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Cross-border regional cooperation for deployment of renewable energy sources

Authors:
Erika Meynaerts (VITO), Nele Renders (VITO), Andries Hof (PBL), Hsing Hsuan Chen (PBL), Javier Esparrago (EEA), Mihai Tomescu (EEA)

ETC/CME consortium partners: *AETHER*, Interprofessional Technical Centre for Studies on Air Pollution (*CITEPA*), Czech Hydrometeorological Institute (*CHMI*), Energy and Environmental Studies and Software Development (*EMISIA)*, Institute for Applied Ecology (*ÖKO-INSTITUT*), *ÖKO-RECHERCHE*, Norwegian Institute for Air Research (*NILU*), Netherlands Environmental Assessment Agency (*PBL*), National Institute for Public Health and the Environment (*RIVM*), Environment Agency Austria (*UBA*), Flemish Institute for Technological Research (*VITO*)

European Environment Agency
European Topic Centre on Climate change mitigation and energy

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European Topic Centre on Climate
change mitigation and energy
Boeretang 200
B-2400 Mol, Belgium
Tel.: +32 14 33 59 77
Web: www.eionet.europa.eu/etcs/etc-cme
Email: etccme@vito.be

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Executive summary

Given the benefits of regional cooperation and the emphasis put on it within the 2030 climate and energy framework and the European Green Deal, this report aims to contribute to improved cross-border cooperation by sharing interesting 'lessons learnt' from Member States that have experience with joint support schemes or joint projects or have assessed the possibility of initiating such projects.

A case study approach is used to gain insights from **three cases** concerning cross-border regional cooperation: two implemented joint support schemes – i.e. the joint electricity certificate market set up between Sweden and Norway and the joint auction for ground-mounted PV between Germany and Denmark – and one attempted, yet abandoned joint project idea, on wind energy, between the UK and Ireland. The **intervention logic framework** of the European Environment Agency is used as analytical tool for assessing the cases and their specific effectiveness, efficiency, added value and coherence. External factors that can have a positive or negative effect on the results of a joint project or joint support scheme are also assessed. As no ex-post evaluation studies on the specific cases seem to be currently available, the assessment draws on evidence found in (mainly grey) literature and information collected through interviews with national governmental bodies (energy agencies, directorates) involved in the joint support scheme or joint project.

The cases described and assessed in this report give some practical, hands-on experience on cross-border regional cooperation for RES deployment, and the challenges and opportunities associated with it. Some **relevant lessons** can be deducted from the joint support schemes and the joint project, even though these mechanisms operate(d) under specific circumstances, which do not necessarily apply to other European Member States.

From a policy perspective, the cases illustrate that cross-border regional cooperation is possible, provided there is sufficient **political interest and will** to make it happen. However, the small number of actual cross-border projects, and their in-depth case-study assessment in this report, confirm the existence of barriers in the way for regional cross-border cooperation on renewable energy projects.

Mutual trust and commitment to exercise good governance emerges as a key enabling factors for cross-border regional cooperation. The agreement between Sweden and Norway, for example, started from the principle that there would be no additional support granted to renewables. Germany and Denmark adopted a simple approach based on trust and mutual recognition to set up the data transfer system. Germany and Denmark also excluded any exit provisions from their agreement to increase political stability and to create better, long-term conditions for investments in renewable energy plants in the frame of the agreement.

Although it is not clear to what extent the joint support schemes triggered additional RES investments in the countries involved, it is most likely that without cooperation the costs would have been higher. As such, the cooperation cases between Sweden-Norway and Denmark-Germany provide a general indication about the **cost-cutting potential** of joint support schemes, in line with findings that emerged from model-based assessments. While a balanced distribution of costs and benefits between participating countries is desirable, countries must accept that their circumstances are different to those of their counterparts, making a perfectly balanced distribution nearly impossible. Instead, they should focus on how cross-border cooperation would help them meet their objectives in a cost-efficient manner compared to acting individually.

The **efficiency of the cooperation mechanism** appears to be an important key factor for cooperation in all the cases. The countries only came to an agreement when the benefits were perceived to be larger than the associated costs and risks. The case of Sweden and Norway illustrates that efficiency gains can

be achieved if one of the partnering countries already has experience in the design, implementation and monitoring of a similar national support scheme.
All the cases, including the failed case of UK and Ireland, show how difficult it is to explain and communicate the benefits of funding RES installations in other countries to the different **stakeholders and the general public**. In setting up the joint tender between Germany and Denmark specific measures were taken to secure public acceptance, such as, the requirement of physical import of electricity and the mechanism of statistical transfer. In the case of Norway and Sweden, both countries exchange information on a regular basis about their communication strategy to the market and to stakeholders in the energy sector to avoid any communication that can influence the price (expectations).

The cases demonstrate that **sufficient time and resources have to be allocated to set up an agreement** for cross-border regional cooperation. In setting up the agreement, it is also crucial that the specific legal, economic, political circumstances of the participating countries are identified and taken into account. Both in the case of Sweden-Norway and Denmark-Germany, separate national (certificate/tender) legislation gave some flexibility to the countries to align the design, implementation and monitoring of the support scheme with national circumstances. The German-Danish pilot auctions demonstrate the importance of **aligning the timing of cross-border auctions with the schedule of national auctions** to avoid overlapping auctions.

Since many different national concerns have to be taken into account, a country should **have as much flexibility as possible when negotiating** a cooperation agreement. If the country has already passed detailed provisions in national legislation, this reduces the flexibility in negotiating the agreement, since the partner country too has to agree with most/all of these national provisions so that they can be incorporated in the agreement. This is illustrated by the case of Denmark and Germany where site restrictions for PV-installations on agricultural land only applied to the German territory in both the Danish and German pilot tenders. This example also highlights the importance of a coordinated approach on energy policy within a well-integrated electricity market, not only between the participating countries, but also at EU level.

The case of Sweden and Norway illustrates that a number of **other factors** can facilitate cross-border regional cooperation, such as the existence of a common electricity market, existing interconnections, or similar potential for renewable electricity production. The cooperation between Sweden and Norway also benefited from the fact the countries are geographically close to each other and had successful collaborations in the past. This way, they could build on a close and trustful communication – a prerequisite for an agreement based on consensus and trust.

1 Introduction

1.1 Context

The energy and climate policy framework for 2030 as well as the European Green Deal emphasise the importance of regional cooperation on renewable energy sources (RES) to enhance national efforts and facilitate the realisation of the EU's targets, especially the binding EU RES target of at least 32% by 2030. The **recast of the Renewable Energy Directive** (Directive (EU) 2018/2001) has an increased focus on regional cooperation mechanisms, like joint projects and joint support schemes, regardless of whether the countries are neighbours or not. Moreover, in the Energy Union Governance Regulation (Regulation (EU) 2018/1999), Member States are asked to indicate in their upcoming integrated national energy and climate plans (NECPs) "*specific measures for regional cooperation, as well as the estimated excess production of energy from renewable sources which could be transferred to other Member States in order to achieve the national contribution and trajectories*" (Annex I, part 1, Policies and Measures, dimension decarbonisation - RES, 3.1.2 ii).

As highlighted by several research projects, failure to adopt a cooperative approach when meeting national and EU renewable energy targets can translate into overall higher costs and/or lower benefits for European citizens (Caldés et al., 2018; Meus et al., 2019). For instance, a model-based quantitative assessment in "Cooperation between EU Member States under de RES Directive" (Ecofys, 2014) indicates that "strong cooperation" compared to "limited cooperation" can reduce additional generation costs, capital and support expenditures at EU level with -10.8% or € 31 billion over the whole period up to 2020. The "moderate cooperation" scenario still shows reductions at EU level of -5.8% (€ 17 billion) over the whole period up to 2020. According to the EC's own impact assessment, strong regional cooperation among governments, competent authorities and even research institutions would translate into energy system cost savings of up to € 1.3 billion a year for the period 2021-2030, at the same time as it would reduce the renewable energy support costs paid by consumers (EC SWD (2016) 0418 final). In addition to economic benefits, the most commonly **reported objectives and needs** for regional cooperation include: closing the potential gap between renewable energy production and renewable energy targets, cooperating for technology development, and promoting long term partnerships and cooperation (Ecofys, 2014; Heinrich Böll Stiftung & Ecofys, 2015; Caldés et al., 2018).

The technical, political and legal barriers preventing (sufficient) regional cooperation are well documented in numerous publications([1]). The most commonly reported barriers are listed in Box 1. While these perceived barriers are mainly related to the 2020 regulatory framework, they are also relevant for the post-2020 period (Heinrich Böll Stiftung & Ecofys, 2015).

Despite the supportive regulatory framework, the demonstrated benefits and extensively documented drivers, Member States have not engaged significantly in regional cooperation for RES deployment so far. The deployment of renewable energy sources continues to be mostly driven by national policies and measures.

([1]) Some examples of relevant publications: "Guidance on the use of renewable energy cooperation mechanism" (SWD(2013) 440 final), "Cooperation between EU Member States under de RES Directive" (Ecofys, 2014), "Driving regional cooperation forward in the 2030 renewable energy framework" (Heinrich Böll Stiftung & Ecofys, 2015), "Impact assessment of the Regulation establishing the Connecting Europe Facility and repealing Regulations" (SDW(2018) 312 final), "Renewable Energy Cooperation in Europe: What Next? Drivers and Barriers to the Use of Cooperation Mechanisms" (Caldés et al., 2018).

Box 1: Commonly reported barriers for regional cooperation

- Perceived technical complexity of designing the most appropriate cooperation model and reluctance to take associated "first mover risk";
- Communicating to the national electorate the benefits of cooperation over reliance on domestic resources;
- Concerns that cooperation might interfere with the effectiveness or efficiency of domestic policy measures and in consequence security of supply and other energy policy goals;
- Perceived uncertainty and complexity of assumptions underlying any appropriate cost and benefit sharing between Member States. As illustrated by Agora Energiewende (2018) different parameters, such as difference in policy and regulatory environment between Member States, can have an impact on the performance of the cooperation mechanisms and the actual costs and benefits realized;
- Lacking transmission infrastructure and market integration;
- Preference of spending taxpayers/consumers' money for reaping the RES benefits nationally (e.g. jobs);
- Potential incompatibility of cooperation mechanisms with national and EU legislation.

The "Trends and projections in Europe 2018" report (EEA, 2018) provides an overview of the existing and planned initiatives in the frame of the regional cooperation mechanisms, as stipulated under the Renewable Energy Directive. It refers to the joint tradable green certificate market between Norway and Sweden, the statistical transfers from both Estonia and Lithuania towards Luxembourg, and auctions for ground-mounted photovoltaics (PV) capacity open to investors in Denmark and Germany. The **lack of regional cooperation between Member States** on RES deployment is also confirmed in the impact assessment of the establishment of the Connection Europe Facility and repealing Regulations (SWD(2018) 312 final), and in more recent publications, such as Meus et al. (2019) and Ecofys (2019).

Existing regional fora that bring together Member States in the field of energy, like e.g. the Pentalateral Energy Forum (PLEF) and NSEC (North Seas Energy Cooperation), focus on connecting existing renewable energy capacity, rather than on joint future deployment of renewable energy sources (Heinrich Böll Stiftung & Ecofys, 2015).

To **promote and support the use of regional cooperation mechanisms**, Caldés et al. (2019) propose a mix of different policy instruments at different government levels (regional, national and EU). The most relevant policy instruments are grouped in the following categories:

(1) Information provision: providing guidance, information and know-how regarding the use of cooperation mechanisms; initiatives like the Concerted Action (CA-RES) (EU level).
(2) Legislative initiatives: passing legislation to open national support schemes to other Member States (EU level).
(3) Access to finance: access to finance under the EU's action plan on sustainable finance or the "cross-border renewables projects" instrument of the Connecting Europe Facility (EU level).
(4) Public awareness campaigns: public awareness campaigns oriented towards a better communication of benefits (national and regional level).
(5) International cooperation: jointly testing new support schemes (EU and national level).

External factors too can indirectly have an impact on the use and results of regional cooperation mechanisms, such as the level of interconnection between Member States, climate leadership, integrated energy market and alignment with the objectives of Paris Agreement (Caldés et al., 2019).

1.2 Aim and scope

Given the benefits of regional cooperation and the emphasis put on it within the 2030 climate and energy framework and the European Green Deal, this report aims to contribute to improved cross-border cooperation by **sharing interesting 'lessons learnt' from Member States** that have experience with joint support schemes or joint projects or have assessed the possibility of initiating such projects.

The report applies the intervention framework to three practical cases to assess the relevance, effectiveness, efficiency, coherence and added value of these cases. The assessment focuses on the lessons learnt (what worked, what didn't and why?) to derive recommendations for actors / EU Member States that may wish to engage in regional cooperation for RES deployment. An evaluation of EU or national policies on cross-border regional cooperation goes beyond the intended scope of this report.

Regional cooperation can have different meanings, depending on the context and stakeholders involved. This report focuses on regional cooperation between two or more countries with the primary objective of **deploying renewable energy sources by means of joint projects and/or joint support schemes**. As such, cross-border cooperation at subnational level (such as between two or more municipalities, cities or regions across different countries, e.g. INTERREG-projects), cross-border cooperation not involving any national governmental bodies (e.g. ENTSO-E, involving electricity transmission system operators) and regional cooperation not primarily aimed at the deployment of RES fall out of the scope of this report. Finally, the joint drafting of (parts of) the integrated national energy and climate plans, as stipulated in the Regulation for the Governance of the Energy Union (Regulation (EU) 2018/1999), is not within the scope of this report.

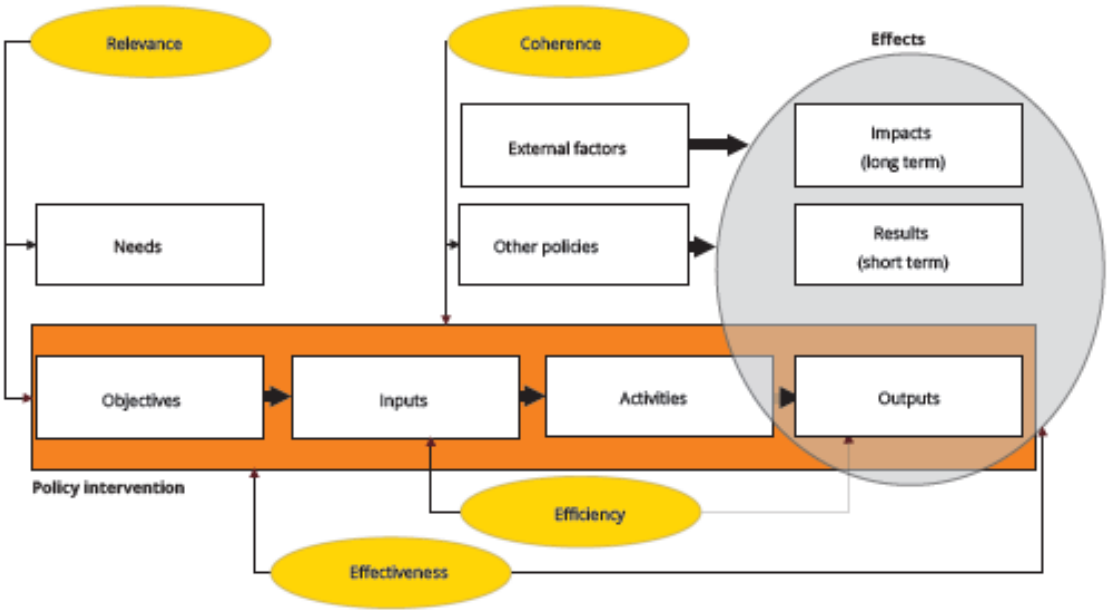
1.3 Approach

1.3.1 Intervention logic and data sources

A case study approach is used to gain insights from **three cases** concerning cross-border regional cooperation. Literature review informed the selection of these cases: two implemented joint support schemes – i.e. the joint electricity certificate market set up between Sweden and Norway and the joint auction for ground-mounted PV between Germany and Denmark – and one attempted, yet abandoned joint project idea, on wind energy, between the UK and Ireland.

The intervention logic framework of the European Environment Agency (EEA, 2016) is used as analytical tool for assessing the cases and their specific effectiveness, efficiency, added value and coherence.

Figure 1. Policy evaluation framework (EEA, 2016) according to intervention logic



External factors that can have a positive or negative effect on the results of a joint project / joint support scheme are also assessed. As the relevance of these case studies is evident, this aspect is excluded from the assessment.

Currently, no ex-post evaluation studies on the specific cases seem to be available. This assessment therefore draws on evidence found in (mainly grey) **literature** and information collected through **interviews with national governmental bodies** (energy agencies, directorates) involved in the joint support scheme or joint project. Relevant lessons are presented in the last chapter.

2 Overview of cooperation agreements

2.1 Sweden and Norway: joint electricity certificate market

Based on: interview with Roger Östberg of the Swedish Energy Agency (2019); interview with Toril Johanne Svaan of the Norwegian Water Resources and Energy Directorate (2019); presentation of Eva Centeno López (2013); Ecofys (2014); Norwegian Water Resources and Energy Directorate (NVE) and the Swedish Energy Agency (SEA) (2016); NVE & SEA (2019).

2.1.1 Details of the cooperation

On the 1st of May 2003 Sweden launched an electricity certificate system to increase the production of renewable electricity and make it more cost-efficient. The electricity certificate system replaced earlier public grants and subsidy systems (SEA, 2017). Discussions between Sweden and Norway on a joint support scheme for renewable electricity production already started in 2003, but ended in 2006, since no agreement could be settled on the burden sharing (Ecofys, 2014). The second round of negotiations led to a signed agreement in 2011 and the start of **the joint electricity certificate market in 2012**. For Sweden, the joint support scheme was an extension of the existing national electricity certificate market of 2003. As such, the joint support scheme could benefit from nine years of Swedish experience in operating a green certificate market. For Norway, the revenues from the certificates replaced the former investment support for wind farms provided by the government-owned enterprise Enova SF.

Within the common certificate market, RES electricity producers receive a certificate for every MWh they generate. At the same time, electricity suppliers and other parties are required to purchase a certain amount of certificates (quota obligation[2]), thus creating additional revenue for RES electricity producers. An electricity certificate issued in one country can be used to meet the quota obligation in the other country, and vice versa (NVE & SEA, 2016). Electricity certificates, both Swedish and Norwegian, are traded on the Nord Pool exchange, with the price agreed between purchasers and sellers. The two countries release **tradable certificates to renewable electricity producers** for the first 15 years of a power generator's lifetime. The scheme is managed by the Norwegian Water Resources and Energy Directorate and the Swedish Energy Agency.

During the first years of negotiations, there were only some loose agreements (Svaan, 2019). In 2011, before the certificate market started, both countries specified in a formal agreement how they were supposed to behave in the common market. A prerequisite of the bilateral agreement was that both countries (thus Norway too) implemented the European Renewable Energy Directive (RED). In line with their obligations pursuant to the RED, Sweden and Norway agreed on a common target of 26.4 TWh in 2020 and **an equal burden sharing** of 13.2 TWh each. This implied that the contribution of both countries would increase annually until 2020, expecting that more RES production would enter into the system year by year. However, quota obligations were higher for Swedish market participants than for Norwegian market participants. The main reason for the quotas being different was that they were determined to also finance the plants in the transition scheme, i.e. plants commissioned before 1 January 2012 and eligible for electricity certificates, but not included in the joint target (1.623 plants in

(2) In Norway the following market participants have quota obligations (NVE & SEA, 2016):
- all those who supply electrical energy to end users;
- all those who consume electrical energy that they have produced themselves; and
- all those who buy electrical energy for their own use on Nordic Pool Spot or through bilateral agreements.

In Sweden the following market participants have quota obligations (NVE & SEA, 2016):
- energy suppliers;
- electricity consumers who use energy they have produced themselves, if the quantity of consumed electrical energy exceeds 60 MWh per year of calculation and has been produced in a plant with an installed output greater than 50 kW;
- electricity consumers who have used electricity they have bought on Nordic Pool Spot; and
- energy-intensive industries that have been registered by the Swedish Energy Agency.

Sweden and 208 plants in Norway) (NVE & SEA, 2016). The difference in quotas was also due to the calculation-relevant electricity consumption (i.e. electricity consumption for which a quota obligation exists) being higher in Sweden than in Norway (NVE & SEA, 2016).

In January 2016, the agreement was amended for the first time: both countries now agreed on a joint target of 28.4 TWh of new renewable electricity production by 2020 (NVE & SEA, 2019), with Sweden and Norway committing to financing 15.2 TWh and 13.2 TWh, respectively. In the course of 2016, the two countries started to disagree on the future of the joint support scheme, with Sweden asking for an extension and Norway seeking to leave the scheme. In 2017, Sweden and Norway reached a compromise, allowing Sweden to add 18 TWh of renewable electricity production by 2030 and Norway to add new RES projects to the scheme only until 2021.

Norway's decision was made public in the White Paper on Energy Policy - Power for Change (Ministry of Petroleum and Energy, 2016), in which the Norwegian Government stated that it would not introduce new targets under the electricity certificate system and let the power market give effective price signals about the value of production and long-term investments. The White Paper was published after a period of significant drops in the price of electricity, partly because of the support for new RES production through the electricity certificate market. As most of the power generation in Norway is already renewable, new RES production is, to a large extent, additional production instead of replacement of fossil power generation. The surplus in electricity production pushed prices of electricity down and put the profitability of renewable power plants under pressure. The electricity certificate scheme contributed to the increase in hydro and wind power, but did not noticeably stimulate technological development. By not introducing new targets in the certificate market, the Norwegian Government wanted to ensure the profitability of its renewable energy resources, while at the same time shift the focus from supporting mature production technologies towards the development of new energy technologies.

Sweden's decision to introduce new targets into the certificate market can be explained by the fact that more renewable electricity production was needed as Sweden wanted to shift its electricity system to 100% renewables by 2040 (Östberg, 2019).

On the 18th of September 2020 the Norwegian and Swedish energy ministers agreed to end the joint certificate scheme by the end of 2035 as technological and market advancements resulted in a faster and bigger increase of renewable electricity production than the scheme was designed to support (Buli, 2020). Under these new terms, the joint certificate market will be closed for entrants from the 1st of January 2022 onwards. Latest estimates indicate that the overall target of 46.4 TWh will be exceeded in 2021.

2.1.2 Assessment of the cooperation

Effectiveness

From 2012 to 2018, the Swedish-Norwegian electricity certificate market contributed to 26.8 TWh of new RES production, of which 19.1 TWh was produced in Sweden and 7.7 TWh was produced in Norway (NVE & SEA, 2019). In spring 2019, the common goal of 28.4 TWh was reached, dominated by Swedish wind power and Norwegian hydropower (Östberg, 2019). Taking the investments and plants under construction into account, the goal of 2030 is expected to be reached by 2020 – 2021. This rapid increase in renewable energy production in Sweden and Norway can most likely be explained by a combination of **technological development**, making hydro and wind power better and cheaper, and the support delivered by the certificate market to push this development (Svaan, 2019; Östberg, 2019). It is however unclear to what extent the **common certificate market triggered investments** in RES power plants in Sweden and Norway. In Sweden, the national certificate market already started in 2003. As such, Sweden was already building wind power plants and biofuel installations when the common certificate

market took off in 2012. In Norway, there were some investments in new hydro power plants before the common certificate market started. Wind power was rather immature. Investment support was provided by the government-owned company Enova SF and triggered about 2 TWh wind power up to 2010. Therefore, it is likely that the certificate market triggered an increase of RES production in Norway and expedited some of the investments in wind power plants. The industry's planning activities seemed to increase in view of the upcoming certificate market. As it takes some time to build a power plant and reinforce the grid, few plants were built in Norway during the first years of the agreement, explaining their total lower generation under the certificate market compared to Sweden. An alternative support scheme, such as a well-designed and predictable investment support system, would have probably also triggered investments in wind power in Norway (Svaan, 2019).

Coherence

Although Sweden and Norway operate a joint support scheme, there are some differences in the implementation of the scheme between the two countries, to take into account variations in e.g. tax regimes and regulations (NVE & SEA, 2016). Each country has its **own national Acts and Regulations** that constitute the national legal basis of the support scheme (Östberg, 2019). For example: in Sweden a plant's entire production may be eligible for electricity certificates following extensive rebuilding, while in Norway only the increase in production is eligible for electricity certificates. Furthermore, peat is eligible only in Sweden for electricity certificates. On the other hand, for the support scheme to work, it is very important to have similar grid tariffs and have the same costs and rules for renewables in both countries (Östberg, 2019). In this regard, Norway and Sweden have an integrated electricity market and nearly the **same quota obligations** (some minor differences exist between both countries in the exemption rules for energy-intensive industries).

In setting up the agreement, understanding the economic, political, legal circumstances in each country took significant time (Östberg, 2019). The agreement stipulated that the countries would inform each other about changes in circumstances (e.g. tax reform) that would have a considerable impact on the terms of the agreement or on the competition in the common certificate market.

The agreement was based on the principle that there would be **no additional support granted to renewables** (Östberg, 2019). An exception was the ongoing investment support for solar in Sweden that was already in place before the common certificate market took off. Norway agreed that this support could be continued, as solar power represents a small market share. Norway has a support system in place for solar and provides technology support to (floating) offshore wind, but plants do not qualify for this support if they enter the common certificate market (Svaan, 2019). Before the start of the common certificate market, some Norwegian wind and biofuel power plants received financial support from the government-owned enterprise Enova. For these projects, developers had to decide if they wanted to retain the support from Enova, or would enter the common certificate market.

Sweden has tried to set up other joint projects or joint support schemes with other European Member States (Östberg, 2019). Staff from the Swedish government travelled through Europe talking to other countries and promoting cooperation. However, no other Member State seemed interested in cross-border regional cooperation mechanisms. In Norway, some companies called on politicians to also consider other flexibility mechanisms under the RED, such as statistical transfers and joint projects (Svaan, 2019). Norway decided to focus on the common certificate market only.

Efficiency

A common market with a considerable amount of players is very important for setting the correct market price for certificates. More trading generates good conditions for new traders and new marketplaces. Good market conditions subsequently result in correct prices. In addition, investors within

a bigger market can choose between different technologies and locations, whilst higher competition lowers the costs.

The **cost for consumers** of the Swedish-Norwegian certificate market is very low in comparison to other support systems in other EU Member States (Svaan, 2019; Östberg, 2019). This is partially a result of the common certificate market, but also due to Norway and Sweden having good potential for hydro and wind power. The RES target of Sweden would also have been achieved in absence of the common certificate market, but probably at a higher cost (Östberg, 2019). By joining with Norway in a common market, Sweden gained access to more hydro power at low cost as well as additional wind power.

The **administrative costs** related to the common certificate market are low in comparison to the volume of the support granted (Östberg, 2019). The support represents the largest share in the total cost of the system. From 2021 onwards, no Norwegian plants can enter the certificate market anymore. However, the owners of renewable electricity plants have the right to receive certificates for 15 years. As such, Norway has to manage the support scheme until 2035. In this regard, it would certainly have been easier to end a support scheme based on investment grants (Svaan, 2019). An assessment of the efficiency of the joint support scheme should also take into account that the system has to be managed and monitored even after the target is reached or the market is closed.

The **choice and design of the support scheme** was not a big issue in setting up the agreement, as Sweden already had a well-functioning support scheme with an Act and Regulation. Norway emulated the support scheme from Sweden, yet it experienced difficulties in explaining the mechanism to stakeholders and their opinions about the choice and design of the support scheme were divided.

Added value

For Sweden, the agreement with Norway increased **political stability** and created better, long-term conditions for investments in renewable energy plants (Östberg, 2019). For example, Sweden cannot make any major changes to the support scheme without agreeing them with Norway. By joining Norway in a common market, Sweden has access to low cost hydro power and good wind power.

For Norway, the common certificate market offered some added value in comparison to a national certificate market (Svaan, 2019). On its own, Norway would have very small amounts of certificates and its national certificate market would not be able to reach the **liquidity of a common certificate market** with Sweden. A less liquid system would have been more vulnerable. Both the investment rate and yearly supply (depending on wind and rainfall) and demand (the quotas based on projections of electricity demand and fluctuations in temperature) would have been highly uncertain. Sweden already had some TWh of renewable energy production in the system when the common market took off, which made the market less volatile and vulnerable. According to industry, the certificate market had also some added value in comparison to the existing investment grants of Enova. The certificate market was based on actual production instead of estimated production; as well as in the investors' market expectations (of both electricity and certificate prices) and their risk assessment instead of Enova's assessment. Moreover, the certificate market would not depend on the available state budget, but on the long-term deployment targets agreed by the countries.

Notwithstanding the above benefits, a systematic assessment of the joint certificate market has not been conducted by the two countries so far. As such, it would be premature to draw any conclusions without assessing in depth the pros and cons of the different support systems from the perspective of the different stakeholders involved (Svaan, 2019).

External factors

The agreement between Norway and Sweden was facilitated by the fact that the countries have an integrated electricity market, existing interconnections and roughly the same potential for renewable electricity generation (López, 2013; Ecofys, 2014; Östberg, 2019). Additionally, the separate national Acts and Regulations that constitute the national legal basis of the support scheme gave some flexibility to both countries. Sweden had the advantage that it could keep the existing design of its national support mechanism without substantial changes in certificate prices.

The cooperation between Norway and Sweden could benefit from the fact the countries are geographically close to each other, although physical transmission of the energy produced is not a requirement for regional cooperation in the RED. Also, Sweden and Norway had successful collaborations in the past, such as the establishment of the integrated electricity market and could build on a close and trustful communication, which is very important in an agreement that is based on consensus and trust (Svaan, 2019). Even so, despite these trustful conditions for collaboration, Sweden and Norway negotiated for 10 years before the common certificate market became operational. When the first discussions about the common certificate market started, the Swedish wind power producers, who had adapted to the Swedish certificate market for already one year, feared that the large potential and lower costs for on-shore and off-shore wind power in Norway would lead to all plants being built in that country under a common Swedish-Norwegian market.

In 2006, the talks ended because Norway and Sweden did not agree on the burden sharing. In Norway, politicians, industry and some NGOs were dissatisfied with this decision. In the following years, Norway tried to set up a national system with feed-in tariffs, but encountered a lot of resistance. In the meantime, political interest for the common certificate market increased also in Sweden, as the RED came into force. Eventually, Norway and Sweden restarted the negotiations and came to an agreement.

There have not been any considerable discussions with the general public about the joint certificate market neither in Norway nor in Sweden (Östberg, 2019; Svaan, 2019). In Norway there were some discussions with market actors about the use of a support scheme (in addition to the EU ETS) as such and about the functionalities of the support scheme, but not about the cross-border cooperation with Sweden (Svaan, 2019).

Communication about a certificate market should be done with great care to not intervene with the market mechanisms. Any communication that can influence the price (expectations) has to be avoided. As such, Sweden and Norway exchange information on a regular basis about their communication strategy (what will be communicated, when and how?). Both countries publish a quarterly and annual progress report on the Norwegian-Swedish electricity certificate market. The Swedish Energy Agency and Norwegian Water Resources and Energy Directorate provide detailed information about the functioning of the certificate market on their websites ([3]).

2.2 Denmark and Germany: joint auction for ground-mounted PV

Based on: interview with Rasmus Zink Sorensen of the Danish Energy Agency (2019), consultation with responsible authorities in Germany; Ecofys (2019); Heinrich Böll Stiftung & World Future Council (2016); SWD (2018) 312 final; Agora Energiewende (2018); von Blücher et al. (2019); podcast of Dijana Dmitruk (2017).

([3]) Sweden: https://www.energimyndigheten.se/fornybart/elcertifikatsystemet/
Norway: https://www.nve.no/energiforsyning/elsertifikater/?ref=mainmen

2.2.1 Details of the cooperation

In 2016, Denmark and Germany launched a cross-border auction for ground-mounted photovoltaic (PV) installations. The Danish and German energy agencies handled the negotiations and were responsible for the design, implementation and monitoring of the agreement. This agreement entailed two separate tenders that were mutually open for Danish and German installations. The aim was to grant the capacities to the cheapest bid, irrespective of where the installations were located. First, Germany run an open tender with a volume of 50 MW. Five Danish projects submitted a successful bid while **no German project was awarded** (Ecofys, 2019). Subsequently, Denmark tendered in a pilot run a total capacity of 20 MW, of which up to 2.4 MW was open for competition from bidders in Germany. In the Danish tender, only bids for projects in Denmark were submitted. There was no quota system to ensure that a certain share of successful bids went to a certain country (Dmitruk, 2017). The instrument of **statistical transfer** was used for counting the two countries' contributions to the European 2020 RES targets.

While it seemed a logical step for Germany and Denmark to cooperate with their – at first glance – similar support schemes (i.e. premiums and feed-in tariffs) and high renewable energy shares (i.e. similar share of wind and solar), the decision to set-up an agreement between both countries was not completely voluntary (Heinrich Böll Stiftung & World Future Council, 2016; Dmitruk, 2017; Sorensen, 2019). The cooperation between Germany and Denmark was born from the circumstance that both countries agreed to open their tenders to a certain extent, in order to **correspond state aid decisions** from the European Commission (EC) for their respective renewable support systems.

The EC questioned the **legality of the Danish Public Service Obligation (PSO) charge** ([4]) (Dmitruk, 2017; Sorensen, 2019). While the PSO charge is to be paid based on all electricity consumed in Denmark, only domestically produced electricity has access to the support for renewables that is financed by the charge. The Commission raised the concern that the charge could be discriminating electricity imported from other countries (cf. art. 30 and 110 of the Treaty on the Functioning of the European Union). To tackle this concern, Denmark reached a temporary settlement with the EC for the years 2015 and 2016, which resulted in the approval of the 2014 solar PV and wind electricity aid: Denmark had to open a pilot tender for 20 MW solar PV, of which 2.4 MW would be open to installations located in one or more countries of the European Economic Area.

In the summer of 2014, Germany agreed with the EC to open from 2017 onwards up to 5 % of the newly installed capacity per year to installations located in other Member States (Dmitruk, 2017). Germany also committed to conducting a cross-border pilot tender for solar PV before 2017.

Although the tenders were mutually open, both countries agreed to conduct two **separate national tenders with separate tender designs** (Heinrich Böll Stiftung & World Future Council, 2016; Dmitruk, 2017). Each country decided how to design its tender, except for elements of the tender's design that would affect the territory of the other country. Some examples of differences between the tenders:

- The Danish tender operates with a fixed premium, while the German tender has a floating premium. In case of negative prices, no financial support is paid in the Danish tender. In the German tender, payments are only stopped in case of negative prices that last for more than 6 hours.
- The German tender includes a maximum price, while there is no maximum price in the Danish tender.

A basic principle in the cooperation between Germany and Denmark is trust (Dmitruk, 2017). On this basis, the cooperation agreement stipulates that if problems were to occur, Germany and Denmark

([4]) The Public Service Obligation tariff was charged in the electricity bill of the Danish consumer and used for financing renewable energy development in Denmark.

would consult each other and find a workable solution in good faith. Withdrawal from the agreement is only possible when it is in accordance with the Vienna Convention of 1969 and is therefore very difficult (Dmitruk, 2017). By **excluding exit provisions from the agreement**, Denmark and Germany aimed explicitly to pass a strong signal to investors that the agreement was there to stay.

After the pilot, the Danish Parliament decided to abandon by end–2021 the contested PSO charge. Given the decision of the Parliament and the fact that Denmark expected to overshoot its RES target for 2020, further joint tenders were not considered an attractive option anymore. Denmark does not plan any other cross-border projects or tenders in the short term, nor does it have a long term strategy for cross-border regional cooperation.

2.2.2 Assessment of the cooperation

Effectiveness

The primary aim of the agreement was not to facilitate reaching the national RES targets (Sorensen, 2019), but to secure EC approval for the proposed national support policies and measures for renewable energy. Given the small volume of the tender, there was no considerable contribution to be expected to the fulfilment of the national RES target of Denmark nor Germany. However, the agreement was effective from a EU regulatory perspective, as it facilitated the approval of the EC for their national programmes.

With the pilot cross-border auctions, Germany wanted to test elaborated concepts for the cross-border auction and procedures of transnational data and support payments. Another objective, which is a general underlying rationale of conducting cross-border cooperation, was to increase the cost-efficiency of the RES support in Germany. From the German perspective, the pilot cross-border auction was successful in achieving these objectives. The auction attracted a lot of competition, which is key to the functioning of an auction.

From EU perspective, the pilot run showed that cross-border regional cooperation on PV-tenders works (Sorensen, 2019). The opening of tenders to foreign producers was successful. Germany contributes to the financial support of PV-installations located in Denmark. In return, the RES share of the Danish installations is accounted for in the fulfilment of the German national RES target. The statistical transfer from Denmark to Germany is considered as a payment for the support of Danish PV-installations financed by Germany and has most likely increased public acceptance.

Although the pilot run did not result in new joint projects or joint support mechanisms, the success of the tender contributed to additional national tenders for renewable energy projects, such as solar PV tenders and technology neutral tenders in Denmark (Sorensen, 2019). In setting up these national tenders, lessons learnt from the German-Danish tender are being taken into account.

Coherence

Denmark drafted the so-called Project Act which constituted the national legal basis for the pilot run (Sorensen, 2019; Dmitruk, 2017). The Project Act only applies to this specific pilot run. In case of a new cross-border tendering project, new legislation has to be drafted and the Parliament has to be consulted. In the Project Act three conditions were included that had to be met by the partner country:

1. The country had to be located within the European economic area.
2. The country had to be directly interconnected to Denmark. If there would be no physical import of electricity, no discrimination would occur.
3. The cooperation agreement had to be concluded.

Germany adopted new cross-border renewable energy regulation that was based on the legal framework and authorization provided by the Renewable Energy Sources Act 2014 (Dmitruk, 2017). Germany included three requirements in the regulation:

1. Reciprocity: Germany could only open its national tender to Denmark, if Denmark would open its pilot tender to Germany. However, the capacity of the openings did not have to be the same in absolute numbers.
2. Physical import of electricity.
3. Conclusion of a cooperation agreement.

In drafting the legal basis for cooperation it is advantageous to include as few as possible conditions for the opening of the tender (Dmitruk, 2017). The legal basis for cross-border cooperation is the Cooperation Agreement. If the country has already passed strict national legislation, this leaves the country with less flexibility in negotiating the agreement.

Germany and Denmark agreed to mutually open their tenders for PV-installations across their borders (Sorensen, 2019). Both countries conducted two **separate national tenders**, with separate tender designs. Both countries aligned the design of their tenders with the existing national legislation and national political context. The choice of mutual cross-border auction seems logic as both countries wanted to conduct a cross-border auction to fulfil a commitment made in the course of the state aid approval (von Blücher et al., 2019). The reciprocal nature of the cooperation was also considered as an important instrument to increase the public acceptance of the cooperation in all cooperating countries. The mutual cross-border auction gave also more flexibility to each of the MS to align the design of the auction and the remuneration scheme with the national circumstances.

A joint auction would have increased the complexity and transaction costs of the system (von Blücher et al., 2019). But the administrative burden would have been lower compared to conducting several mutual cross-border auctions. A joint auction would also have the advantage of economies of scale. It would be easier to introduce other countries to the system and it would give a strong political signal for cooperation. However, given the pilot character of this cross-border cooperation, the costs of a joint auction would probably not outweigh the benefits. Germany had the ambition to use this pilot to develop and test various design options and procedures for the implementation of future cross-border auctions. Denmark, on the other hand, had no intention to conduct further cross-border auctions.

Critical in cross-border tenders is that the opening of a country's national support scheme may intervene with the way that the partner country politically wishes to deploy renewables on its territory (Dmitruk, 2017). A most discussed item in the cross-border cooperation between Germany and Denmark was the **restriction on eligible sites in Germany**. According to German national legislation, only specific sites were available for funded installations, such that PV-installations on agricultural land cannot get support in Germany from the national support scheme, particularly in rural areas, to ensure viability of agricultural land (Dmitruk, 2017). If PV-installations are in accordance with the rules of spatial planning, they can be installed on agricultural land, but cannot receive support under the German support scheme. However, they can receive support from abroad, in this case Denmark. Therefore, Denmark chose to respect the way in which Germany wanted to deploy renewables and implemented the same site restrictions for German installations in the Danish tender (Dmitruk, 2017). However, Denmark did not include the German site restrictions in Danish nationwide legislation, as that would not have been in accordance with the Danish political context at that time. If both the site restrictions and the fact that the installations had to be ground-mounted had to apply, there would in fact be hardly any sites available in Denmark, compared to available sites in Germany. Consequently, the site restrictions only applied to the German territory in both the Danish and German pilot tenders.

Efficiency

The pilot run confirmed the cost-cutting potential of cross-border tenders. The results of the cross-border tender illustrate how a Member State can **limit the costs of financing renewables** through allowing foreign electricity generators to bid in the auction (SWD(2018) 312 final). For Denmark, it was the first time it conducted a tender to support electricity generated by solar PV. They received 36 bids from Denmark only and historical low prices were achieved (circa 1.37 eurocents per kWh, corresponding to 12.81 Danish ore per kWh), as a premium on top of the market price (Dmitruk, 2017; von Blücher et al., 2019). Initially, Denmark expected a total volume of aid of approximately 8 million DKK (approximately EUR 1 million) to be paid annually to the installations connected to the Danish grid (Sorensen, 2019; Dmitruk, 2017; von Blücher et al., 2019). After achieving the low price, Denmark estimates the commitment closer to 2.8 million DKK (EUR 0.4 million) annually.

The German tender received 43 bids with a total volume of 297 MW: 17 bids from Denmark (154 MW) and 26 bids from Germany (143 MW). The tender demonstrates the willingness of electricity generators to participate in a broader market with bids totalling almost fivefold the foreseen capacity of 50 MW and half of the bids represented by foreign installations. A Danish developer cleared the German pilot tender with 5 winning bids at 5.38 eurocents per kWh, 2 cents below the previous national tender for solar PV (SWD(2018) 312 final; Dmitruk, 2017; von Blücher et al., 2019).

There is not one, simple and unambiguous explanation for the fact that **full capacity went to Danish** installations. The result of the auctions is most likely impacted by an interplay of different factors:

- The Danish locations that were part of the bid had a better natural potential (i.e. higher full load hours) than the German locations (Agora Energiewende, 2018; Dmitruk, 2017). This finding can be explained by two observations: less cloud formation over the coast (i.e. high solar irradiation), and lower temperatures that increased the PV modules' efficiency and thus the capacity factor (von Blücher et al., 2019).
- In contrast to Denmark, where fewer site restrictions exist, Germany does not allow solar PV installations on farmland (Dmitruk, 2017; Agora Energiewende, 2018; von Blücher et al., 2019). This significantly reduced the availability of sites in Germany. As available sites for ground-mounted PV with high solar potential were scarce in Germany, German bidders had higher site procurement costs than their Danish competitors (von Blücher et al., 2019).
- German developers were less motivated to participate in the pilot run, as German installations could also participate in subsequent national tenders (Dmitruk, D, 2017; Agora Energiewende, 2018; von Blücher et al., 2019). Due to the lack of alternative support schemes and a significant number of planned projects, there was a strong interest by Danish developers in the cross-border auctions. It can be assumed that Danish project developers placed aggressive (i.e. low) bids to secure support.
- Others indicate that the small volume of 2.4 MW open to German installations and the fixed premium in the Danish tender contributed to the fact that the Danish tender did not receive any German bids (Dmitruk, 2017; von Blücher et al., 2019).

There is also a **small administrative burden related to the design, implementation and monitoring** of the tender (Sorensen, 2019). Designing the agreement required certain efforts. The monitoring activities on the other hand, were quite straightforward. From the Danish side, the most significant cost related to this pilot run was the volume of aid that had to be financed.

The **set-up of the data transfer system** was the most time consuming part of the negotiations, as it involved different actors (Dmitruk, 2017). To calculate the amount of support that an installation located in Germany receives from Denmark, Denmark had to receive information from Germany about e.g. the amount of electricity produced and the market price in the relevant zone of the electricity market. The same applies for installations located in Denmark but funded in Germany. Denmark and Germany adopted a simple approach that is based on trust and mutual recognition, i.e. if the control system of the

partner country is adequate for the installations that are nationally supported, it is also adequate for the installations that are supported from abroad. This approach was based on Germany and Denmark having confidence in the control systems of the other countries and the nature of the pilot tender. They had to find pragmatic solutions that could work and they could actually test.

National circumstances (e.g. taxes, spatial planning restrictions) have a large impact on the costs and benefits achieved (Sorensen, 2019). As a result, it should not be expected that the costs and benefits are perfectly distributed among the participating countries.

Added value

As a result of the pilot run, there is an additional capacity of 50 MW of solar PV installed in Denmark. This additional RES capacity would probably not have been installed without the German tender. The mutual cross-border auction gave Germany access to the Danish market, making available Danish sites with good natural potential (high number of full load hours in coastal regions) and Danish projects that can be realized at low cost.

From an EU perspective, the pilot run was an important test-case to gather practical, hands-on experience (Sorensen, 2019; Dmitruk, 2017). The pilot run has shown that regional cooperation for RES support is possible if there is sufficient political interest and will to make it happen. As a result of the mutual cross-border auction between Denmark and Germany 50 MW of solar PV that is located in Denmark is supported by Germany. The pilot run also confirmed the cost-cutting potential of cross-border tenders.

External factors

Given the motivation and configuration of the agreement (i.e. pilot run, small tender volume, separate tenders), the impact of external factors is considered limited (Sorensen, 2019). Transmission infrastructure is not considered as a barrier given the high level of interconnection and the small volume of the tender (Sorensen, 2019).

In setting up the agreement both countries paid much attention to mechanisms that they could introduce to secure **public acceptance** (Dmitruk, 2017). The requirement of physical import of electricity ensured that there was some kind of real effect on the national electricity market of electricity produced abroad. Also, the mechanism of statistical transfer was used to increase public acceptance for the cross-border support for renewables. Small-scale communication campaigns were organized in Denmark to increase public acceptance.

2.3 UK and Ireland: joint wind project

2.3.1 Details of the cooperation

In January 2013 a Memorandum of Understanding was signed between Edward Davey (the UK Secretary for Energy and Climate Change), and Pat Rabbitte (the Irish Minister for Communications, Energy & Natural Resources). Both countries committed themselves to work closely together and to secure economic benefits for both countries by cross-border trade of renewable energy. The Memorandum of Understanding (Irish Government News Service, 2013) affirmed the two States' commitment to:

- maintain a strong partnership on energy issues;
- achieve closer integration of electricity markets;
- maximize the sustainable use of low carbon renewable energy resources.

More concretely, the plan was to trade onshore and offshore wind produced in Ireland with the UK up to a maximum of 5 GW. For the UK, the project would help to achieve its 2020 RES target, while it would

increase investments, jobs and economic growth in Ireland. A working program had to give clarity on the costs and benefits of the trade in electricity, low-carbon support mechanisms, grid connections to the UK and regulation (Duggan, 2013; Ecofys, 2014). The aim was to establish and sign an intergovernmental agreement on energy trading by 2014. However, the agreement on energy trading has never been signed.

Some debates suggest that the UK was unable to make certain key decisions. Pat Rabbitte (2014) said in the Lower House of Ireland on the 6th of May 2014: "Progressing to an intergovernmental agreement on renewable energy trading would require any agreement to be designed in a manner that would work for both countries. In that regard, the UK is not yet in a position to take certain key decisions on the quantity of energy to be procured, the regulatory treatment of Irish assets, the structure of subsidies to Irish developers and the resultant financial flows.'' In the same speech, he indicated that only after 2020, greater energy trade between the UK and Ireland would be a realistic option: "Given the economic, political and regulatory complexities involved and the outstanding decisions to be taken by the United Kingdom, delivery by 2020 of an intergovernmental agreement to facilitate energy export is not a realistic proposition. While it has not been possible at this time to conclude an agreement, in the context of a European internal energy market, greater trade in energy between Britain and Ireland is inevitable in the post-2020 scenario".

2.3.2 Assessment of the cooperation

The UK and Ireland could not come to an agreement due to political, legal and economic factors. The debate in the Lower House of Ireland on the 6th of May 2014 suggests that there was a disagreement about the quantity of energy to be traded, regulation, the subsidies for the developers and the resultant financial flows.

Most likely, the lack of public support in Ireland did not help the matter forward (Ecofys, 2015). In February 2014, more than 100 opposition groups in rural areas protested against new wind farms, induced by the planned cooperation between the UK and Ireland. Allegedly, Ireland would become Great Britain's wind farm, while the wind turbines' negative impacts on landscape and living conditions would occur in Ireland (BBC News, 2009).

Box 2: Example of proposed international cooperation between EU, Middle East and North Africa: DESERTEC

DESERTEC was a large-scale initiative supported by the foundation of the same name. Started in 2009, the original project aimed to develop concentrated solar power plants (CSP) in the desert areas of North Africa and the Middle East, which would supply power to both these regions and to Europe. The project included the development of a Euro-Mediterranean electricity network. The majority of the stakeholders left the initiative at the end of 2014. The initiative was relocated from Munich to Dubai in the spring of 2015. As of 2019 onwards, the status of the project is reported as "on hold" and "failed".

In literature, several factors are reported that contributed to the failure of this initiative.

Firstly, the increasing political instability in North Africa and the Middle East after the winter of 2010-2011 made cross-border cooperation more difficult. For instance, the border between Algeria and Morocco was closed due to the disagreement about the Western Sahara.

Secondly, the initiative was affected by the global financial crisis as Spain, an important transit country and customer, was hit especially hard by this crisis. In response to the crisis, Spain halted the feed-in remuneration of CSP, cutting down the investment opportunity of CSP projects both nationally as well as internationally. Moreover, Spain had no interest in importing electricity as it had a surplus.

Thirdly, the initiative was affected by the German subsidies for decentralized renewable energy generation as this led to a large increase in installed capacity of PV domestically, lowering the need to import renewable electricity.

Finally, the DESERTEC initiative had a preference for CSP over PV as solar thermal heat could be stored more easily. However, the electricity generation costs of PV proved to decrease much faster than those of CSP, preventing large-scale expansion of CSP.

Schmitt (2018); Dii, (2019); The National (2009)

3 Lessons learnt

The cases described and assessed in this report give some practical, hands-on experience on cross-border regional cooperation for RES deployment, and the challenges and opportunities associated with it. Some relevant lessons can be deducted from the joint support schemes and the joint project, even though these mechanisms operate(d) under specific circumstances, which do not necessarily apply to other European Member States.

From a policy perspective, the cases illustrate that cross-border regional cooperation is possible, provided there is sufficient **political interest and will** to make it happen. However, the small number of actual cross-border projects, and their in-depth case-study assessment in this report, confirm the existence of barriers in the way for regional cross-border cooperation on renewable energy projects.

Mutual trust and commitment to exercise good governance emerges as a key enabling factors for cross-border regional cooperation. The agreement between Sweden and Norway, for example, started from the principle that there would be no additional support granted to renewables. Germany and Denmark adopted a simple approach based on trust and mutual recognition to set up the data transfer system: if the control system of the partner country is adequate for the installations that are nationally supported, it is also adequate for the installations that are supported from abroad. Germany and Denmark also excluded any exit provisions from their agreement, to signal to investors that the agreement was firm. This succeeded to increase political stability and created better, long-term conditions for investments in renewable energy plants in the frame of the agreement.

Although it is not clear to what extent the joint support schemes triggered additional RES investments in the countries involved, it is most likely that without cooperation the costs would have been higher. As such, the cooperation cases between Sweden-Norway and Denmark-Germany provide a general indication about the **cost-cutting potential** of joint support schemes, in line with findings that emerged from model-based assessments. The cost for consumers of the Swedish-Norwegian certificate market, for example, is very low in comparison with other support systems in other EU Member States. This is probably influenced by the common certificate market as well as their national circumstances (e.g. availability of good locations for RES). The tenders for ground-mounted PV resulted in historically low electricity prices for solar PV in Denmark and in Germany. Costs and benefits are heavily influenced by their national circumstances (e.g. taxes, spatial planning restrictions). While a balanced distribution of costs and benefits between participating countries is desirable, countries must accept that their circumstances are different to those of their counterparts, making a perfectly balanced distribution nearly impossible. Instead, they should focus on how cross-border cooperation would help them meet their objectives in a cost efficient manner compared to acting individually.

The **efficiency of the cooperation mechanism** appears to be an important key factor for cooperation in all the cases. The countries only came to an agreement when the benefits were perceived to be larger than the associated costs and risks. The case of Sweden and Norway illustrate that efficiency gains can be achieved if one of the partnering countries already has experience in the design, implementation and monitoring of a similar national support scheme. The joint certificate market was an extension of the Swedish electricity certificate market that was already in operation since 2003. As such, the joint support scheme could benefit from nine years of Swedish experience in operating a green certificate market.

All the cases, including the failed case of UK and Ireland, show how difficult it is to explain and communicate the benefits of funding RES installations in other countries to the different **stakeholders and the general public**. In setting up the joint tender between Germany and Denmark, for example, specific measures were taken to secure public acceptance. They included the requirement of physical import of electricity to ensure that there was some tangible effect on the national electricity market of electricity produced abroad. In addition, the mechanism of statistical transfer was used to increase public acceptance. In the case of Norway and Sweden, special attention is paid to the communication to

the market and to stakeholders in the energy sector. Both countries exchange information on a regular basis about their communication strategy to avoid any communication that can influence the price (expectations).

The cases demonstrate that **sufficient time and resources have to be allocated to set up an agreement** for cross-border regional cooperation. Negotiating and designing a joint support scheme or joint project is complex, with many steps to be taken into account and different stakeholders to be involved. In setting up the agreement, it is crucial that the specific legal, economic, political circumstances of the participating countries are identified and taken into account. Differences in, for example taxes and spatial planning restrictions, can have a large impact on the distribution of costs and benefits. Both in the case of Sweden-Norway and Denmark-Germany, separate national (certificate/tender) legislation gave some flexibility to the countries to align the design, implementation and monitoring of the support scheme with national circumstances. The German-Danish pilot auctions demonstrate the importance of **aligning the timing of cross-border auctions with the schedule of national auctions** to avoid overlapping auctions. Parallelism of auctions could undermine the level of competition in the auctions or lead to unwanted bidding behaviour, potentially even collusion.

Since many different national concerns have to be taken into account, a country should **have as much flexibility as possible when negotiating** a cooperation agreement. If the country has already passed detailed provisions in national legislation, this reduces the flexibility in negotiating the agreement, since the partner country too has to agree with most/all of these national provisions so that they can be incorporated in the agreement. This is illustrated by the case of Denmark and Germany: according to German national legislation, PV-installations on agricultural land cannot get support from the national support scheme. Denmark chose to respect the way in which Germany wanted to deploy renewables and implemented the same site restrictions for German installations in the Danish tender. However, Denmark did not include the German site restrictions in Danish nationwide legislation. Consequently, the site restrictions only applied to the German territory in both the Danish and German pilot tenders. Some stakeholders argue that this was a critical disadvantage for German installations, compared with Danish installations in the cross-border tenders. This also highlights the importance of a coordinated approach on energy policy within a well-integrated electricity market, not only between the participating countries, but also at EU level.

The case of Sweden and Norway illustrates that a number of **other factors** can facilitate cross-border regional cooperation, such as the existence of a common electricity market, existing interconnections, or similar potential for renewable electricity production. The cooperation between Sweden and Norway also benefited from the fact the countries are geographically close to each other and had successful collaborations in the past. This way, they could build on a close and trustful communication – a prerequisite for an agreement based on consensus and trust.

References

Agora Energiewende, 2018, Cross-border renewables cooperation – the impact of national policies and regulation on the cost of onshore wind across the PENTA region and priorities for cooperation.

BBC News, 2014, Ireland's rural protests over wind energy, 2 February 2014. Retrieved from: https://www.bbc.com/news/world-europe-25966198

Buli N. K., Sweden, Norway seal end of joint green subsidy scheme in 2035, Sustainable business, Reuters, 18 September 2020. Retrieved from: https://www.reuters.com/article/us-norway-sweden-electricity/sweden-norway-seal-end-of-joint-green-subsidy-scheme-in-2035-idINKBN26922B.

Caldés N., Lechón Y. and Gerbeti A., 2018, Renewable Energy Cooperation in Europe: What Next? Drivers and Barriers to the Use of Cooperation Mechanisms, Energies.

Dii, 2019, "Dii – Desert Energy", Retrieved from https://www.dii-desertenergy.org/, 9 October 2019.

Duggan, A., 2013, Ireland & UK: Joint project on renewable energy export. Presentation given at the 10th IFIC workshop in Brussels, 24 October 2013.

Ecofys, 2014, Cooperation between EU Member States under de RES Directive.

Ecofys, 2015, Driving regional cooperation forward in the 2030 renewable energy framework.

Ecofys, 2019, Technical assistance in realization of the 4th report on progress of renewable energy in the EU.

EEA, 2016, Environment and climate policy evaluation, EEA Report No 18/2016.

EEA, 2019, Assessing the effectiveness of EU policy on large combustion plants in reducing air pollutant emissions, EEA Report No 07/2019.

European Commission, 2013, Guidance on the use of renewable energy cooperation mechanism, SWD(2013) 440 final.

European Commission, 2016, Staff Working Document, Impact Assessment accompanying the document Proposal for a Directive of the European Parliament and of the Council on the promotion of the use of energy from renewable sources (recast), SWD/2016/0418 final. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52016SC0418

European Commission, 2018, Impact assessment of the Regulation establishing the Connecting Europe Facility and repealing Regulations, SWD(2018) 312 final.

European Environment Agency, Trends and projections in Europe 2018.

Heinrich Böll Stiftung & Ecofys, 2015, Driving regional cooperation forward in the 2030 renewable energy framework.

Heinrich Böll Stiftung & World Future Council, 2016, Enhancing Regional Renewables Cooperation in the EU Experiences and policy recommendations from a Study Tour to the North Sea Region.

Irish Government News Service, 2013, Energy trading creates opportunities for Ireland & UK, 24 January, 2013. Retrieved from: https://merrionstreet.ie/en/Category-Index/Economy/Energy/energy-trading-creates-opportunities-for-ireland-uk-rabbitte-davey.html

Meus J., Van den Bergh K., Delarue E. and Proost S., 2019, On International Renewable Cooperation Mechanisms: the Impact of National RES-E Support Schemes, K.U. Leuven & EnergyVille, Preprint submitted to Energy Economics, March 4, 2019.

Ministry of Petroleum and Energy of Norway, 2016, White Paper on Norway's Energy Policy: Power for Change. Available at: https://www.regjeringen.no/no/dokumenter/meld.-st.-25-20152016/id2482952/

Norwegian Water Resources and Energy Directorate (NVE) and the Swedish Energy Agency (SEA), 2016, The Norwegian-Swedish Electricity Certificate Market – Annual report 2015.

Norwegian Water Resources and Energy Directorate (NVE) and the Swedish Energy Agency, 2019, The Swedish-Norwegian Electricity Certificate Market - Annual report 2018.

Rabbitte, P. (Minister for Communications, Energy and Natural Resources), 2014, "Wind Energy Generation" debate at House of the Oireachtas, 6 May 2014. Retrieved from: https://www.oireachtas.ie/en/debates/question/2014-05-06/109/

Schmitt T. M., 2018, (Why) did Desertec fail? An interim analysis of a large-scale renewable energy infrastructure project from a Social Studies of Technology perspective.

Swedish Energy Agency (SEA), 2017, The Electricity Certificate System, 3 July 2017. Retrieved from http://www.energimyndigheten.se/en/sustainability/the-electricity-certificate-system/.

The National, 2009, "Could Desertec be hamstrung by Algerian apathy?", 15 November 2009. Retrieved from https://www.thenational.ae/business/energy/could-desertec-be-hamstrung-by-algerian-apathy-1.547659.

Von Blücher F., Gephart M., Wigand F., Anatolitis V., Winkler J., Held A., Sekamane J. K., and Kitzing L., 2019, Design options for cross-border auctions, Navigant, Fraunhofer ISI, DTU, Aures II - Design options for cross-border auctions.

Annex I – Key assessment questions

The following paragraphs provide an overview of the key assessment questions that guided the interviews with national competent authorities in the identified case studies. Questions relate to the specific terms of the assessed cooperation agreements, the intervention logic of the project/agreement and a general appraisal of key factors.

Configuration of the regional cooperation agreement

- What are/were the terms of the agreement?
- How was the agreement designed? Who was/is involved?
- How was/is the agreement implemented? Who was/is involved?
- How was/is the impact of the agreement monitored? Who is/was involved?
- Do you have additional documentation available?

Effectiveness

- Was/Is the case effective in improving RES investments and RES production in both Member States? What is the actual outcome or are the results so far for each of the Member States involved? E.g. RES production and capacity by year? Total investments? Number of participants?
- Was/Is the case effective in contributing to the overall RES targets in the Member States involved?
- What actions did you take/do you plan to improve the effectiveness of the joint support scheme or joint project?
- Or another way to ask:
    - What are/were the objectives in terms of effectiveness/results/impact?
    - To what extent did/does the case contribute to the objectives in terms of effectiveness?
- Are/were there differences in effectiveness between the Member States involved? Please explain.
- Did/does the initiative trigger the progress in terms of more RES production and/or other regional cooperation initiatives? Please explain or give an example.
- Are there other initiatives planned given the 2030 energy and climate framework and NECPs? Please explain (what would be the objective of this initiative?) or give an example.

Coherence

- To what extent was/is the initiative complementary to and coherent with other national and EU initiatives in the field? What are/were the main synergies you can/could determine? Is the initiative enforcing/lowering/weakening the impact of other policy measures within the RES domain and other domains?
- What actions did you take/do you plan to maximize these synergies? What actions did you take/do you plan to align with other national and EU initiatives in the field?
- To what extent is/was the initiative coherent between both Member States involved? What makes the cooperation between the two Member States coherent/non-coherent? Can you illustrate with an example?
- Is the initiative part of a policy mix or policy strategy? Is the initiative part of a strategic plan for designing, implementing and monitoring measures to promote RES within the Member States? Please explain.

Efficiency

- What are the resources allocated to the initiative (e.g. number of staff/person months; budget/share of the total budget for RES related policies)? If possible, can you make a distinction between design, implementation and monitoring activities?
- What are/were the objectives in terms of efficiency/inputs/activities from MS? To what extent did the regional cooperation correspond to the objectives in terms of efficiency? Please explain.

- Was the regional cooperation initiative a cost-efficient mean for achieving the objectives? Have the expected results been obtained at reasonable costs?
- What actions did you take/do you plan to improve the (cost) efficiency of the joint project or joint support scheme?
- In literature the following drivers and barriers are reported to design, implement and monitor regional cooperation – What's your opinion? Please explain.
    - perceived technical complexity of designing the most appropriate cooperation model and reluctance to take associated "first mover risk";
    - communicating to the national electorate the benefits of cooperation over reliance on domestic resources;
    - perceived uncertainty and complexity of assumptions underlying any appropriate cost and benefit sharing arrangements between Member States.

Added/lost value

Added Value

- What is/was the added value of regional cooperation in general, in comparison to other national RES initiatives or RES policies without regional cooperation? Can you give an example to illustrate?
- What is the added value of this specific type of cooperation: Why this type of cooperation? Please explain.
- What's the added value of cooperating with this specific MS: Why this partner? Please explain.
- Or another way to ask: Would it have been possible to achieve the same results in absence of the joint support scheme or joint project?
- Are there other initiatives for regional cooperation with this or other MS planned given the 2030 energy and climate framework and NECPs? Please explain (what would be the added value of this initiative?) or give an example.

Lost Value

- What are the main drawbacks of regional cooperation in general, in comparison to other national initiatives or RES policies without regional cooperation? Can you give an example to illustrate?
- What are the main drawbacks of this specific type of cooperation?
- What are the difficulties/barriers that you have faced? Can you explain or illustrate with an example how you dealt with these barriers in frame of the joint mechanism or joint project?

External factors

- Could you list other drivers & barriers you have experienced in designing, implementing and monitoring the joint mechanism or joint project?
- Can you explain or illustrate with an example how you dealt with these external factors in frame of the joint mechanism or joint project?
- Or another way to ask: In literature we found the following drivers and barriers for designing, implementing and monitoring regional cooperation – What is your opinion?
    - concerns that cooperation might interfere with the effectiveness or efficiency of domestic policy measures and in consequence security of supply and other energy policy goals;
    - lacking transmission infrastructure and market integration;
    - potential incompatibility of cooperation mechanisms with national and EU legislation.

General appraisal of contribution of key evaluation factors

- Which of the following factors do you consider a key success factor for regional cooperation?
    - The joint project or joint support scheme meets the objectives/anticipated results or impact (e.g. RES target achieved, RES investments increased with x%).
    - The joint project or joint support scheme meets the objectives at reasonable costs.

    - The joint project or support scheme is coherent with other national policies/initiatives in the field of RES.
    - The general public supports the joint support scheme or public acceptance of the joint project or joint support scheme is high.
    - The joint project or joint support scheme is of added value in comparison to a national policy or measure.
- How would you rank them in order of high/low contribution to success/failure of regional cooperation?

European Topic Centre on Climate change
mitigation and energy
Boeretang 200
B-2400 Mol, Belgium
Tel.: +32 14 33 59 77
Web: www.eionet.europa.eu/etcs/etc-cme
Email: etccme@vito.be

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