Barriers and Critical Success Factors for the Implementation of Cooperation Mechanisms

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Publication date:
2012

Document Version
Publisher's PDF, also known as Version of record

Cost-Efficient and sustainable deployment of renewable energy sources towards the 20% target by 2020, and beyond

D3.1

Barriers and Critical Success Factors for the Implementation of Cooperation Mechanisms

June 2012

Supported by INTELLIGENT ENERGY EUROPE

Project no.:
IEE/09/999/SI2.558312

Deliverable number:	D3.1
Deliverable title:	Barriers and Critical Success Factors
Work package:	WP3
Lead contractor:	DTU
Logo of the contractor	

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

PREFACE/ACKNOWLEDGEMENTS

This document reports activities and results of Task 3.1 of the Intelligent Energy Europe supported project RES4Less. This work is the initial analyses and survey of barriers for implementing cooperation mechanisms in the EU countries. This work builds on earlier Intelligent Energy Europe projects and is the result of literature surveys and discussions in the project group. Furthermore, fruitful inputs have been obtained in the stakeholder workshops carried out within the RES4Less project. Additionally, the topic has been presented and debated at two international conferences.

The preliminary results were also shared and enriched by comments from other members of the RES4Less Team during internal meetings of the project.

EXECUTIVE SUMMARY

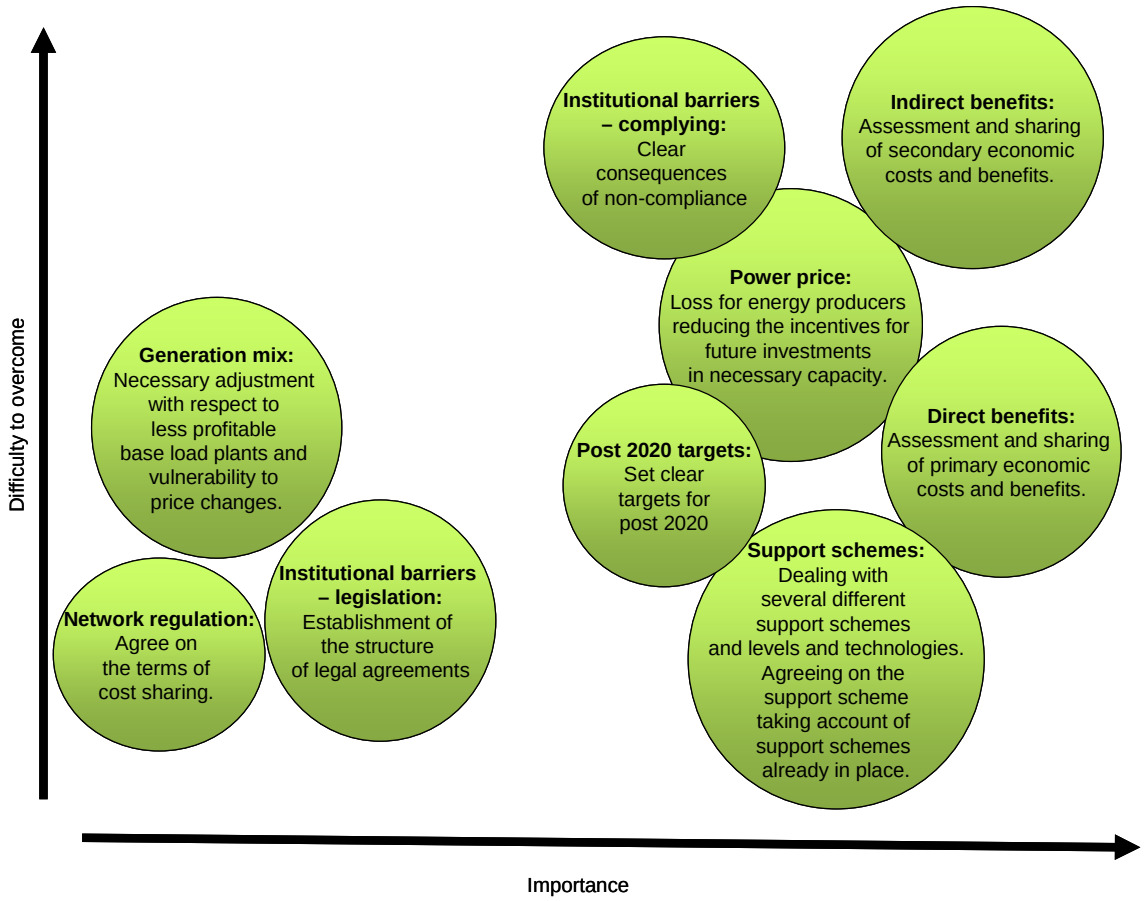
The RES Directive 2009/28/EC set legally binding targets for EU Member States on energy consumption from renewable sources – the 2020 RES targets. A part of this can be achieved through the use of cooperation mechanisms: statistical transfer, joint project and joint support scheme. The intention of the cooperation mechanisms is to provide the flexibility needed to achieve Europe's renewable energy targets in a more cost-efficient way. In Task 3 of the RES4Less project we analyse the barriers for two of the cooperation mechanisms: joint project and joint support schemes. This report is the outcome of the work in task 3.1 with the purpose of analysing the barriers for cooperation mechanisms and the critical success factors that ensure the removal of the most important barriers. The general barriers identified and covered in this report will be used as input for further analysis in the specific case studies in Task 3.3 to 3.5 of this work package.

Cooperation mechanisms have the potential to reduce the compliance costs of reaching the 2020 RES targets for EU member states. The initiation of cooperation mechanisms is dependent on addressing a range of barriers. This report examines the barriers associated with different structures, power markets, regulation and policies in member states. Critical barriers for the implementation of cooperation are identified and the possible link with the core compensation issue is discussed.

The precondition for establishing cooperation is that the participating countries all need to have a net benefit from cooperation. This will in most cases require that a compensation scheme/RES price can be designed to reduce the barriers.
The first category of barriers identified here is within the direct support for renewables and covers both the type of support, the objective of support scheme as well as the level of support/financing. The objective for support can be such domestic priorities as development/protection of infant industries, employment, and diversification of energy sources or reduction of negative externalities such as emissions/pollution. One of the important examples is connected to the existence of a high level of technology-specific support for industrial development reasons that would be abolished if engaging in full joint support schemes with one common support level.
Power market differences are the source of other important barriers, as widespread cooperation would imply that power market price levels and composition are affected. Such effects would benefit some and draw on others. For example existing power generators in a host country would suffer from expanding considerably generation capacity with low marginal cost technologies. On the other hand consumers in the host country would benefit through reduced power prices.
Institutional barriers, especially regarding the entities regulating investment in renewables, network infrastructure and financing principles for renewable can also be substantial.

Within our analysis, barriers are characterized in two dimensions, namely their *importance* and the *difficulty to overcome* (see Figure 1).

Figure 1 Categorisation of barriers



Support schemes and power prices are among the most important barriers. Of these the support scheme barriers seem the easiest to overcome. For more concrete conclusions on how to overcome the barriers the constellations of specific countries, technologies and type of cooperation have to be addressed.

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1 INTRODUCTION

The RES Directive 2009/28/EC (European Commission 2009) sets legally binding targets for EU Member States on energy consumption from renewable sources – the 2020 RES targets. A part of this can be achieved through the use of cooperation mechanisms: statistical transfer, joint project and joint support schemes. The intention of cooperation mechanisms is to assure the flexibility needed to achieve Europe's renewable energy targets in the most cost-efficient way.

Cooperation mechanisms do have potential benefits, but there are a number of barriers for their successful implementation. This report reviews and categorises the barriers and illustrates which barriers have to be addressed specifically for all types of cooperation mechanisms. The report will draw on literature studies, especially the previous projects in IEE dealing with cooperation mechanisms and RES support and system integration issues.

The EU 2020 member state (MS) targets for renewable energy are based on the national shares in 2005. The required total addition of renewable energy for the EU has been distributed among the member states taking very few parameters into account (Klessmann et al 2010). One parameter considered is the income level, thereby putting a slightly higher burden on wealthier countries. However, the differences in costs of implementing renewable investments for member states has not been directly included in setting the targets, so there is no consideration for cost efficient implementation. Therefore potential benefits through reduced compliance costs for countries exist if they can implement their targets jointly. These benefits can be realised by using cooperation mechanisms. Current EU legislation has opened for using joint support schemes, joint projects and statistical transfers as support for promoting renewable energy to meet the 2020 targets, but the details for these mechanisms have not been laid out.

The least complicated mechanism is *statistical transfer*, an ex-post transfer of virtual RES certificates that can be used for target compliance. This mechanism depends directly on governmental involvement and can also be associated with the other mechanisms at the final stage of transferring the achieved RES certificates from one country to another. It does not by itself induce additional RES development since no prior agreements assure the sale of the credits and therefore it has limited use as promoting a more efficient distribution of RES development. Due to the incentive structure behind this mechanism, it is expected that only very limited 'statistical transfer'-volumes will be available to MS for complying with their target in 2020 (Klessman et al 2010). The reason being that, if this mechanism should be used as strategic instrument rather than as an ad-hoc means of 'filling the gaps', MS would have to guarantee the delivery of RES certificates under a statistical transfer several years prior to 2020, so that the receiving MS can avoid the development of own RES production. However, many MS, especially those using Feed-in tariffs or other non quantity-driven support systems, will not be able to guarantee delivery long before 2020, as they will be uncertain in regards to their own target compliance. Therefore sharing of compliance risk would be a critical issue in agreements on statistical transfers ex ante.

The mechanism of *joint projects* gives those MS that lack sufficient low-cost RES potential (user country) the possibility to develop projects in another MS (host country). In this case the user country would support investors in undertaking the project or investors are supported jointly by the two countries and then the total costs are balanced via a compensation scheme. MS can either cooperate on a project-to-project basis or agree on a special support framework for a number of projects. These special support frameworks can be defined for a certain technology or a certain area, and can be implemented in parallel to existing national support schemes. In the medium to

long term, the cooperation on special support frameworks might lead to a further expansion of the cooperation itself (i.e. through standardisation), and therewith lead to the development of joint support schemes.

The mechanism of *joint support schemes* is a broad cooperation of MS on a national level and may pave the path towards harmonisation in the long run. In this case the MS agree on a common support scheme. The introduction of a common support scheme gives the greatest potential to efficiently utilise RES potential in the involved MS, as the establishment of equal incentives will ensure the development of RES at the most beneficial sites in the cooperation area. A less ambitious option is that the MS partially coordinate their national support schemes, such that the common support scheme only applies to specific technologies, or to specific areas. These possibilities will be dealt with in more detail in Task 3.2 of the RES4Less project, but the barriers are treated in this report.

In Table 1 the main characteristics of the three cooperation mechanisms are summarized.

Table 1 Cooperation mechanisms and their main characteristics

Statistical Transfer	Joint Project	Joint support scheme
Ex-post transfer of virtual RES certificates	Gives MS that lack sufficient low-cost RES potential the possibility to develop projects in another MS	Broad cooperation of MS on a national level
Does not induce additional RES development	MS can either cooperate on a project-to-project basis or agree on a special support framework for a number of projects	MS agree on a common support scheme – fully (cover all technologies and areas) or partially (only covers specific technologies, or to specific areas)
	Support frameworks can be defined for a certain technology or a certain area	Gives the greatest potential to efficiently utilise RES potential in the involved MS

The cooperation mechanisms actually implemented might be somewhere in between, as they may contain elements from both types. If, e.g., two countries agree on a common tender for an offshore wind farm supported by a price premium are we then dealing with a joint support scheme or a joint project? The fact that it is a limited project – the offshore wind farm – makes it a joint project, whereas the support scheme – the price premium – makes it a joint support scheme.

In Task 3 of the RES4Less project we analyse the barriers for two of the cooperation mechanisms: joint projects and joint support schemes. We do not address the Statistical Transfers since the barriers and the complexities related statistical transfers initially in the project definition were assumed to be very limited. Furthermore, transfers do not provide more efficient RES development but only exploit ex post surpluses. This report is the outcome of the work in Task 3.1 with the purpose of analysing the barriers for cooperation mechanisms and critical success factors that ensures the removal the most important barriers. We consider barriers existing due to differences in types of support schemes and level of support, as well as barriers associated with differences in power market regulation and power prices. Furthermore, we consider the barriers arising due to the costs and benefits connected to cooperation.

One general barrier for implementing RES jointly among member states is related to grid connection and transmission capacity. These issues are beyond the scope of this report and will be discussed in work package 4.

2 BARRIERS

The purpose of cooperation mechanisms is to achieve the EU 2020 RES target in a more efficient way, compared to the individual country solution. However, cooperation between countries does not seem to come along automatically, due to the presence of several barriers.

The overall precondition for the countries to engage in cooperation is that member states will only agree on a cooperation mechanism if they all benefit from it. This means that the overall benefits from cooperation for all MS have to exceed the overall costs from cooperation. Therefore, in general, main barrier is the challenge relating to identifying, quantifying as well as establishing how to allocate the costs and benefits such that all countries eventually benefit from cooperation. This issue is addressed in Section 2.5. Other issues may result in barriers:

- Different political agendas such as supporting certain industries or the assumption that development of renewable energy will provide positive welfare effects such as increased employment and technological development. These issues are discussed in section 2.1.
- Increased share of renewable energy has different effects on the energy system. As renewable energy is assumed to be connected to lower marginal production costs the areas with increased share of renewable energy will experience a decrease in the electricity price. This benefits the consumers but has consequences for the energy system that have to be taken into account. These issues are addressed in the Sections 2.2 and 2.3.
- Differences in legislation and political acceptance (Section 2.4).
- The exact consequences for the MS in case they do not reach their target have not been specified, the alternative costs of not achieving the target are unknown, decreasing the overall motivation to engage in cooperation (Section 2.4).
- Post-2020 targets have not been set, there is high uncertainty on the actual long-term value of renewable energy. This indeed increases the difficulties in allocating costs and benefits related to the development of renewable energy and constitutes a serious barrier. This problem is discussed in Section 2.6.

2.1 Different RES support systems

Historically EU countries have applied several different support schemes aiming at several different technologies (Hass et al 2011). Feed-in tariffs seemed to be the most popular support scheme from the very beginning but also tax incentives as well as tendering played a role. Later quotas and tradable green certificates increased in popularity in the MS (Table 2).

Table 2 Overview of support schemes applied in some EU countries

Member state	Wind onshore	Wind offshore	Hydro (mainly small scale)	Geothermal	Solar PV	Biomass, Biogas and Waste, others
Austria	Feed-in tariff		Feed-in tariff	Feed-in tariff	Feed-in tariff	Feed-in tariff
Belgium	TGC	TGC	TGC		TGC	TGC
Czech Rep.	Feed-in tariff Feed-in-premium		Feed-in tariff Feed-in-premium		Feed-in tariff Feed-in-premium	Feed-in tariff Feed-in-premium
Estonia	Feed-in tariff Direct support	Feed-in tariff Direct support	Feed-in tariff Direct support			Feed-in tariff Direct support
Finland	Investment subsidies Electricity tax	Investment subsidies Electricity tax	Investment subsidies Electricity tax	Investment subsidies	Investment subsidies	Investment subsidies Electricity tax

	returns	returns	returns			returns
Denmark	Feed-in-premium	Feed-in tariff Tendering			Tax exemptions	Feed-in-premium
France	Feed-in tariff Call for tenders		Feed-in tariff	Feed-in tariff	Feed-in tariff Call for tenders	Feed-in tariff Call for tenders (biomass)
Germany	Feed-in tariff	Feed-in tariff	Feed-in tariff	Feed-in tariff	Feed-in tariff	Feed-in tariff
Great Britain	TGC	TGC	TGC		TGC	TGC
Greece	Feed-in tariff	Feed-in tariff	Feed-in tariff	Feed-in tariff	Feed-in tariff	Feed-in tariff
Ireland	Feed-in tariff	Feed-in tariff	Feed-in tariff			Feed-in tariff
Italy	Feed-in tariff TGC		Feed-in tariff TGC	Feed-in tariff TGC	Feed-in premium TGC	Feed-in tariff TGC
Hungary	Feed-in tariff		Feed-in tariff			Feed-in tariff
Lithuania	Feed-in tariff		Feed-in tariff		Feed-in tariff	Feed-in tariff
Luxembourg	Feed-in tariff Feed-in-premium		Feed-in tariff Feed-in-premium		Feed-in tariff Feed-in-premium	Feed-in tariff Feed-in-premium
Poland	TGC	TGC	TGC	TGC	TGC	TGC
Portugal	Feed-in tariff		Feed-in tariff		Feed-in tariff	Feed-in tariff
Romania	Exempt from excise payment TGC	Exempt from excise payment TGC	Exempt from excise payment TGC	Exempt from excise payment TGC	Exempt from excise payment TGC	Exempt from excise payment TGC
Slovenia	Feed-in tariff Feed-in premium	Feed-in tariff Feed-in premium	Feed-in tariff Feed-in premium	Feed-in tariff Feed-in premium	Feed-in tariff Feed-in premium	Feed-in tariff Feed-in premium
Spain	Feed-in tariff Feed-in-premium	Feed-in tariff Feed-in-premium	Feed-in tariff Feed-in-premium	Feed-in tariff Feed-in-premium	Feed-in tariff	Feed-in tariff Feed-in-premium
Sweden	TGC	TGC	TGC	TGC	TGC	TGC
The Netherlands	Feed-in tariff Feed-in-premium	Feed-in tariff	Feed-in tariff		Feed-in tariff Feed-in-premium	Feed-in tariff

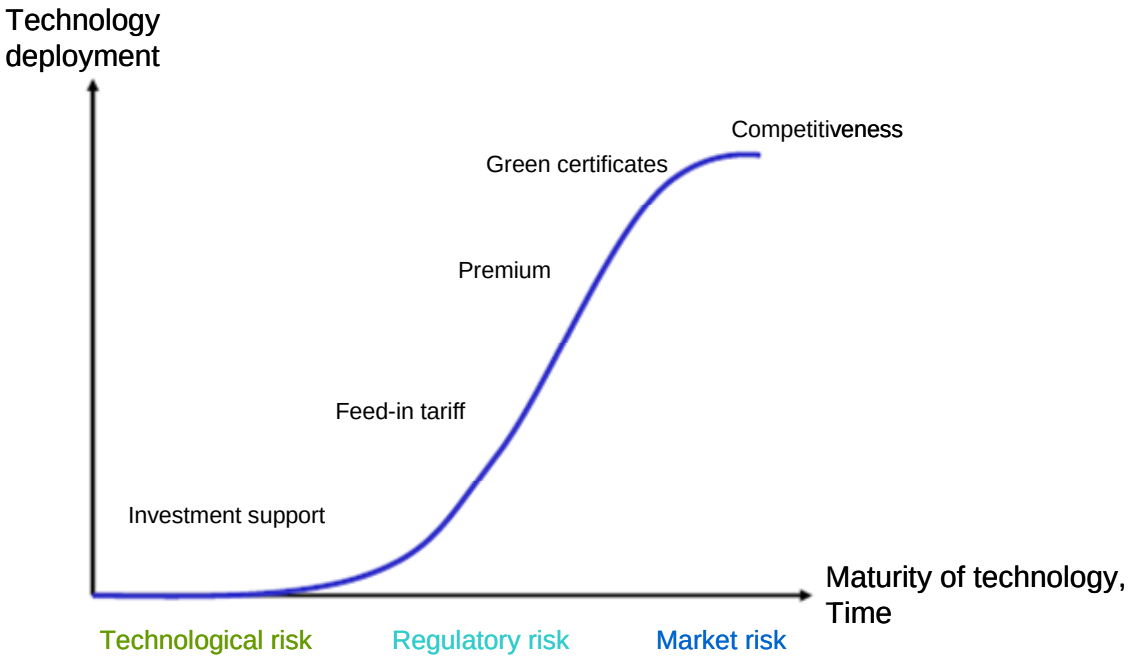
Source: CEER 2008, CEER 2011

The fact that the different MS historically have applied different support schemes aiming at different technologies may constitute a barrier. In the following we address the issues regarding differences in RES support schemes.

2.1.1 Different support schemes

Different support schemes are normally applied dependent on the development of the technology in question. The support mechanism providing the most security for the investors is investment support. In this case the investor is granted an up-front support covering parts of or the entire investment costs removing the technological risk. Next in line to provide the security for the investors is a fixed feed-in tariff replacing the power market price. In this case the investor is guaranteed a fixed price for the electricity sold and is therefore not exposed to market risk at all. The feed-in tariff is followed by the fixed price premium on top of the power market price where the investor to a larger extent is exposed to the market risk as the revenue is dependent on the market price as well. Tradable green certificates expose the technology to a higher level of competition as the support is entirely determined on a market for certificates. Finally, the technology is sufficiently mature to compete on the market and receives no support.

Figure 2 Technological development and support schemes



The diversification of support schemes in European MS can be explained by the different perception of the technological maturity in different countries, as well as the perception of how necessary support is in order to assure the targeted RES. The size of the market can also affect the support scheme chosen: for example it makes less sense to implement a tradable green certificate scheme in a small market compared to a larger market.

In the case that two countries decide to cooperate via a joint support scheme, and the two countries as a point of departure do not have the same support scheme, a number of barriers arise. First of all there are a number of administrative barriers: As the existing capacity is supported from one kind of support scheme while the capacity installed under the cooperation between countries will be supported from another kind of support scheme, the regulator will have to administer two support schemes. Further, as the new type of support scheme will be set in place the legislation also has to be regulated imposing further costs on the system. The extra management increases the administration costs related to RES development under cooperation and decreases the motivation for cooperation.

Furthermore, firms investing in renewable technologies will perceive the introduction of new support schemes as an increased uncertainty. They face new risks and new cash flows they have to take into account. This leads to more transaction costs and decreases the amount of investments.

2.1.2 Combinations of support systems

In this section we discuss the different combinations of support schemes and the implications for cooperation. Further, we briefly assess the extent to which the combinations are a barrier to cooperation or works well together.

Feed-in tariff and tradable green certificate support schemes
The two support schemes offer different properties with regard to the volumes realized and the support costs. Feed-in does not control the volume and could generate both excess and deficit results relative to 2020 RES targets. Tradable green certificate (TGC) schemes require a broader range of conditions fulfilled to work well, of which the liquidity and transparency of the market is most difficult to satisfy. Feed-in offers less risk in the support revenue to investors whereas TGC only does so if there is a commitment to increase the renewable obligations along the way. Smaller investors would normally favour the feed-in to the certificate scheme if the intended level of support is in the same range.

Combing the two is possible with feed-in for some technologies and a common certificate system for other technologies. The main barrier is that the feed-in easily offers technology specific support level and the certificates would work best with competition between technologies and hence there is a contradiction between the two support systems.

Feed-in tariff and tendering schemes
Feed-in schemes work well with both smaller and larger projects, but are inflexible in providing the market incentive to increase or cut back on RES deployment speed. Tendering works well with larger projects that require interaction with government/TSO, planning of infrastructure and localization of investment etc. Feed-in and tendering are often combined with a fixed support at the time of settling with the tender winners. New tenders are associated with a different level of feed-in tariff. The actual expansion of renewables can thus be controlled contrary to the case where feed-in alone is used.

The combination works in particular in cases where the tenders are for high cost surplus RES options, and can be used for cooperation and RES certificate exchange.

Feed-in tariff and feed-in premium
Feed-in tariff and feed-in premium are often used technology specific aiming at technologies at different technological stage of development. Feed-in premiums are used for technologies that are mature, are very flexible operationally or have already high penetration rates in the power system. A feed-in premium provides the incentive for the producer to respond to the market price and thus stabilises the electricity market in contrast to the feed-in tariff, giving the producer the incentive to produce at any given moment.

Combining the two support schemes for different technologies or different areas is no problem. However, the technologies supported by a feed-in tariff may attract more investors due to the higher level of security and therefore implementing one common support system may have impacts on power markets both through operation and deployment of the given technology.

Tradable green certificates and tendering
TGC is often used when competition between technologies is a target whereas tendering is applied for larger projects implemented without interfering with the remaining part of RES support. The

two support schemes thus have opposite points of departure, and combining the two would reduce the effectiveness of the TGC scheme.

Tradable green certificates and feed-in premium
The application of TGC has competition among technologies in mind whereas a feed-in premium can be technology specific as well as general. The TGC has its advantage in meeting a specific RES quantity target if designed with sufficiently high non-compliance targets, whereas the premium has the advantage in providing a known level of support cost per unit RES deployed. Depending on the use of feed-in premium there may or may not be a contradiction between the two support schemes. If the feed-in premium is general it may provide a similar support to RES investors as a TCG scheme and there will not necessarily be a barrier between countries using the two support schemes. If the feed-in premium on the other hand is technology specific, the main barrier is that there is a contradiction between the two support systems in terms of deploying the cheapest RES options or supporting all technologies.

Tendering and feed-in premium
Tendering works well with larger projects whereas feed-in premium works well with both smaller and larger projects. They can be both technology specific as well as general. Combining the two schemes works in particular in cases where the tenders are for high cost surplus RES options, and can be used for cooperation and RES certificate exchange.

In Table 3 the main issues related to combining different support schemes are summarized.

Table 3 Combination of support schemes in host and user country

	Feed-in tariffs	**TGC**	**Tendering**	**Feed-in premium**
Feed-in tariffs	- Different levels of support - Different targeted technologies - Different support period and uncertainty	- Feed-in is technology-specific, TGC works best with competition and no technology differentiation - Different support level	- The two schemes are often used in combination for larger projects, where the needed feed-in tariff is the outcome of the tender	- Different support levels - Different targeted technologies - Different technological stage
TGC		- Different price levels, i.e. support levels - TGC may be general or only covering some technologies	- Tendering is technology-specific, TGC works best with competition - Tendering is used for large project, TGC is general	- Feed-in premium may or may not be technology specific, TGC enhance competition between technologies
Tendering			- Tendering used in two countries do not necessarily differ. Procedures, support rules, network connection etc are defined specifically for each tender. The tender outcome will not depend on whether the tender is called in more than one country.	- Feed-in premium could be general as well as technology specific, tender is mostly technology specific - The two schemes could easily be used in combination for larger projects, where the needed

				feed-in premium is the outcome of the tender
Feed-in premium				- Different levels of support - Different targeted technologies

In WP2 of the RES4Less project (Dalla Longa et al 2011) the pure technology costs were addressed. If we assign value to RES targets and the secondary objectives of technology development, industrial development, employment and diversified power technologies the cost curves should be evaluated against these benefits. That will be the justifying argument for the difference in support that some support schemes target. The support schemes with general non-technology specific support (broad TGC schemes, common FIT or common premium) correspond more directly to the cost curves produced in WP2.

2.1.3 Technology-specific support versus general support

In this section we describe how the differences in support schemes are motivated by differences in the objectives of the support schemes. We specifically address the issue of technology-specific versus general support.

A support system can have a number of different objectives. These determine whether technology-specific or general support should be adopted:

- competition between RES technologies and cost efficiency → general
- developing infant domestic industries → technology-specific
- developing immature technologies → technology-specific
- secure diversified power technologies → technology specific

In the following we discuss the identified objectives and related barriers:

- If the objective of a support scheme is to develop infant domestic industries, the support scheme will most likely be technology-specific. In that case it might in fact support an objective of giving immature technologies more support than more mature technologies if the industry in question is related to immature technologies. On the other hand if the infant domestic industry targeted by the support is related to a more mature renewable technology the support scheme does not support such objective. A support scheme aiming at supporting infant domestic industries will not necessarily assure diversified deployment of RES technologies as more mature technologies might loose their competitiveness if more immature technologies are targeted by the industry specific support. Finally, a support scheme aiming at supporting infant domestic industries will most likely not assure competition between technologies as specific technologies are promoted leaving other technologies behind. Depending on the objective of the regulator and the support schemes traditionally used in the participating countries a barrier to cooperation may arise.

- If a support scheme is designed to promote competition between renewable technologies it is quite difficult to combine it with a scheme that has the objective of securing a diversified deployment of RES technologies. In the first case the most mature and therefore most competitive technologies will presumably become the most widespread. In the latter case, where the objective

is to secure diversified deployment of technologies, higher support should be given to less mature technologies as they are less competitive, and therefore actually support the objective of promoting immature technologies.

- Finally, a scheme with the objective to secure diversified power technologies will only contradict with an objective of competition between technologies. Such a scheme probably will support both infant domestic industries as well as provide higher support for immature technologies. This, in general, contradicts the idea of competition between technologies as the technology specific support schemes and support levels will not assure that the cheapest technologies possible will be the ones applied.

2.1.4 Different support levels

Difference in support levels creates barriers as the support levels express the willingness of the population/government to pay for renewable expansion. Barriers might arise due to a different level of RES support in cooperating countries as at least one of the countries will have to adjust their support level. If a country has a certain support level being sufficient to achieve its own RES targets, but having excess capacity/potentials, the country is a potential host country. A user country – with a higher support level and lower capacity/potentials – would then like to cooperate with the host country in order to achieve its RES targets at lower costs. Assuming that the two countries agreed on introducing a joint support scheme for just one or all the renewable technologies the effects on the two countries are as follows:

- The support level in host country would inevitably rise as the needed amount of installed renewable capacity would increase leading to a larger share of the more expensive technologies. In this case the host country (with the low support) would have important opposition against the increase in support cost for their RES development especially if the burden is directly on the consumers and industry. On the contrary the producers of renewable energy would gain from the cooperation.

- The user country will gain as the total costs of compliance would decrease. However, the producers of renewable energy in the user country would lose as the support level of the user country will decrease compared to a situation where the user country should reach its RES targets within its own boarders. Renewable industry, green development supporters and renewable investors would all oppose to the reduction of support levels even though it is the benefit of the cooperation that support can be reduced because cheaper options can be exploited.

For example, Germany and Spain could decide to cooperate on a joint support scheme for new photovoltaic (PV) installations. The two support schemes are currently rather similar, featuring a differentiated feed-in tariff. However, Spain recently introduced a capacity cap, limiting the support of new PV installations, because they feared a too high increase of their overall RES support cost. At the same time, there is a significant build-out of PV in Germany to a much higher RES support cost. Assuming a joint support system, where Germany and Spain would have one common market for PV at an adequate common support level, the build-out of PV would move from Germany to Spain (due to the much better solar radiation levels). The overall support cost would be reduced by the difference of the required support cost in Germany to the required support cost in Spain. Germany and Spain would then share the RES certificates and the support cost. However, finding the right cost allocation would be a difficult negotiation. Germany would have a significant reduction in support cost (per generated unit of renewable energy), but would

also lose local benefits. Spain would need to be compensated for bearing all physical and market integration issues, but would have all local benefits including the innovation and industry benefits, which currently seems to be a significant factor in Germany's PV support considerations.

For this example the critical success factors are that Germany and Spain should be able to agree on a compensation scheme that would take the following into account:

- The gains for Germany with respect to decreased support level
- The costs for Spain with respect to the market integration
- The indirect benefits for Spain given by innovation, industry benefits and job creation

2.1.5 Concluding remarks

As seen the EU countries apply a wide variety of support schemes targeting different technologies (Table 2). For most of the support schemes there is as such no problem in combining the use of the different support schemes. However, the purpose of TGC, i.e. competition between technologies, contradicts the use of the tendering and to a certain extent feed-in tariffs as well as feed-in premiums, which often target a specific technology with a pre-determined support level. Therefore the largest challenge seems to agree on which support scheme to apply and how to coordinate with the support schemes already in place.

2.2 Power markets

Power markets differ even though they are in many cases coupled and therefore prices to some extent are correlated. Differences in market concentration and technology composition constitute potential barriers. The mix of technologies in power generation can be more or less flexible to adjust to short term changes in renewable generation. It can be an important barrier for increasing the renewable capacity in a country if existing inflexible generation capacity has to be combined with new fluctuating renewables, e.g. combining nuclear power with large amounts of wind energy, as the system may not be tuned to handle this. Increasing the flexibility of the system may impose additional costs on the electricity producers and hence the consumers.

Power market price level and volatility differ from country to country and this creates additional barriers. Price levels in some countries will not be affected very much from increasing or decreasing the renewable expansion. However countries where renewable expansion potentials are abundant and cheap could experience considerable changes in power prices in case of expansion of the renewable energy shares. The market price an consequently the investment incentives are affected.

2.2.1 Market price

Higher shares of renewable energy in the energy system lead to deterioration in profitability of existing conventional and renewable capacity. Supporting such a development will be opposed by producers whereas consumers will support such a strategy. Barriers may arise for example to compensate losses on the firms/producers' side with gains in terms of lower prices on the consumers' side. However, the level compensation is not necessarily easy to establish and more importantly such compensation is also controversial and therefore not very easy to carry out.

2.2.2 Investment incentives

As higher shares of low marginal costs RES in the energy system is assumed to lead to lower short term electricity prices the country facing reduced prices will probably have to provide alternative ways to secure the incentives for future investment in conventional capacity. Additionally, the option of securing the connection to other markets with higher market prices could reduce the effect of capacity on the market price and thus the effect on the investment incentives.

2.2.3 Generation mix

Generation mix might be quite substantially influenced by intensively exploiting one cheap renewable resource. First of all the expansion of the technology itself will affect the generation mix. Secondly, the general power price, which is assumed to be reduced for low marginal costs RES as referred above, makes the least efficient base load plants less profitable or even loss making resulting in permanent shut downs of these plants. The generation mix will consequently become less diversified and the sector becomes more vulnerable to changes in the prices of few or just one fuel, such as natural gas. This will eventually affect the sector in a direction that it provides less security of supply for power.

2.3 Network regulation

Network regulation varies a great deal between member states from rate of return to incentive based price and revenue caps. The details in incentive regulation include numerous differences and the enforcement of regulation is not always effective. Network regulation has impacts on the incentives for networks to facilitate efficient connection of new technologies and network reinforcement (Ropenus et al, 2011).

If national regulation allows networks to include reinforcement investments caused by renewable generation in their capital base and thereby revenue cap, then this cost will be borne by the network customers. As special treatment of projects stemming from cooperation mechanisms in regulation is not practical, nor desirable, the host country might require the user country to compensate also this cost in case of cooperation. However, the transfer to network customers seems very difficult to realise.

2.4 Institutional barriers

In this section we address a list of issues gathered under the headline institutional barriers. They are barriers related to legislation, institutional design as well as political acceptance. Institutional barriers especially regarding the entities regulating investment in renewables, network infrastructure and financing principles for renewable can also be substantial. Even strategic consideration for domestic business and generator interests among national regulatory authorities can form a barrier even though this objective is not openly pursued.

2.4.1 Legislation

Different issues regarding legislation may constitute barriers for cooperation. First of all there is the question of how to structure the agreements legally, the resources used on lawyers, and how

legal agreements are traditionally designed in the one country compared to the other country. These costs reduce the incentives to engage in cooperation with other countries.

Furthermore, there are differences among countries regarding how the costs of support are allocated: is it public service obligations for the electricity consumers or is it the government providing the support? Depending on the model used in the two countries prior to cooperation the countries may have to agree on a type of cost allocation constituting a potential barrier.

2.4.2 Political acceptance

Political acceptance is closely related to acceptance of the population, which again is linked to a sense of fairness. In respect hereto the issue of "not in my backyard" – relating to the regular assumption that renewable energy production is generally attractive as long as the visual and other side effects do not affect "me" – is turned up side down in the sense that social acceptance is harder to achieve for projects taking place abroad: In case the support and development of specific RES technologies and industries are in focus, the population's acceptance of being a user country, i.e. where the country support RES projects in other countries, might be quite low as the development of industries will take place in another country and the user country will thus miss the indirect benefits of development of technologies and industries.

The traditional problem of acceptance issues in the host country, due e.g. to more wind turbines in the landscape, will also constitute a barrier. However, as the wind power projects implemented as cooperation most likely will be offshore wind farms these are less relevant issues as the visual and noise impact are limited.

Finally, as the focus of the cooperation mechanisms is to decrease the cost of reaching the RES targets and not necessarily focus on where new installed capacity of electricity production is needed, an extension of the connection between countries or regions and thus an extension of transmission lines such as overhead cables may be required. As overhead cables are regulated by complicated administrative procedures and have substantial negative visual impact, political as well as social acceptance of cooperation might decrease.

2.4.3 EU policy

One important barrier to cooperation is the lack of clear EU regulation when it comes to the case of non-compliance. It is not specified what the consequences will be if a country fail to comply with their target and the lack of an actual penalty mans that the alternative costs compared to complying presumably is perceived to be zero.

As the MS do not have a clear perception of the consequences of not complying, and cooperation is a mean to comply, the motivation and incentives to take actions in order to be sure to comply is decreased with the lack of clear policy in the area.

2.5 Compensatory challenges

Member states will only agree on cooperation if they both benefit from it. This means that the overall benefits from cooperation for both (all) members states have to exceed the overall costs from cooperation. Klessmann (2009) describes the different elements of costs and benefits for each MS under a cooperation mechanism. A barrier arises as costs and benefits are not evenly

distributed between the participating countries, and therefore special mechanisms to share them need to be devised.

First of all there is a problem in determining how to divide the net-benefits but more importantly: most benefits are difficult if not impossible to quantify and hence settling the compensation will be just as difficult. In the following sections we address the various benefits from cooperation.

Independently of whether each country actually possesses the RES capacity to meet their 2020 RES targets, countries could benefit from cooperation: Assuming that the costs of installing the marginal RES unit in one country is less than the costs of installing the marginal RES unit in another country, the country with the highest marginal costs of RES will benefit from installing its RES in the first country. Furthermore, the country with the lowest marginal RES costs also benefit from cooperation. The benefits of cooperation can be grouped into two categories:

1. Direct benefits: reduced target compliance costs for the user country
2. Indirect benefits: benefits linked to the indirect effects of cooperation e.g. reduced cost in electricity supply and faster RE technological progress

The direct benefits primarily profit the user country whereas the indirect benefits to a higher extent are related to the effects in the host country.

2.5.1 Direct benefits

Cooperation and coordination of implementation of renewable energy across countries can contribute to a more efficient expansion of renewable generation and can therefore reduce the costs of compliance with 2020 renewable targets. The larger the difference between marginal costs of RES expansion between two countries, the larger the benefits of jointly meeting the targets will be, since the country with the higher costs of RES expansion will face substantially lower costs exploiting the opportunity to install the RES in another country. The cost reduction will not be equally shared between the two countries in the first place as the user country is the one experiencing the direct benefits by achieving the target less costly. The host country, on the other hand, experience direct costs related to grid connection issues.

The direct costs and benefits for the countries participating in cooperation are not automatically shared between the countries in an equal manner. The settling of a mechanism to assure a fair division of costs and benefits may be difficult and therefore constitute a barrier.

2.5.2 Indirect benefits

It is quite important that the direct benefits, given by reduced costs of compliance with 2020 renewable targets, are not achieved at the expense of some indirect objectives of the national RES policies. The secondary group of benefits of cooperation accounts for the less measurable benefits as well as other secondary policy objectives. We have identified the most relevant indirect benefits to include:

- Technology
- Power generation efficiency
- Employment
- Environmental
- Security of supply
- Investor risk
- National risk of compliance

In the following we describe and discuss each of the identified indirect benefits:

Technology
One of the most important indirect benefits expected is the improvement of technological progress. An increase in the installed capacity of renewable energy sources is expected to lead to an increase in the level of research and development (R&D). This eventually leads to learning effects and thus faster RE technological progress in the host country. This assumption is supported by Bürer and Wurstenhagen (2009), Lund (2011) and Loiter and Norberg-Bohm (1999) concluding that subsidies for renewable energy create technological development.

As discussed above (Section 2.1.2) one purpose of subsidising renewable energy could be to develop domestic industries. That support could very well be founded in the assumption of increased R&D, learning effects and RE technological development. In the case of cooperation the user country will directly and indirectly support industries in the host country and therefore not harvest the indirect benefits of supporting renewable energy, only initially compensated by the direct benefit, i.e. reduced compliance costs. This potential loss of net-benefits may constitute a barrier towards cooperation.

Power generation efficiency
Assuming increased cooperation would result in renewable investments where additional power generation capacity is actually required, the power generation efficiency would improve, and hence the power generation costs would be reduced. In this case, the investors of the relatively new conventional generation would benefit from having invested in a user country as opposed to a host country. However, from the overall country perspective, this is not a sufficient condition for launching cooperation. In contrast, increased cooperation would result in renewable investments where additional renewable generation will replace relatively new efficient conventional generation and hence decrease the power generation efficiency.

Cooperation projects that involve expanding the interconnection capacities, for example to bring off-shore wind power a-shore in a high price area, would certainly also improve the generation allocation efficiency.

Employment
A number of studies (Lehr et al (2008), Mathiesen et al (2011), Blanco and Rodrigues (2009) and Hillebrand et al (2006)) deal with the employment effects of additional renewable energy capacity. The overall conclusion is that there are positive employment effects in the short run. Lehr et al. (2008) conclude that there is a positive effect in the long run as well whereas Hillebrand et al. (2006) find that in the long run the effect turns negative, however small.

Investment in renewable deployment creates temporary employment in the construction phase, and permanent employment in operation and maintenance. The short term employment benefit is often assumed to affect more remote areas with weak employment opportunities to a higher degree than conventional power plant investments (sse e.g. Hanley and Nevin 1999). Permanent jobs are also for some renewable technologies (e.g. biomass) seen as exceeding the number of jobs that they replace in the conventional generation.

Furthermore, increase in the installed capacity of renewable energy is assumed to lead to higher level of research and development and thus faster RE technological progress. This is expected to

have positive employment effects in MS. Furthermore, as installing more RES capacity is expected to increase the domestic demand for RES technologies and learning effects are expected to provide competitive advantages for producers of renewable technology. This again is expected to result in higher employment.

As the user country directly and indirectly supports these positive employment effects in the host country, the user country may be reluctant to engage in cooperation. However, if the user country has lots of international companies, operating in RES, the net effects could also be positive. For example in the case of wind offshore, the wind-offshore companies of the user country could participate to tenders and lead large developments of offshore wind in another country.

Environment

Environmental concerns must be seen as the major direct argument for the RES targets set for 2020. The environmental effects are for the climate impact part identical for all the EU countries and therefore do not provide additional benefits for a host country of renewable installations. There may be some other environmental benefits that depend directly on the location of RES installations. That may be emission reduction for NO_x, particulates or even reduction of noise. In case there is a future binding CO_2 target for each country and quota trade deployment of additional RES would provide a benefit to the host country as long as this is not adjusted for in the future CO_2 targets. Even though there is an effect at the host country level, it will not affect the total EU level emission or compliance cost for its overall target.

Security of supply

Another benefit from cooperation across countries is increased security of supply. This is especially the case if cooperation involves increased interconnection capacity and cooperation mechanisms are heavily used. However, this is not expected to happen prior to 2020. Interconnection will also reduce the reserve capacity requirement and thereby costs of securing supply. Additionally, possible positive effects from harmonising connection, planning, and support administrative procedures will lead to faster implementation of best practices and thus improved security of supply.

The effect on security of supply in case of relatively large changes in RES expansion depends critically on the effect on other generators and their incentives for maintaining conventional power capacity. If cooperation results in more fluctuating RES generation, this capacity will only add marginally to security of supply. In a situation where this leads to decommissioning of conventional more controllable capacity the total effect on security could be negative. For most RES expansion it is however plausible that the effect on other generation will be to reduce operational time and only limited decommissioning will occur. The effects on security will thus be neutral.

Third countries that act as transit for physical exchange of power from joint projects could experience a deterioration in security due to more likely congestion in transmission. They may also experience a positive impact if more interconnection capacity for the third country is a result of the joint project. If all electricity from a joint project is physically transferred from host country to user country without connection to host country no effect on security will be observed.

Investor risk

One of the barriers for investors in renewable energy is the regulatory risk. Investors being uncertain of the future support policy will choose not to invest in a new technology as compared

to other markets. However, joint support schemes and joint projects across countries targeting the 2020 RES targets will imply a larger degree of certainty as a change in the support scheme would be equal to a breach of international contracts and is therefore not expected.

National risk of compliance
Finally, reduced national risk of compliance represents an indirect benefit of cooperation. The risk of not complying with the 2020 RES targets for the country initially being in lack of renewable capacity will be strongly reduced if not eliminated.

2.5.3 Concluding remarks

Above we presented and discussed the most important indirect benefits connected to cooperation. Some of the benefits are mainly affecting the user country and some mainly the host country and a few both of them. As the precondition for cooperation is that both (all) participating countries experience net-benefits from cooperation the indirect and direct benefits have to balanced between the participating countries. Some sort of compensation scheme has to be in place in order to assure this including evaluating the effects in monetary terms. Establishing such a compensation scheme constitutes a serious potential barrier for cooperation.

2.6 Uncertainty regarding the post 2020 targets

The EU targets for 2020 RES shares have been set without specifying the targets for the following years. This is creating high uncertainty about the continuous development of renewable resources, and also leads to high uncertainty regarding the investments made up to 2020. For cooperation this is a major barrier, as potential user countries will focus entirely on the 2020 RES contributions to their target, and de facto focus on the costs of RES credits for a single year. On the other hand, the costs from investments in renewable technologies with 15-25 years lifetime will be very large compared to RES credits for a single year. The value of the electricity generated post 2020 will cover part of the investment, but for almost all renewable investment there is a considerable cost disadvantage compared to conventional technologies.

Cooperation with high uncertainty about the future targets will thus face high cost barriers with RES credits having only a relatively well known value in 2020 and extremely high uncertainty post 2020. In the extreme situation credits post 2020 will be assigned a zero value.

For host countries this forms a barrier as the uncertainty regarding their own future obligations (after 2020) will lead to unwillingness to engage in cooperation involving their cheapest surplus resources. They might be willing to provide their surplus RES generation in 2020, but still retain the ability to meet additional RES targets post 2020 with their cheap domestic RES resources. As these future targets are not known the value of this ability is very uncertain. If marginal RES long term generation costs are close to power prices the barrier will be less important.

The barriers for host countries would diminish if there is a perceived domestic value (higher willingness to pay) for reaching RES shares above the 2020 target, i.e. targets past 2020. In this way there could possibly be established a balance between the perceived value of the RES credits of the user country and host country.

3 CRITICAL SUCCESS FACTORS

The purpose of this section is determine which barriers are the most critical to establishing the cooperation mechanisms and to identify the critical success factors to remove the barriers. The barriers are evaluated with respect to how difficult they appear to overcome and their possible level of obstruction. Furthermore, we briefly touch on the importance relative to the two cooperation mechanisms, joint support scheme and joint project.

3.1 Support schemes

Earlier we discussed the type of barriers that possibly can arise as a result of differences in support schemes in the cooperating countries, either the application of different support schemes or combinations of supports schemes as well as the purpose of the support scheme. The historical introduction of support schemes has been characterised by several different kinds of support and the different support schemes have addressed several technologies Hass et al (2011).

The historical review by Haas et. al. (2011) reveals that investment subsidies, feed in tariffs, tendering systems, tax exemptions, premiums, green tariffs and soft loans have played a role in the increased deployment of RES in the EU countries. Furthermore, a study intends to determine the efficiency of a list of different support systems for the European countries Marques and Fuinhas (2012). Both of these studies point towards the fact that the European countries are perfectly capable of handling several different support schemes targeting several different energy types. Furthermore, they indicate that introducing cooperation mechanisms covering specific energy types as well as applying specific support schemes will not be an administrative barrier for the EU countries.

In case the host country already has implemented a support scheme targeting a specific energy type, and the cooperation mechanism in question suggest the application of another support scheme, an adjustment has to take place. This is not assumed to be a difficult barrier to overcome, however it is an important barrier.[1] The conditions necessary to be in place in order to remove this barrier is the willingness and the opportunity to incorporate the additional costs associated with implementing an extra support mechanism or handling several support levels for different technologies.

With respect to the two cooperation mechanisms, joint support scheme and joint project, the barrier arising from having implemented different support schemes in the two countries will be most crucial when it comes to joint support scheme. In this case the countries have to harmonise such that the support scheme in question is not clashing with another support scheme in any of the participating countries.

[1] The barriers regarding the purpose of the support schemes as described in the technology specific versus general support are covered in Section 3.5.2

3.2 Network regulation

Differences in network regulation is a matter of addressing a legislative issue. As network regulation affects the incentives for networks to facilitate efficient connection of new technologies and network reinforcement, the connection costs should be reflected in the cost sharing between the cooperating countries.

Relating to the two cooperation mechanisms the barriers arising due to differences in network regulation appears to be more crucial in case of a joint support scheme compared to a joint project. In case of a joint support where the participating countries have different network regulation the incentives will differ in the different countries depending on the type of regulation, and the renewable energy might not be installed where it is most effective due to imperfections in the joint support scheme set up. In case of a joint project specific compensation for the network regulation can be agreed upon.

Differences in network regulation is not perceived to be a crucial barrier to overcome, however, if it turns out to be necessary barrier to overcome it might be connected with certain difficulties. The challenge for the countries is to estimate what are the additional costs associated to that particular project as well as to agree on the terms of cost sharing. As some national regulation allow networks to include reinforcement investments caused by renewable generation in their capital base and thereby revenue cap these costs are to a certain extent known. One of the critical success factors is how to share and realise these costs. In case of a joint support scheme a critical success factor is to agree on a regulatory set up assuring the installation of RES where it is most effective.

3.3 Power markets

3.3.1 Market price and investment incentives

The largest obstacle when it comes to the differences in power markets between cooperating countries is the effect the introduction of large shares of renewable energy has on the power price. In order for a country to wish to engage in cooperation mechanisms, the potential losses the electricity and heat producers in the host country will experience as a result of the larger share of renewable energy in the energy system has to be compensated for, in order to assure future incentives for investment in necessary capacity.

The challenge consists of two elements: determining the level of compensation and how to address the compensation. The critical success factor in this case is the ability to agree on a compensation scheme where the level of compensation should reflect the loss without providing undesirable incentives and without compromising the overall precondition that the net-benefits from cooperation should be positive.

The barriers related to differences in power process are considerable and not very easy to solve. Furthermore, they seem equally relevant to both cooperation mechanisms.

3.3.2 Generation mix

As the generation mix might be affected, as described above, the existing capacity becomes less profitable and the least efficient base load plants may even become loss making. This will then

negatively affect the security of supply, as the necessary base load will not be in place when renewables produce less, e.g. in case of no wind or overcast. Furthermore, the energy system will become more vulnerable to changes in specific fuel prices as the generation mix is less diversified.

This is not expected to constitute a major barrier as the development of renewable energy will happen over a relatively long time period, and the necessary time to adjust to the new situation is assumed to be available. Furthermore, the issue seems equally important for both a joint support scheme as well as a joint project.

The challenge is to assure that the markets are adjusted to overcome the changes in the energy market. Two factors are important: one is the willingness from the regulatory authorities to help enable the adjustment, the other is the time necessary to adjust to the changes such the security of supply is maintained.

3.4 Institutional barriers[2]

The additional costs to solving the questions of how to structure the agreements legally and how legal agreements traditionally are designed in the one country compared to the other country will be minimal compared to other issues regarding the cooperation mechanisms, and will diminish and ultimately disappear as experience with the cooperation mechanisms will be gained. Furthermore, the additional costs connected to establishing the legal agreements between the cooperating countries are easily shared equally between the countries. As legal agreements have to be in place independently of the type of cooperation mechanism the barrier is equally important for both joint projects and joint support schemes. Thus the critical success factor is initially the willingness for the cooperating countries to incorporate the costs of jointly designing such an agreement.

Not possessing the knowledge about the alternative costs of not complying with the 2020 targets comprises a serious barrier. However, the barrier is sufficiently concrete and is therefore perceived to be a simple question to address. On the other hand, the institution that has to assure the barrier is overcome is large and probably inflexible, increasing the risk of the barrier not being ruled out. The critical success factor in this case it the settlement of exact non-compliance costs.

3.5 Allocation of costs and benefits

As described earlier, there are a number of indirect cost and benefits that require additional adjustments to allocation agreements. The difficulty in quantifying these indirect costs and benefits is a barrier for the implementation of cooperation mechanisms. In some situations the indirect benefits will be entirely shifted between MS in cooperation and this could be effectively hindering the co-operation.

Especially local benefits (jobs, security, innovation, export options) are often mentioned as a significant element by political decision makers and they therefore form a barrier if they will be negatively affected or missing the positive effects in one country when engaging in cooperation.

[2] The issues regarding political acceptance as well as how the costs of the support are allocated are discussed in Section 3.5.2

Additionally the compensation for such losses is very hard to quantify into a price premium on the RES-certificate transfer price.

3.5.1 Direct benefits

The Direct benefits are given by the reduced compliance costs, as a country with higher costs of installing the marginal RES unit will benefit from installing its RES in a country with lower costs of installing the marginal RES unit. The larger the difference between marginal costs of RES expansion between in two countries is the larger the benefits of jointly meeting the targets will be. In order for this not to constitute a barrier the cost reduction has to be equally shared between the two countries. The sharing mechanism may be difficult to establish, however, the actual level of reduced costs can be established rather firmly.

The assessment of the direct benefits will be equally challenging independent of the type of cooperation mechanism. In case of a joint project the entire renewable development is expected to take place in the host country, whereas under a joint support scheme the renewable energy development in principle can take place in all the participating countries (two or more). However, the assessment of the direct benefits, i.e. the reduced compliance costs, is equally difficult independent of the set up.

3.5.2 Indirect benefits

One of the largest and most difficult to overcome barriers is the issue regarding indirect benefits. Klessmann et al (2010) states that for a country to agree on the role as a host country, the user country has to compensate the host country for the extra costs to the society the additional renewable energy causes. However, there is a bigger chance that the user country actually feels that they finance indirect benefits in the host country exceeding the additional costs in the host country. As mentioned in Section 2.5.2, the possible indirect benefits regard increased employment, technological development, industrial development, increased power generation efficiency, increased security of supply, reduced investor risk and finally reduced political risk.

Benefits such as increased employment, technological development, industrial development and increased power generation efficiency will cause direct economic benefits for the host country but are as difficult to estimate as they are diffuse. The studies Lehr et al (2008), Mathiesen et al (2011), Blanco and Rodrigues (2009) and Hillebrand et al (2006) indicate that there are short term positive effects from installing additional renewable energy capacity. As an economic crisis with high and/or growing unemployment rates is dominating the EU these effects seem very attractive to achieve.

Renewable energy support often is justified by the economical side effects from technological development, industrial development and employment effects. These economical side effects are often assuring the social acceptance towards supporting renewable energy. These effects, supported by Marques and Fuinhas (2012) and Söderholm (2008), underpin the importance of including these benefits for the host country and the absence of these benefits for the user country in the compensation scheme.

The benefits of reduced investor risk as well as national risk of compliance are assumed to benefit both host and user country.

The assessment of the indirect benefits and costs appear to be connected with more challenges in case of a joint support scheme compared to a joint project. In case of a joint project the entire renewable development is expected to take place in the host country. In this case the indirect benefits mentioned above for the host country as well as the indirect benefits not achieved in the user country have to be assessed.

Under a joint support scheme the renewable energy development in principle can take place in all the participating countries (two or more). In this case the indirect benefits have to be assessed for all the countries and the benefits will undoubtedly differ between the countries. Furthermore, there is not certainty about where the renewable development will take place where aspects such as administrative issues as well as the before mentioned network regulation might play a role.

3.5.3 Compensation scheme and critical success factors

All the costs and benefits in the cooperating countries described above have to be captured in an overall compensation scheme. The costs and benefits regards:

- The direct costs associated with additional costs of network regulation and cost sharing as some national regulation allow networks to include reinforcement investments caused by renewable generation in their capital base and thereby revenue cap.
- The power price reduction in the host countries leading to a loss for the electricity and heat producers who have to be compensated in order to assure future incentives for investment in necessary capacity.
- The lower compliance costs where the reduction has to be equally shared between the two countries.
- The long list of indirect benefits: employment effects, technological development, industrial development, improved power generation efficiency, improved security of supply and finally reduced investor risk and political risk.

In order to successfully implement a cooperation mechanism between two or more countries all of these have to be mirrored in a compensation scheme agreed on between the cooperating countries. In particular, the assessment of the indirect costs and benefits has to be satisfactory to all the participating countries. Finally, the compensation scheme may not compromise the precondition that all countries have to experience net-benefits from cooperating.

3.6 Post 2020 targets

The uncertainty regarding the post 2020 targets is assumed to constitute a serious barrier as neither the host country or the user country knows the value of the RES after the targets have been complied with in 2020. Worst case scenario is that the value is perceived to be zero. In this case the host country has to be compensated for the entire costs up front making the 2020 targets extremely expensive.

The insecurity regarding the targets after 2020 is equally important for both joint support scheme and joint project. As with the case of the uncertainty about the consequences of non-compliance the solution to this barrier is also vary concrete: set targets for post 2020. However, the institutional set up is large and inflexible and there is a certain risk that it will not be settled in the next few years.

For the lack of post 2020 targets the critical success factor for MS to engage in cooperation is the settlement of post 2020 targets. Each MS can set individual targets; however, without an agreement in the EU level the barrier will not be removed.

4 CONCLUSIONS

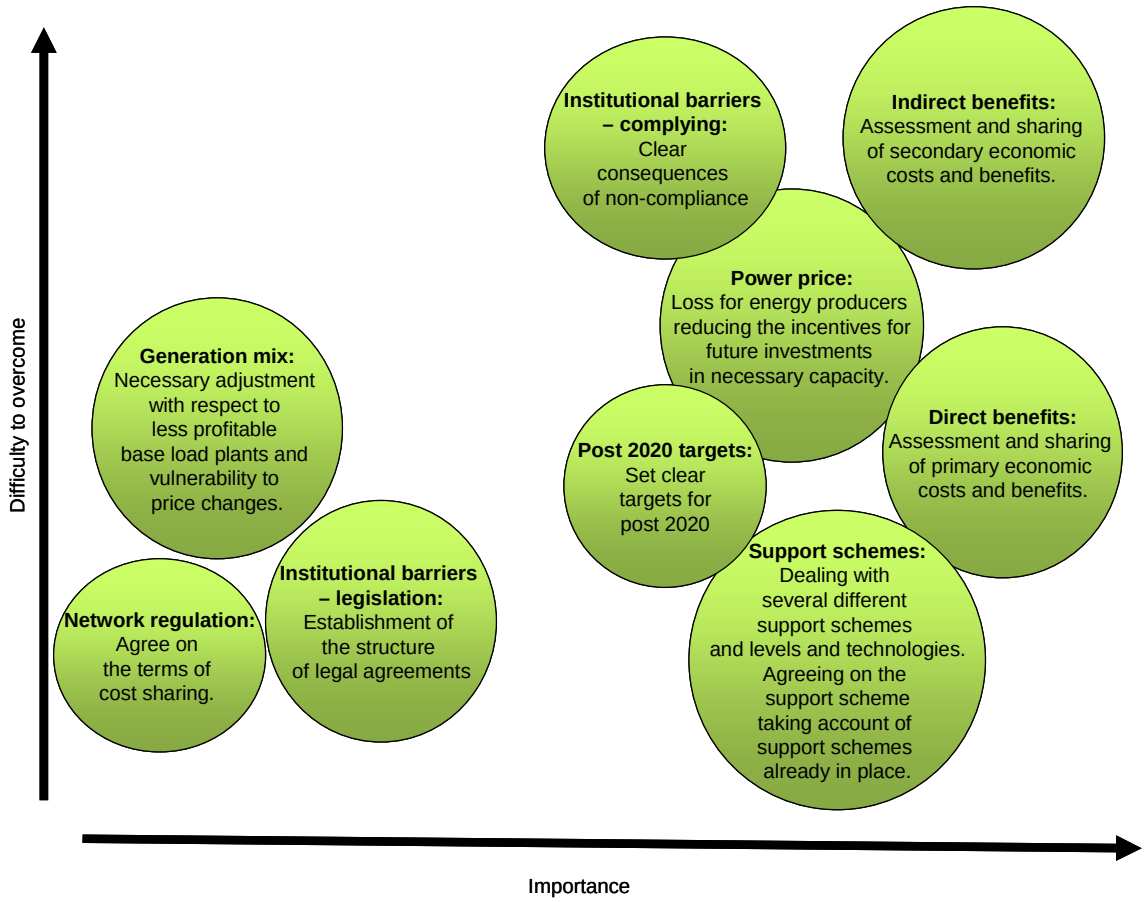
In this report we have described the barriers that may arise when using the cooperation mechanisms to achieve the renewable energy target for 2020 in EU. We have addressed the issues that may arise regarding:

- differences in support schemes
- network regulation
- power market
- power prices
- legislation
- political acceptance
- uncertainty of non-compliance consequences
- different institutional barriers
- compensational challenges
- uncertainty regarding post 2020 targets

Furthermore, we discussed the extent to which each barrier constitutes a crucial barrier in the sense that the cooperation mechanism most likely will not be used if they are not overcome, and the level of difficulty to overcome the barriers. We addressed the barriers in relation to the two cooperation mechanisms in question, i.e. joint support scheme and joint project and evaluated the extent to which the barriers is most relevant to the one or the other or both. Finally, we have addressed the issue of critical success factor for each barrier.

In Figure 3 the main categories of the barriers are illustrated according their importance for the cooperation mechanisms as well at the expected difficulty with respect to overcoming the barrier.

Figure 3 Categorisation of barriers



Our analysis indicates that that the institutional barriers as well as the barriers regarding generation mix and network regulation do not constitute serious barriers for the implementation of cooperation mechanisms. On the other hand we reach the conclusion that the most important barriers to overcome are the barriers regarding indirect benefits, power price changes, direct benefits, and finally differences in support schemes. Furthermore, it is our expectation that assessing the indirect benefits will be a potential source of serious disagreements between the cooperating countries and thus conclusively constitute the most important barrier to set up solutions for.

The critical success factors identified in the analysis comprise:

- The willingness and the opportunity to incorporate the additional costs associated with implementing an extra support mechanism or handling several support levels for different technologies
- Assessment and agreement on how to share the costs associated with network regulation and assure a regulatory set up assuring the most effective installation of RES
- Market price and investment incentives
- Determining the level of compensation of changes in market price without providing undesirable incentives and maintaining the precondition that the net-benefits from cooperation should be positive
- Willingness and ability to adjust to the changes in the energy market
- Willingness for the cooperating countries to incorporate the costs legal agreements and agree on how to design such an agreement
- Settlement of exact non-compliance costs

- All costs and benefits have to be mirrored in a compensation scheme agreed on between the cooperating countries
- Settlement of clear post 2020 targets

The most critical success factors can be divided into two categories: the factors relating to legislation issues (legal agreements, network regulation, non-compliance costs and post 2020 targets) on the one hand and the compensatory issues on the other. The compensatory issues appear to be the least concrete and the most difficult to asses. Further, in case the assessment has succeeded the final challenge is to agree on a compensation scheme that satisfies all partners without compromising the overall precondition of positive net-benefits for all parties.

The different cooperation mechanisms are thoroughly analysed in Deliverable 3.2 including how the identified barriers for each type of cooperation can be tackled. The critical success factors identified here are used as a main input in Deliverable 3.2, where solutions and final implications for the relevance of the different cooperation mechanisms are identified.

In Deliverables 3.3 to 3.5, specific case studies for individual technologies, namely wind, biomass and solar, are considered. The specific barriers that must be overcome are addressed, and concrete solutions including quantification of compensation payments are suggested.

References

M.I. Blanco and Rodrigues, G. (2009) Direct employment in the wind energy sector: A EU study. Energy Policy 37 pp. 2847-2857

M.J. Bürer and Wurstenhagen, R. (2009) Which renewable energy policy is a venture capitalits's best friend? Empirical evidence from a survey of international cleantech investors. Energy Policy 37 pp. 4997-5005

Council of European Energy Regulators (2008) Status Review of Renewable and Energy Efficiency Support Schemes in EU. Ref: C08-SDE-05-03
Council of European Energy Regulators (2011) CEER Report on Renewable Energy Support in Europe. Ref: C10-sde-19-04a

F. Dalla Longa, Bole-Rentel T (2011) Methodology to identify possible valleys of opportunity for cooperation among EU countries, ECN December 2011, Deliverable D2.2 of the RES4LESS project

Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC. OJ L 140/16-62.

N. Hanley and Nevin, C. (1999) Appaising renewable energy developments in the remote communities: the case of the North Assynt Estate, Scotland. Energy Policy 27. p. 527-547

R. Hass, Panzer, C., Resch, G., Ragwitz, M., Reece, G. and Held, A. (2011) A historical review of promotion strategies for electricity from renewable energy sources in EU countries. Renewable and Sustainable Energy Reviews 15 pp. 1003-1034

B. Hillebrand, Buttermann, H.G., Behringer, J.M. and Bleuel, M. (2006) The expansion of renewable energies and employment effects in Germany. Energy Policy 34 pp. 3484-3494

C. Klessmann (2009) The evolution of flexibility mechanisms for achieving European renewable energy targets 2020- ex-ante evaluation of the principle mechanisms. Energy Policy 37. p. 4966-4979

C. Klessmann, Lamers, P.; Ragwitz, M.; Resch, G. (2010) Design options for cooperation mechanisms under the new European renewable energy directive. Energy Policy 38. p. 4679-4691

U. Lehr, Nitsch, J., Kratzat, M., Lutz, C. and Edler, D. (2008). Renewable energy and employment in Germany. Energy Policy 36 pp. 108-117

J. M. Loiter and Norberg-Bohm, V. (1999) Technology policy and renewable energy. public roles in development of new energy technologies. Enegy Policy 27 pp. 85-98

P.D. Lund (2011) Boosting new renewable technologies towards grid parity – Economic and Policy aspects. Renewable Energy 36 pp. 2776-2784

A.C. Marques and Fuinhas, J.A. (2012) Are public policies towards renewables successful? Evidence from the European countries. Renewable Energy (Article in Press)

B.V. Mathiesen, Lund, H., and Karlsson, K. (2011) 100% Renewable energy systems, climate mitigation and economic growth. Applied Energy 88 pp. 488-501

S. Ropenus, Jacobsen, H.K. and Schröder, S.T. (2011) Network regulation and support schemes – How policy interactions affect the integration of distributed generation. Renewable Energy 36 pp. 1949-1956

P. Söderholm (2008) The political economy if international green certificate markets. Energy Policy 36 pp. 2051-2062