschke et al., 2018) identified a network of companies and associations on the supply side but hardly any actors on the demand side who actively associate with CSP. As this study therefore is of exploratory character, a qualitative research approach was chosen to allow for openness with respect to relevant issues. 53 interviews were conducted to generate an empirical basis for the analysis; interviewees were representatives from societal groups derived from the TIS-based systematization including policy makers and administration; science and research; technology providers and project developers (supply side); electricity grid operators; electricity consumers (incl. utilities, companies) (demand side); influencers (e.g. NGOs, media, labour unions); local stakeholders. Interviewees were obtained from three focus countries, i.e. Spain as a host country as well as Germany and the

Netherlands as potential offtaker countries. This view is extended by interviews from France which could be involved as a transit country as well as European perspectives from interviewees who are representatives of organisations on the European level.

Problem perception

A first line of analysis across the interviews was to find out in how far interviewees perceive implementing CSP through cooperation mechanisms as solving a current problem or contributing to a societal need. In all three countries, Spain, Germany and the Netherlands, a significant share of respondents referred to decarbonisation by increasing the share of renewable energy sources across Europe as a need. Some Spanish respondents emphasized the integration of the European electricity market. This specifically also referred to the perception that Spain is physically isolated due to weak connections towards Central Europe. In Germany, some interviewees saw such a development as a chance for a better integration and cooperation in Europe in general. In the Dutch interviews a contrary perspective, i.e. the fulfillment of national climate goals was a relevant topic while in Spain the advancement of the CSP technology per se is another underlying rationale. It is generally challenging to determine in how far findings of interviews on a specific case are representative for countries as a whole. What can be taken from the findings here is that the narrative around CSP and cooperation mechanisms is heterogeneous and could evolve in different ways. A cautious assumption could be that the found narratives differ between the countries under study. Furthermore, there are also some tendencies that policy makers seem to argue differently from other groups.

Perceived benefits

There is a shared understanding in all three countries that the main benefits from CSP and cooperation mechanisms are economic benefits, reflected by the fact that economic aspects dominate the respective discussion around advantages. This includes socio-economic development in the host country, brought about firstly by building and maintaining the CSP plant, but also by secondary effects e.g. through combined use of such an infrastructure, and technology development that can also be exported. These effects are not perceived to be restricted to the host country but a reverse cooperation of German or also Dutch industry in technology development is also mentioned leading to positive effects like employment in the offtaker countries. In Spain, the further development of CSP as a technology is seen as related to such economic co-benefits.

Another shared block of advantages evolves around decarbonisation and climate change mitigation. In this context, primarily German and Dutch respondents also refer to the dispatchable quality of CSP as an advantage in an energy system that includes more volatile energy sources.

Finally, there are references in all three countries of a better integration within Europe in the energy market or beyond which is both seen as favourable.

Perceived costs

The main downsides from a Spanish perspective are a potential negative local environmental impact of CSP plants, the need of new grid infrastructure, and an increase in the cost of electricity for the off-taker country. Costs are also an important factor in German interviews. However, more prevalent in German interviews are political barriers, e.g. preferences for national strategies and doubts on political stability and reliability in the countries involved. The actual implementation of cooperation is perceived as complex. Political issues and national interests are also mentioned most often by Dutch respondents when referring to barriers. In Germany and the Netherlands, the topic of infrastructure is also prevalent. Here, two further streams of discussion emerge: one refers to the challenge that local needs for renewable energy sources in the host countries need to be met as well, the other focuses on a preference for using national potentials in the offtaker country prior to cooperation.

Attitude

In all three countries, Spain, Germany and the Netherlands, the majority of interviewees support the implementation of joint projects for CSP. However, while in Spain this support is nearly unequivocal, in Germany and the Netherlands support is only shared by about half of the interviewees or less, thus, showing a less homogeneous view. In Germany, scientists and technology developers positioned themselves very much on the positive angle, similarly in the Netherlands, while the other stakeholders stated less clear or critical attitudes. The reasons the Spanish interviewees give for this positive embracement are similar to the arguments discussed as the basic rationale (problem perception) and as benefits: a positive view of cooperation between EU countries for the promotion of renewable energy, the expectation of local socio-economic benefits of developing new CSP projects and the expectation of significant benefits for the CSP technology. The enthusiasts in Germany argued similarly, pushing forward a European idea and cooperation within Europe, excitement for the CSP-technology and / or strong support for a quick transition to a renewable energy system. This last argument is the main issue brought forward by Dutch supporters.

Those sceptical or undecided in Germany and the Netherlands were concerned if the time is ripe for CSP and cooperation mechanisms, that the implementation might not be realistic or referred to the long term perspective connected to such an arrangement. Those few sceptical in Spain tended to refer to the existence of better alternatives to cooperation (such as local generation) as well as to the associated management/political and or infrastructure related problems associated to cooperation.

Acceptance conditions and equity

As conditions for acceptance Spanish interview partners relate to issues such as the existence of a real need for renewable electricity in the offtaker country, the equal distribution of benefits and costs between the offtaker and host country, the existence of political support, the impacts on the

local environment of the project, and the technological design. Similar conditions are also brought forward in Germany, e.g. emphasizing the importance of local knowledge and value creation. Other than that, an important topic that emerges in the Dutch interviews is ensuring that the implementation of such an opportunity would really save costs for the Netherlands. At the same time, respondents underline that they find it important that the project is locally implemented according to standards valid in the Netherlands and also refer to local value creation. Thus, Spanish and German respondents had higher overlap on thoughts on acceptance conditions amongst each other than Dutch respondents.

Perception of other actors

The Spanish interviewees believe that *policy makers* in Spain as the host country would not be opposed, in principle, to cooperation mechanisms for CSP. In Germany, policy makers are perceived as ambivalent and trying to be in line with German industry and German voters' interests. The perceptions of the attitudes of Dutch *policy makers* are on the one hand positive and associated with putting hopes on such an arrangement to fulfill climate goals but balanced by a negative side on the other hand with an anticipation of high complexity and sensitivity from voters. All three countries are connected by the perception of interviewees that this topic is not high on the political agenda.

Regarding the supply side industry, German interviewees expect the industry to be prone to become active and engaged. In the Netherlands this is more or less agreed, however, recent interest from industry is not perceived as very visible. In Spain, concerns are raised that the electricity companies might be sceptical if locations become occupied by facilities and infrastructure to generate electricity for another country. On the demand side, Spanish and German interviewpartners argue that it is important to avoid rising electricity prices. No active support but also no active resistance is anticipated from this group.

Socio-political acceptance (society / influencers) is perceived as neutral across countries and respondents with no recent impetus and no strong opposition is expected. Similarly, in Dutch interviews, environmental NGOs as societal influencers are perceived as distant and little interested. Counter-arguments from NGOs could be that national funds are invested abroad or that there is a strong preference for a highly decentralized energy system.

In Spain, interviewees feel that local communities with solar resources and CSP installations such as Extremadura and Andalucía would welcome new CSP projects for cooperation mechanisms. Similarly, from the offtaker country perspective, local acceptance issues are acknowledged but are not expected to be particularly strong especially because CSP should usually come with local benefits.

Overall the perceptions of the different actor groups are mixed, but mainly ranging from slightly negative to slightly positive views with a small tendency towards the positive side. Several groups are perceived as mainly neutral and - what could be more important - not very interested. Thus

while social acceptance issues seem to be manageable, the greater challenge around CSP with cooperations mechanisms is that the idea is lacking interest and active supporters.

Preference for alternative options

A preference for a highly decentralized energy system is present among a number of interviewees in all three countries and cross-European cooperation on large installations like CSP do not seem to be in line with such a scenario. Alternatively, some German interviewees share a preference for a liberalized energy market in Europe that may also trigger CSP if it is economically viable. Some German interviewees point to regulatory changes as a first step to create windows of opportunity that may or may not lead to the implementation of CSP. Dutch respondents emphasize local renewables, mainly wind, as an alternative option.

Future expectations

Shared across the three countries is the view that implementing CSP in Europe with or without bilateral cooperation mechanisms is a long-term pathway and will probably require political changes beforehand. In Spain several respondents are still optimistic while in Germany only few respondents see windows of opportunity in Italy (host) or France (transit). Other German respondents see chances for CSP in a liberalized European electricity market making cooperation mechanisms obsolete. Two Dutch respondents see chances for CSP in connection with a rising hydrogen economy. However, some Dutch interviewees are also pessimistic about CSP and regard it as more likely that, for example, combining PV and storage or statistical transfers are the more probable developments.

French and European perspective

Of the five interviews in France, two take a rather ambivalent to sceptical position by stating that national achievement of targets is possible and should be favoured - a line of argument that is also been prevalent in the Netherlands. A third interviewee is quite positive and sees it as a potential strengthening of a current electricity system integration that is already ongoing. A fourth interviewee from industry mainly embraces the idea of statistical transfer which does not yield implications for France.

The European perspective is positive across interviews viewing such a scenario as helpful on the pathway towards decarbonisation acknowledging at the same time that national enthusiasm is limited so far. Thus interviewees reflect on potential fair distributions of burdens and profits. The representative from an industry association finally relates to the advantages of the dispatchable quality of CSP.

4.2 Limitations

To ensure openness in all directions about relevant issues we chose a qualitative research design. However, as the sample for a qualitative approach is based on purposeful sampling and not on

statistical criteria it is always difficult to ensure that all potential views are covered. In this study, we tried to enhance sample quality by using systematic categories of respondents. However, as also practical issues limited the number of interviews that were conducted, we might still have missed some relevant issues. Furthermore, while our qualitative approach enables the identification of relevant issues, such a design does not allow for generalizations about the prevalence of certain arguments in the respective (national) society. Similarly, while data seem to point to some country differences, these might also be due to interviewers (which were different in all countries) or not be valid on a larger scale. To avoid interviewer effects, a semi-structured guideline was developed and talked through with all interviewers. Nevertheless, interviews are always shaped - to a varying degree - by interviewer personality.

It is especially important to take the findings on France with caution as they only mirror the point of view of societal actors and we have not been successful in recruiting respondents among policy makers or the grid developers which would certainly have added an important perspective.

4.3 Conclusions

This study made a first step into exploring the social acceptance for the combination of CSP and cooperation mechanisms empirically. The main finding across countries and stakeholders is that despite the perception of strong benefits from joint projects for CSP by the stakeholders, an impetus from society or important actors in the innovation system is missing to drive the development of these projects. Limited interest and a lack of recent discussions is perceived for many groups, such as policy makers, societal actors, and to some extent the relevant industry itself. From an energy system point of view, many interviewees think that CSP could play a useful role, e.g. contributing to achieve climate goals in certain countries, or supporting the energy system with dispatchable electricity. However, they also believe that this role could be filled by realizing other options, such as PV and storage. A crucial issue regarding the innovation system of CSP is the issue of necessary infrastructure. Spain is currently only weakly connected to Central Europe and this is changing slowly at best.

Another pathway that could open a window of opportunity for CSP implemented through cooperation mechanisms is a scenario where cooperation across countries in Europe is strengthened more generally. Such a process is on the one hand related to strengthen a European energy union, but also - as some interviewees elaborate - a stronger European alliance on more general terms where such projects are also seen as important because they contribute to local economic strength and value creation.

From an acceptance point of view, market acceptance for CSP seems feasible and positive on the supply side - the industry is there and should be eager to contribute. The demand side is less clear as electricity is usually not bought specifically from a certain generation unit but via the electricity market, which is additionally subject to extensive regulation and specific market mechanisms as well as bound by infrastructure. Thus, on the one hand, the demand side is less relevant for pushing

developments than in other markets where the products are more differentiated than electricity. On the other hand, demand side investments in PV and wind have also been influential for the development of renewable energies and thus show the power of the demand side also for this market. Local acceptance is not identified as specifically critical for CSP. Generally, debates about local infrastructure have gained prominence in the past years and CSP also means significant land use and visual impacts. However, given that implementation is guided by the application of transparent procedures that enable participation, the interviews lead to the conclusion that local community acceptance should not be a major barrier, due to the potential local benefits and the fact that the implementation is usually less densely populated areas community,. Finally, socio-political acceptance is an important issue around CSP. Depending on the narrative that might become prominent (e.g. putting it to extremes: investing large sums of money in a foreign country for insecure outcomes vs. supporting a European idea with a project that helps mitigating climate change and stands for efficient use of resources and a win-win-situation between countries), the current more neutral view could change in either direction.

5 REFERENCES

- Caldés, N., del Río, P., Lechón, Y., & Gerbeti, A. (2019). Renewable Energy Cooperation in Europe: What Next? Drivers and Barriers to the Use of Cooperation Mechanisms. *Energies*, *12*(70), 1–22.
- Caldés, N., Lechón, Y., Rodríguez, I., & del Río, P. (2018). *Analysis of the barriers to the use of the cooperation mechanisms for renewable energy in the EU: MUSTEC D4.1*.
- Caldés-Gómez, N., Díaz-Vázquez, A.R. (2018). *Promoting solar electricity exports from southern to central and northern European countries* (EUR 29087 EN). Luxembourg. Retrieved from <http://s3platform.jrc.ec.europa.eu/-/promoting-solar-electricity-exports-from-southern-to-central-and-northern-european-countries-extremadura-case-study?inheritRedirect=true&redirect=%2Fs3-energy-partnerships-solar-energy>
- Del Río, P., & Kiefer, C. P. (2018). *Analysis of the Drivers and Barriers to the Market Uptake of CSP in the EU.: Deliverable 4.3*. Madrid, Spain.
- Del Río, P., Peñasco, C., & Mir-Artigues, P. (2018). An overview of drivers and barriers to concentrated solar power in the European Union. *Renewable and Sustainable Energy Reviews*, *81*, 1019–1029. <https://doi.org/10.1016/j.rser.2017.06.038>
- Dütschke, E., Choi, S.-M., Sala, R., & Oltra, C. (2018). *Stakeholder mapping report: MUSTEC D3.1*.
- EurObserv'ER. (2018). *The state of renewable energies in Europe: Edition 2017*. Paris. Retrieved from <file:///C:/Users/de/Downloads/EurObservER-Annual-Overview-2017-EN.pdf>
- European Commission DG-ENER. (2018). *Towards a more Europeanised approach to renewables policy– A possible instrument to support cross-border cooperation on renewables in the Multiannual Financial Framework post2020* (Background document for the Expert Consultation Meeting). Brussels.
- Hanger, S., Komendantova, N., Schinke, B., Zejli, D., Ihlal, A., & Patt, A. (2016). Community acceptance of large-scale solar energy installations in developing countries: Evidence from Morocco. *Energy Research & Social Science*, *14*, 80–89. <https://doi.org/10.1016/j.erss.2016.01.010>
- Hekkert, M., Negro, S., Heimeriks, G., & Harmsen, R. (2011). *Technological Innovation System Analysis: A manual for analysts*. Utrecht.
- Sonnberger, M., & Ruddat, M. (2016). *Die gesellschaftliche Wahrnehmung der Energiewende – Ergebnisse einer deutschlandweiten Repräsentativbefragung* (Stuttgarter Beiträge zur Risikound Nachhaltigkeitsforschung No. 34).
- Upham, P., Oltra, C., & Boso, À. (2015). Towards a cross-paradigmatic framework of the social acceptance of energy systems. *Energy Research & Social Science*, *8*, 100–112. <https://doi.org/10.1016/j.erss.2015.05.003>

Wüstenhagen, R., Wolsink, M., & Bürer, M. J. (2007). Social acceptance of renewable energy innovation: An introduction to the concept. *Energy Policy*, 35(5), 2683–2691.
<https://doi.org/10.1016/j.enpol.2006.12.001>

6 ANNEX

Interview guideline

My name is _____ and we are conducting this interview as a part of the MUSTEC project. The goal of the project is to understand the views of the different stakeholders on cooperation projects (joint projects) to supply renewable electricity on demand from CSP plants in the South of Europe to Central and Northern European countries. As a _____ we value your opinions and insights. We want to know how you personally or your organization feel about these mechanisms, how do you perceive their potential benefits and costs and what you think what the views of other members of the society are on these issues.

Information on informed consent / data protection

Problem perception

What do you think is the main problem that the implementation of joint projects can help or are aimed to solve? Is this problem relevant?

Initial reaction

Let's imagine that a joint project is proposed between a Southern European country/ Spain and a Central European country/ Germany to supply renewable electricity on demand from CSP plants.

- What would be your initial reaction?
 - Would it be enthusiasm, concern, interest...?

Perception of benefits and costs (focus on the country of the interviewee, unless it is an European stakeholder)

[If the interviewee has mentioned any benefit or cost]

- You have mentioned that these project would benefit/have this cost...please explain a little more
- What other benefits do you think this project would have for your country/host country/off-taker country?
- What other costs do you think this project would have for your country/host country/off-taker country?

[If the interviewee has not mentioned any benefit or cost]

- What do you think would be the main (direct and indirect) benefits for your country/host country/off-taker country?
- What do you think would be the main costs for your country/host country/off-taker country?

- | |
|---|
| <ul style="list-style-type: none"> • cost savings, effects on domestic industry and labour market, tax revenues, |
|---|

- security/diversity of supply
- technology development
- launching long-term cooperation, etc.
- legal, financial and political costs and risks;
- technical complexity
- domestic policy considerations,
- interference with the effectiveness or efficiency of domestic policy measures
- uncertainty and complexity of assumptions underlying any appropriate cost and benefit sharing arrangements between Member States.

General attitude and conditions of acceptance

Rejection-ambivalence-acceptance/tolerance-support-identification

- Thinking overall, what is your general position towards this type of projects? Are you in favor, ambivalent or against?
- Under what conditions would you accept/reject a project like this? [Explore potential conditions for acceptance or rejection]:
 - Participating member states
 - Project parameters
 - RES amounts that are to be attributed to the off-taking country's target
 - If there is a case for physical import of the electricity
 - Delivery time period
 - Ad hoc, project by project or a larger joint project framework?
 - Type of technology, location(s) or geographical area,
 - Acceptable level support payments according to the cost benefit analysis conducted from the off-taking country's perspective
 - Implications for infrastructure/interconnectors
 - Risk sharing between the project parties

Perception of other societal actors

- What do you think will be the views of other societal actors on this? Will they care about it? What will be important to them?
 - policy makers and administration
 - science and research
 - technology providers and project developers
 - electricity grid operators (TSOs, DSOs)
 - electricity consumers (incl. utilities, companies)
 - investors
 - other societal actors (which do you consider relevant? e.g. NGOs, media, labour unions)
 - citizens in general?
 - local stakeholders and the local public (host countries)?
- If so, what conditions or developments would be relevant for them to make them either favour or oppose this?

Trust and fairness issues

- What do you think would be a fair or equal distribution of the benefits and costs of the project between the host and off-taker country?
- Explore other potential trust issues (if there is an identifiable actor promoting the project)
 - Do you think project developers are capable of handling the technical and coordination challenges of this project?
 - Do you think project developers will treat communities with respect; act with fairness in dealings; work to minimise harm to the environment and to people? Do you think project proposers will listen, respond, keep promises and engage in mutual dialogue with stakeholders? Do you think project proposers will work for your interests?

Preference for alternative options

- Are there alternative options that you consider better suited to [*insert the problem that the interviewee identified in Q1*] or
 - to decarbonize EU economy
 - deliver renewable energy to or Northern European countries
 - promoting developments in renewable technologies in the South
 - promote the creation of a European renewable energy market?

Final comments

- Now coming to the end of the interview, I would like to ask you if there are any final comments you want to make or issues you would like to raise - which we did not cover so far but are relevant from your point of view for the issues discussed?

THANK YOU

WHO WE ARE

The MUSTEC consortium consists of nine renowned institutions from six European countries and includes many of the most prolific researchers in the European energy policy community, with very long track records of research in European and nationally funded energy policy research projects. The project is coordinated by Centro de Investigaciones Energeticas, Medioambientales y Tecnologicas-CIEMAT.

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