The Potential Use of the Flexibility Mechanisms of the RES Directive in the Danube Region

Issue Paper

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1. INTRODUCTION

This paper has multiple objectives. First, it describes the various flexible mechanisms introduced by the RES Directive, then it assesses their recent development and explores the options for the Danube Region (DR) countries to take more active role in their application. Beyond an initial assessment, this paper is meant to provide recommendations for the potential next steps for policymakers.

The paper is framed upon two central questions:

- How can the Danube Region Strategy embrace and effectively implement flexible mechanisms in the region?
- Under what conditions can flexibility mechanisms provide market opportunities for private investors?

Consequently, we examine the possible options from two points of view. First, we assess the issue from the perspective of a private developer (e.g. MVM) as a possible future participant in the use of the flexible mechanisms (joint projects and joint support schemes). Second, we make an assessment from the point of view of the Danube Region Strategy which could influence the policymakers/authorities in the region to take a more active role in setting up the necessary framework for the use of flexibility mechanisms. One important lesson from this assessment is that without the active participation of public authorities (regulators, ministries) there is only a limited possibility for advancement in this field. These authorities have to initiate the process, and create the framework for such co-operations.

The 2009/28/EC Directives introduces three flexibility mechanisms for Member States; statistical transfers, joint projects and joint support schemes. These mechanisms are scarcely used in practice presently, but they allow for the achievement of aggregate targets with lower overall compliance cost. (European Commission, 2013a) In this paper we discuss the Swedish-Norwegian joint support scheme and the joint project between Italy and Serbia. The underlying factors behind the slow advancement in this area are the delay in setting post-2020 targets, information asymmetry between participants, the uncertainty around target achievements, difficulties in quantifying indirect costs and benefits, security of supply issues and domestic value added. Non-economic factors such as transactional and legal complexities contribute further to the delay.

The paper first introduces the three types of flexibility mechanisms, and then assesses the basic opportunities that they offer for the region and the main barriers that could prevent their full exploitation. This is followed by two case studies, the Norway-Sweden joint support scheme and the Italy-Serbia joint hydro project on the Ibar river. This is followed by a section outlining RES target achievements of member states and an initial quantitative assessment of the potential benefits of the flexible instruments in the Danube Region. A conclusion and recommendation section closes the paper.

1.1 Statistical transfers

1.1.1. Definitions and prerequisites

Article 6 of the Directive states that *'Member States may agree on and may make arrangements for the statistical transfer of a specified amount of energy from renewable sources from one Member State to another Member State.'* This means that both EU Member States and Energy Community (EnC) members could participate in such projects if they fulfil their renewable targets.(Energy Community, 2012; European Commission, 2013b)

Figure 1. Structure of statistical transfer as defined by the Directive

Source: GreenStream Report (2010) p.13

Additional main characteristics of the mechanisms are the followings.

- Transactions take place between governments, so no private participation is foreseen in this instrument.
- Transferring RES-E takes place 'ex post' meaning that only actual savings relative to interim or 2020 targets could be sold to other countries.
- The duration of the transaction depending on the agreement of the parties.
- The price – as well – depends on the agreement of the two parties.
- No physical transfer of electricity is required by the mechanism.
- Could be any form of RES transfer, electricity or heat.

Since host countries also have to achieve their respective targets, the statistical transfer only allows for the surplus production to be sold to the off-taking (buying country). The relatively 'cheap' wind, biomass and hydro are the logical technologies that could be offered by the host countries.

1.1.2. Opportunities offered by the instruments

This instrument is the simplest to execute with 'ex post' trading, and the subsequent price setting is the easiest amongst the three instruments.

In theory, the ex-post nature of the mechanism offers the lowest transaction cost amongst the three instruments. There is no reliable information concerning this cost level, due to the lack of such transactions.

1.1.3. Main barriers

Even though the instrument offers the highest flexibility, the lowest transaction costs and the lowest level of uncertainty concerning prices, the fact that an intra–governmental agreement is needed for the transactions slows the process. Governments and public authorities not only need to agree on the terms of such transactions, but also have to defend the use of such instruments amongst the stakeholders (e.g. that benefits outweigh the loss of labour and security of supply impacts).

An additional problem with the use of the instruments is that a waiting strategy of a Member State (MS) is paying off. The binding RES target is set for 2020 while the risk of penalty for missing the interim targets is much lower. In addition, the 'wait-and-see' strategy is rational for the host countries as well: it can use the sites and RES resources with lower production cost to fulfil domestic targets, and would only use the more expensive options if real demand appears closer to the 2020 target (not selling 'low hanging fruits'). In addition, reliable information on the under- or overachievement of the MSs in fulfilling their targets appear later in the compliance period.

As the trade takes place ex post, it means that no a real incentive exists to further increase RES capacities, so in the long term this instrument gives less incentives for further deployment.

Finally there is a risk of non-compliance, i.e. if the host country cannot produce the agreed amount of RES, the purchasing country would be in breach of its target. This problem has to be handled by the parties in their agreement as well.

1.1.4. Recommendations concerning the use of the instrument

As the statistical transfer gives opportunities for the 'first mover' countries with large differences in RES production costs and those having higher than planned production, identification of the viable host countries capable of exporting this production is an important task. Within the V4 (Visegrad countries), we can observe equal potentials for most of the RES production (biomass, wind, hydro) while EnC countries could be complimentary partners with the V4; Serbia and other SEE countries have much better hydro potential and Croatia in particular has higher wind potential.[1]

Consequently, the first task for this instrument is to identify countries that have suitable RES potential to make economically viable offers in the time frame of 2015-2020.

1.2. Joint projects

1.2.1. Definitions and prerequisites

Joint projects could be set up amongst Member States, but there is an opportunity for MS to cooperate with third countries outside the EU. Article 7 of the Directive states: *'Two or more Member States may cooperate on all types of joint projects relating to the production of electricity, heating or cooling from renewable energy sources. That cooperation may involve private operators.'* Article 9 of the Directive states: *'One or more Member States may cooperate with one or more third countries on all types of joint projects regarding the production of electricity from renewable energy sources. Such cooperation may involve private operators.'*

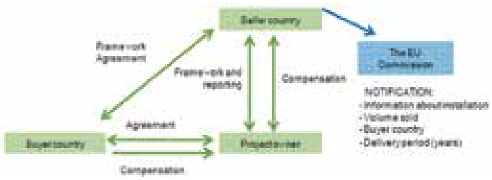

Figure 2. Joint projects between Member States

Source: GreenStream Report 2010 p.14

[1] Croatia already licensed more wind capacity by 2013 than their originally planned capacity (400 MW). The excess could be dedicated to joint initiatives.

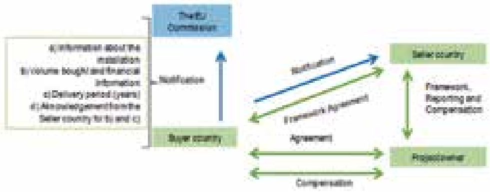

Figure 3. Joint projects between Member States and third countries

Source: GreenStream Report (2010) p.15

Joint projects differ in many aspects from statistical transfers:

– it can involve non-EU states
– the project developer is a new and potentially private sector actor
– the scope of the agreement is a concrete investment project.[2]

Joint projects can involve third countries, meaning that further RES potential can be mobilised. There are, however, strict conditions that apply to this instrument: because electricity generated must be physically transported to the EU, a level of connection capacity must be dedicated to the transfer. The installation must have been built after 25 June 2009 and the host country cannot receive production support for the installation, with the exception of investment subsidies. Third countries from the EnC can participate in joint projects as long as they are also meeting their predetermined RES targets.

A distinct characteristic of the joint projects is the participation of private, non-state actors. This can be very beneficial since private actors are more active in the field of development and have better information pertaining to potential cooperation mechanisms with third countries. However their involvement should be based on a well-designed selection process (e.g. tendering) that identifies the most suitable and economic offers for additional RES capacities, or a framework should be developed within which the agreements of joint projects are based (e.g. sharing production and costs). This means that private actors alone cannot independently initiate the process, and most likely they have to participate in an official selection process.

Joint projects are generally based on a long term agreement, which ensures a stable environment for RES development. Due to this longer term commitment, a detailed agreement is required between the host and buyer country which covers all financial, technical and operational aspects. Most critical is the method for sharing costs and benefits, where the extra cost of the host country for grid connection and balancing energy related expenses are either covered through financial payments (e.g. by feed-in-premium type of compensation by the seller) or by part of the produced RES resource. In this case the shares and the methodology of the division have to be agreed to in advance.

Generally the third party is the project developer whose tasks and obligations have to be agreed upon in advance in order to cover the extra risks born by the party (e.g. non-fulfilments of production obligations which endangers the target achievement of the buying country).

[2] It is analogous with Joint Implementation and Clean Development Mechanism operating under the Kyoto Protocol.

Additional basic characteristics of the mechanisms:

- Active private participation is envisioned, mainly in the development and operational phases.
- Transferring RES-E takes place 'ex ante' where the rules are established in the previously negotiated agreements.
- Generally it is a long term agreement, which makes the benefit sharing mechanism after the 2020 target year an important consideration if it goes beyond this year.
- The price setting mechanism is a complex issue, as it has to cover a longer period and many cost items.
- There is no physical transfer of electricity required by the mechanism between Member States, however with EnC countries physical transfer is still required.
- The scheme can cover both electricity and heat generation projects.

1.2.2. Opportunities

This method offers an incentive for the participating countries to engage in longer term RES developments, making the scheme more appealing for the host member states as well. Due to the longer term commitment the buying state would be more willing to cover some additional costs that are related to the projects (e.g. grid developments).

The second strength of the scheme is the possibility of private participation. Private actors play a more pro-active role in the energy markets than governments, and they are more informed about business opportunities to exploit maximum benefits from the instrument.[3] With this potential they can suggest opportunities for co-operations that would be difficult to realise or would be delayed if left to the public authorities.

1.2.3. Main barriers

The longer time horizon of the joint projects requires longer administrative processes compared to the statistical transfer options, e.g. the need for setting up a supporting framework and/or a tendering process. Under this system, the host government must develop a framework that lays out the basic conditions for an investment project. Normative rules are important to maintain the legitimacy of the scheme within the domestic constituency.

Once the project requires the physical transfer of electricity (see for example the Italy-Serbia project) to increase Security of Supply (SoS) in the receiving country, transmission capacity must be reserved for the transfer. Currently transfer capacities in the EU could be reserved on a yearly basis as the longest period, which raises an issue on the feasibility of long term reservations of transfer capacities.

1.2.4. Recommendations concerning the use of the instrument

Joint projects are potentially rewarding instruments from the perspective of private investors. Companies with regional experience could take a proactive role and start to explore opportunities in these countries for setting up joint projects. Their task however would be twofold; in addition to mapping possible projects, they have to explore the possible regulatory approaches in both the host and buyer countries if they are open to such cooperation. In this sense the Danube Region Strategy could serve as a starting point for exploring the willingness of policy makers and regulators to engage in such initiatives.

In order to carry out this type of joint project, the estimated direct and indirect costs and benefits must be evaluated beforehand. For assessing some indirect cost elements, such as the cost of the necessary

[3] E.g. the Czech CEZ would be familiar with all business opportunities in Romania, as it is already active player in the country concerning RES-E developments and knows the landscape.

network upgrades and increased balancing costs, the work in progress on RES-E monitoring in the Danube Region could serve as a good starting point for further activities. The assessment of changes in the consumer and producer surplus values necessitates a common CBA (Cost-Benefit Analyses) and modelling platform.

1.3. Joint Support Schemes

1.3.1. Definitions and prerequisites

Joint support schemes are defined by the Directive as *'two or more Member States may decide, on a voluntary basis, to join or partly coordinate their national support schemes. In such cases, a certain amount of energy from renewable sources produced in the territory of one participating Member State may count towards the national overall target of another participating Member State'.*

Within a joint support scheme, the involved Member States parties will make a statistical transfer or agree on a distribution rule to allocate the amounts of the renewable energy generated between the countries.

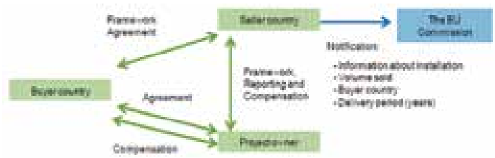

Figure 4. Joint support schemes between Member States

Source: GreenStream Report (2010) p.15

This flexibility mechanism is the most complex as defined by the Directive. As the support scheme is expected to be maintained for a longer period, all cost and benefits, direct and indirect, must be quantified. In addition, it is reasonable to assume that only countries with similar support schemes would consider the application of this instrument. Thus it is not surprising that to date only one joint support scheme has occurred in Europe, between Sweden and Norway. This scheme will be further analysed in details in section 2. Other countries like the UK do not want to cede control over their domestic support mechanism for renewable generation (DECC, 2012). According to the EU Communication (European Commission, 2013a) on the Guidance on the use of renewable energy cooperation mechanism, a feed-in premium (FIP) system is preferred to a feed-in tariff (FIT), or a joint green certificate scheme would be more viable. This latter system is applied in the joint scheme of Norway-Sweden.

1.3.2. Opportunities

Once the participating countries agree on the details of cooperation, the scheme provides the most efficient framework for supporting renewable energy developments, meaning RES growth will take place in the country where it is the cheapest. Greater geographical coverage of the scheme will lead to higher expected efficiency gains. In the long term, this is the joint support scheme most resembling to a harmonised European support framework.

1.3.3. Main barriers

As mentioned before, setting up joint support schemes require a high level of coordination between the participating member states. The sharing of targets and costs must be agreed in advance of the undertaking of the scheme, and this is a time consuming process. If a system, for example, operated on a feed-in premium support scheme, the parties would have to agree not only on the common premium levels according to technology but on the other details as well, e.g. the length of the support period. If a country has a preference for a certain technology for the given strategy, perhaps in order to promote an innovative technology which has strategic interest, then the countries would have to agree on the handling of these parameters as well.

Additional basis characteristics of the mechanisms:

- The joint scheme is designed by the respective governments, but once an agreement is reached private actors will participate in the renewable energy markets as before.
- Joint support schemes are long term agreement between the parties.
- The price setting mechanism must be agreed to in advance when FIT/FIP support schemes are applied in the participating countries. In the case of green certificate market, the split of the joint quota target must be accomplished in advance. This is one of the most important issues in setting up the scheme.
- No physical transfer of electricity between the participating countries is required in the support scheme. Generated RES units are counted together in the two (or more) participating countries to fulfil a common target.
- The scheme could cover any form of RES: electricity or heat.

1.3.4. Recommendations concerning the use of the instrument

Due to the complexity of this flexibility instrument, the recommendation is that the Danube Region should observe but not yet participate in such initiatives.

1.4. Additional critical issues

In the previous chapter we have assessed the various flexibility instruments separately. However there are some additional important issues that are shared by all instruments.

The European Commission presented its view and assessment on the use of flexibility mechanism in November 2013 (European Commission, 2013b). In addition to that communication, other studies also presented their assessment on the development of the flexible mechanisms in Europe over the last two years while also looking to the future. Amongst them the most important sources are reports of the RES4Less, RE-Shaping, Reflex research projects (RE-Shaping, 2012; RES4Less, 2013; REFLEX, 2012).

Based on these assessments, the following critical issues are highlighted:

- Bankability of RES-E achievements beyond 2020
- Post 2020 targets
- Penalty level for missing the target

The Directive gives no guidance on the bankability of RES production, which would have two complementary effects on the flexibility mechanisms. On the one hand it reduces the risk of the host countries in undertaking additional RES projects, as the country can use its excess RES production in the post 2020 period. On the other hand, it might increase the price for statistical transfers in the first period, as host countries will consider the opportunity cost of banking the excess quantity of produced RES energy depending on the expected post-2020 targets. Countries would utilise their higher cost RES options if more stringent targets and enforcement mechanism are expected in the subsequent period, which could help the uptake of flexibility mechanisms. In case of higher (expected) targets, the cost differences amongst countries would increase and lead to higher saving potential via the flexibility mechanisms. If an agreement on the EU-wide 2030 RES target is reached soon, it will help the developments with a longer lead time (joint projects and support schemes) and reduce deadlock of these projects. Without this long term target uncertainty over the economic feasibility of these projects can be too high to induce significant investments.

A third point in this area is the uncertainty about the penalty level that EU members have to face when missing their target. If this level is too low, or the enforcement mechanisms are weak, it could also diminish the incentives to use of the various flexibility schemes.

In these areas the flexibility mechanism operate very similarly to the Joint Implementation (JI) and Clean Development Mechanism (CDM) of the Kyoto Protocol where the bankability, the post-Kyoto targets, and penalty levels were similarly critical issues in the reliable long term operation of the mechanism.

2. CASE STUDIES

2.1. Italy-Serbia joint hydro project on the Ibar river[4]

2.1.1. Hydropower potential of Ibar river

The Ibar river descends the Hajla mountains in Montenegro from where it flows east, mostly through narrow canyons. In its upper course, Ibar has no major tributaries and flows through several small sparsely populated villages until it reaches the dam where it forms the artificial Lake Gazivode. Continuing downwards, Ibar in its middle course passes through the city of Kosovska Mitrovica where it turns sharply north and flows across mineral and ore rich slopes of Kopaonik mountain (national park).

Figure 5. Location of the River Ibar in Serbia

Figure 6. Ibar River - railroad and highway

In the lower course, Ibar enters the municipality of Raška. It is in this section that the river receives its major tributaries, passes through one of the most densely populated parts of the country, and flows through the 40km long and 550m deep Ibar gorge finally reaching the city of Kraljevo where it empties into Zapadna Morava River.

The development plans for HPPs on Ibar River date from 1996 and a proposed system consists of 10 hydropower cascades of varying height ranging from 11 to 15m. Each of the planned power stations utilizes run-of-the-river flows with pondages for water storage. Although they do dam the river, artificial lakes (reservoirs) which they create are much smaller compared to the conventional hydropower plants. The proposed concrete gravity dams have wide overflow spillways controlled by Tainter gates, while the non-overflow part of the dam is used for the placement of the powerhouse which accommodates two horizontal S turbines, compact turbines, and auxiliary equipment.

Out of the available gross head of 155 m, this concept will utilize approximately 149 m, in order to avoid flooding the lowest part of the railroad between Lakat site and Maglic site.

[4] This case study is the work of Dejan Stojadinovic, Serbian energy expert.

Figure 7. Planned SHPP's on Ibar river

Site – SHPP	Generating capacity (MW)	Avg. annual output (GWh/yr)
Lakat	11	48.4
Maglič	12	50.7
Dobre strane	10.5	45
Bela glava	9.9	42.4
Gradina	10.8	45
Cerje	10.5	43.7
Glavica	9.8	40.4
Ušće	8.5	31
Gokčanica	10.3	37
Bojanići	9.7	34.5
TOTAL	**103.15**	**418.6**

Table 1. Planned SHPP's on Ibar river

Installed discharge on all 10 hydropower plants is 100 m^3/s, and total power is 103.15 MW. It is expected that the system will annually output 418.6 GWh/year on average. The lowest output is expected in August and September, and the highest in the months of March and April. Estimated investment value is 285 million EUR, i.e. 2,760 EUR/kW of installed capacity.

2.1.2. Institutional framework for Ibar river project

Institutional framework for the Ibar river project is established through several governmental and corporate agreements.

During 2009, Serbia and Italy signed an energy cooperation protocol, where EPS and the Italian company Seci Energia SpA were labelled strategic partners in projects for the production of electrical energy.[5] In October 2009, according to agreement, it was decided that the first project of mutual cooperation would be the construction of hydroelectric power plants on the Ibar.

For the purposes of the project, a joint venture company Ibarske hidroelektrane was established in July 2010. This is a partnership of a public enterprise and a private company, with strong government support from both countries. The joint venture company is in charge of design, construction and operation of the ten HPPs along the Ibar River. Seci Energia will provide the entire funding for the project construction and is granted with majority 51% stake in Ibarske hidroelektrane, while EPS owns the remaining 49%.

At the end of October 2011, representatives of Serbia and Italy signed the agreement on energy sector cooperation. According to the agreement, Italy will purchase all electricity produced from the jointly developed power plants, which will use renewable energy sources (RES). The purchase price was set at 155 euros/MWh. The agreement refers to the purchase of electricity produced by the future hydropower plants (SHPPs) on Ibar River.

[5] Seci Energia SpA is a privately owned company, which actually initiated the signing of the agreement.

Chronology of the signed agreements between Serbia and Italy on cooperation in the energy sector is shown in Table 2.

Date of signature	Agreement	Main provisions
5 February 2009.	Joint Statement	Minister of Mining and Energy of the Republic of Serbia, Mr. Petar Skundric and the Minister of Economic Development of the Republic of Italy, Mr. Claudio Scajola signed a Joint Statement and expressed mutual interest in the development of energy sector cooperation
March 2009.	Cooperation Protocol between the Ministry of Mining and Energy of the Republic of Serbia, and the Ministry of Economic Development of the Republic of Italy	Serbia and Italy agreed: • to jointly identify potential RES-E projects • to prepare agreement on the system of incentive measures for RES-E • to prepare agreement for the acceptance of certificates of origin in Italy issued by Serbia • to export electricity to Italy through the transmission capacity, currently under development by Terna, between Italy and Montenegro • to develop cooperation between power transmission system operators of EMS (Serbia) and Terna (Italy) on construction and strengthening of new energy corridors (400 kV between Serbia and Montenegro) for the electricity exchange between Serbia and Italy • to designate EPS (Serbia) and Seci Energia (Italy)as strategic partners, and to establish joint venture company to develop RES-E projects • to fund foreseen activities by international market capital raising, through applicable incentive measures, credit lines and EU pre-accession funds • Protocol remain in force 10 years
June 2009.	Preliminary Agreement on Cooperation in Electroenergetics between EPS (Serbia) and Seci Energia (Italy)	EPS (Serbia) and Seci Energia (Italy) set the conditions for joint investments: • Establishment of Coordination Committee (two representatives of each company) • joint financing (50% : 50%) of feasibility studies for the construction of new electric power facilities on Ibar river • joint acceptance of the results of feasibility studies and decision whether the construction of facilities is feasible • joint preparation of the project design documentation (i.e. general design, conceptual design) • joint decision on the financing method and cost sharing for the project design documentation, for the relevant projects • EPS agreed that Seci Energia shall be able to acquire majority stake in established joint companies • Preliminary Agreement is applicable during the validity of the Cooperation Protocol (10 years)
November 2009.	Agreement between the Ministry of Mining and Energy of the Republic of Serbia and the Ministry of Economic Development of the Italian Republic on strategic partnership in power generation	Serbia and Italy agreed: • to appoint a Task Force to monitor implementation of the agreement • that GSE - Gestore Servizi Energetici (Italian state-owned company that manages support schemes for renewable energy sources at the national level) will be obliged to buy exported energy based on annual or multi-annual contracts • that Terna (Italian TSO) and EMS (Serbia TSO) shall strive to upgrade cooperation with an aim to stimulate new investments in the transmission grid of Serbia, and in the interconnections between Serbia and neighbouring countries • that Italian side is committed to developing interconnection transmission capacities between Italy and South East Europe • validity of the agreement is 4 years
November 2009.	Agreement between the Ministry of Mining and Energy of the Republic of Serbia and the Ministry of Economic Development and the Ministry of Environment and Protection of Land and of Sea of the Italian Republic on the mutually applicable incentive schemes for energy from renewable sources	Serbia and Italy agreed: • to mutually recognise the guarantees of origin issued for RES-E • that RES-E produced in Serbia and exported to the Italy will be accounted, by means of statistical transfer, in the Italian objective (as per Directive 2009/28/EC) • that GSE has the ability to control all data transmitted, including inspections of generation capacities • That Serbia shall submit to GSE, each year, the list of the power plants producing electricity from RES, which, in the previous year, produced energy exported into Italy
October 2011	Law on Ratification of the Agreement between the Government of the Republic of Serbia and the Government of the Italian Republic on the cooperation in the energy sector Ratified by Serbian Parliament on 29 December 2012.	Serbia and Italy agreed: • construction of 10 hydropower plants on Ibar river and export of electricity to Italy • incentive mechanism for the electricity produced and exported to Italy, in the form of feed-in tariff valid for the period of 15 years, with the fixed amount of 155 €/MWh paid by the Italian side • that fixed amount of 155 €/MWh does not include transmission costs • incentives are valid for the projects that are going to be completed and put into operation by the 2020 • that import and payment of incentives will be operated by the GSE - Gestore Servizi Energetici • that electricity exported to Italy will be subject to priority dispatching through Montenegro-Italy interconnection • validity of the agreement is 4 years

Table 2. Agreements between Serbia and Italy on cooperation in the energy sector

The key stakeholders responsible for successful implementation of the energy cooperation between Serbia and Italy are shown in Table 3:

Responsibility	Stakeholders: Serbia	Stakeholders: Italy
Establishment of legal framework	• Government of Serbia • Ministry in charge of Energy (currently, MEDEP – Ministry of Energy, Development and Environmental Protection)	• Government of Italy • Ministry of Economic Development • Ministry of Environment and Protection of Land and of Sea
Project development / construction	• EPS – Elektroprivreda Srbije	• Seci Energia
Development of transmission capacities for RES-E export to Italy	• EMS – Elektromreza Srbije	• Terna
RES-E trading, payment of incentives, statistical transfer	• Ibarske hidroelektrane (joint venture company established by EPS and Seci Energia)	• GSE - Gestore Servizi Energetici

Table 3. Stakeholders analysis

2.1.3. Development of transmission capacities for electricity export to Italy

The development of transmission capacities for electricity export to Italy is one of the key factors to successful implementation of the project, requiring:

- Construction and strengthening of 400 kV energy corridors between Serbia and Montenegro.
- Construction of new submarine interconnection between Italy and Montenegro.

The Italy-Montenegro interconnection is a regional top priority project, with the purpose of connecting the Italian energy market with the future production hubs of the region (Bosnia and Herzegovina, Serbia, Kosovo, and Bulgaria and Romania (via Serbia)), and providing an electric platform for trade between Italy and South Eastern Europe.

Supported by an intergovernmental agreement between Italy and Montenegro, the project is managed by Italian company Terna, and includes development of 1,000-MW Italy-Montenegro undersea interconnection between Villanova (Italy) and Tivat (Montenegro) constructed by Terna. Pursuant to the Intergovernmental Agreement, Montenegro and Italy also agreed that the transmission capacity made available by the submarine interconnection will be split as follows: 80% to the Italian power system and 20% to the Montenegrin power system. In Italy, the authorisation process was initiated on 3 December 2009, while in Montenegro an inter-ministry committee was set up and is working to include the project in the detailed national plan. The cable is currently scheduled to be available for commercial use in 2017.[6]

Italy-Montenegro Interconnection Cable
- Total Capex: €777mn
- Capacity: 2x500MW HVDC cables
- Length: 415km (of which 390 km undersea cable)
- Cables and AC/DC procurement process under way

Italian Side
- Portion of capex in waters/land
- Authorization process completed

Montenegrin Side
- Portion of capex in waters/land
- Authorization process ongoing:
  - Detailed Spatial Plan approved by the Government of Montenegro
  - Expropriation process ongoing
  - Public land (including maritime property) rights acquisition process ongoing
- Engineering and design activities with local standard

Figure 8. Basic data on Italy-Montenegro interconnection

Additional characteristics of the infrastructure:

- An investment plan for enhancing Montenegro's transmission grid will be carried out by the local TSO, Prenos, with the goal of ensuring the functioning and optimal use of the new interconnection for exporting electricity from all Balkan countries to Italy.
- The agreements with Terna provide for Montenegro to construct at least one of the new interconnections with Bosnia-Herzegovina or Serbia. The investment will be made by a private consortium or, if it is not feasible economically, by the two transmission companies involved.
- To protect its investment in the undersea electric interconnection, in the first half of 2011 Terna acquired a 22% equity interest in Crnogorski Elektroprenosni Sistem (CGES) ad.[7]

[6] Project subcontractors are Nexans for the cables – 300 mill EUR; Toshiba Corporation – EPC contract – 243 mill US$. Toshiba is expected to start construction in September 2013 and deliver equipment in April 2015 while the conversion stations along the route are expected to be on stream in September 2017.
[7] CGES is owned 55% by the Government of Montenegro, 22% by Terna and 23: small shareholders

The project also provides significant benefits for Montenegro's electric system, which can be summarised as follows:

- creation of the best conditions possible for attracting investment in the field of electricity generation and developing the country's considerable energy resources, especially hydro and other renewable sources;
- activation of a direct connection with the European energy market;
- increased capacity for importing energy through the planned interconnection lines;
- improvement of service quality and operating safety standards from the enhancement and renovation of the domestic grid.

2.1.4. Implementation of cooperation mechanisms envisaged by EU RES Directive

In June 2009 a new EU directive on the promotion of renewable energy sources (RES) entered into effect. The directive, 2009/28/EC, provides for three cooperation mechanisms that will help member states achieve their national RES target in cooperation with other member states: statistical transfer, joint projects, and joint support schemes.

In October 2012 the Energy Community Ministerial Council decided on the implementation of EU RES Directive 2009/28/EC for the Energy Community. With this decision, Albania, Bosnia and Herzegovina, Croatia, Former Yugoslav Republic of Macedonia, Kosovo, Moldova, Montenegro, Serbia and Ukraine committed to a binding share of renewable energy as part of their overall consumption in 2020. Thereby, despite their official status as third countries, they are eligible to make use of statistical transfers and joint support schemes. Special adaptations to Directive 2009/28/EC were made that include the requirement of EU energy audits. In addition, upon request of a party wanting to make use of statistical transfers or joint support schemes, the ministerial council of the Energy Community will make a case-specific decision. Joint projects between EU Member States and contracting parties to the Energy Community will continue to be governed by the provisions of Article 9 and 10 of the RES Directive (joint projects with third countries), requiring the physical transfer of the involved electricity. Joint projects with the Energy Community countries thus have to follow the same provisions as joint projects with third countries in other regions.

According to the agreement signed on 13 November 2009, it was envisaged that RES-E produced in Serbia and exported to Italy will be accounted, by means of statistical transfer, according to the Italian objective. In this case, cooperation mechanism uses statistical transfer for target accounting.

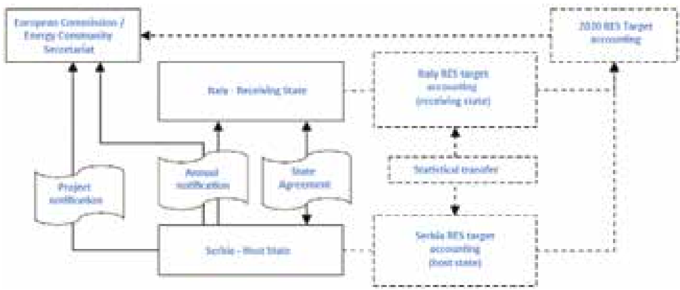

Figure 9. Statistical transfer mechanism between Serbia and Italy[8]

[8] The scheme was agreed before the RES Directive was enacted, so this scheme is a mixed form of a joint project and statistical transfer.

Additionally, Serbia and Italy established a fixed payment scheme whereby Italy guarantees to purchase all electricity produced from the jointly developed power plants at the fixed purchase price set at 155 euros/MWh, for a period of 15 years.

The starting point in negotiations between Serbia and Italy was the attractive prices for renewable energy in the Italian market (average electricity price + green certificate price) and Italy's proposed application of its national incentive scheme to the electricity imported from Serbia. At that time, Serbian FITs for electricity produced in hydropower plants was 78.5-97 EUR/MWh for a period of 12 years.

Serbia proposed the creation of incentive mechanism more similar to FITs to avoid uncertainties related to prices of electricity and green certificates, and making the system more attractive to investors.

Finally, there was a bilateral agreement to establish a fixed amount of 155 EUR/MWh as an incentive scheme paid to exporters of electricity in Serbia for a 15 years period.

The cost structure of the electricity export from Serbia to Italy consists of the electricity generation costs, costs of transmission through Serbia, costs of border transmission from Serbia to Montenegro, costs of transmission through Montenegro, and costs of transmission through an undersea cable to Italy.

2.1.5. Key benefits of the successful project implementation

The key benefits achieved with the successful implementation of the Ibar river project include the following:

- The energy potential of the river Ibar is currently unexploited: with the construction of new hydro power plants, the hydro potential would be partially exploited and would increase the stability of the electrical energy system in Serbia
- Implementation of the project create new investments in under-developed Serbian municipalities where SHPP's are located, which also contributes to employment
- With the envisaged construction of SHPPs, the Serbian municipalities would secure additional income from the resource fee charges (about 2% to 3% of the revenue earned by hydroelectric power plants)
- The Ibar river project is feasible only if electricity is sold on Italian market: financial analysis showed that internal rate of return, when electricity is exported to Italy is 15%, with the net value of the project of around 140 million Euros. When it comes to the Serbian market, the price of electrical energy is very low, and the indicators of profitability prove the Ibar river project as non-feasible at the present level of RES support in Serbia.
- Successful project implementation would increase energy security for Italy, contribute to its 2020 RES target, and increased availability of renewable energy at a lower cost than the average weighted value of the incentives paid to the RES-E plants situated in Italy.

2.2. Swedish-Norwegian joint green certificate scheme: the single operating joint support scheme in Europe

The Renewable Directive defines the options of using cooperation mechanisms with the aim of reducing the overall implementation cost of reaching the community-wide 20% RES target. From the three cooperation mechanisms defined in the Directive, joint support mechanisms provide for the greatest harmonisation and cost saving, especially when covering extended geographical areas. They can be applied to all renewable support mechanisms and do not necessarily require the same coverage as those within the national support system of cooperating countries: the scope of joint support system can be limited to certain forms of energy (electricity, heating or cooling), certain technologies, or even specific geographical areas.

The rationale behind extending national support to another country is to lower the cost of overall production support by the extension of the resource base offered by a larger geographic area. The main characteristics of a joint support system are:

- Same support level regardless to the county where the capacity is built.
- Joint target that is submitted to the European Commissions.
- The overall support cost must be distributed among the participating countries ex ante.

2.2.1. History of the Swedish-Norwegian joint green certificate scheme

Sweden already has had an operating GC system since 2003, which was reformed in 2006 when the system was extended until 2030 and the eligibility period for support was set at 15 years. In 2004, the Norwegian government issued a draft of its own proposed GC system with the implicit intention of joining the Swedish system by 2006 or 2007.

In these earlier times, EU policy seemed to be heading toward a harmonised, community-wide green certificate system and the 2001 RES-E Directive left an option for creating a shared community framework. Later in 2006, however, the Commission retreated from this course and decided to postpone the decision until it abandoned the idea in 2008, due to the rejection of some member states. The EU maintained the importance of voluntary or bilateral cooperation to drive down implementation cost, so this option is maintained in the RES directive (Söderhol, 2008).

The negotiation was eventually abandoned by Norway due to remaining issues that the two parties could not agree on. The first was the inclusion of hydro power units in the joint system. The original Swedish GC system included small scale plants but did not provide support for new large hydro plants, which was contested by Norwegian political parties. The second reason for its failure was the disagreement over the allocation of quotas (burden sharing) between the two countries. Sweden insisted on an equal payment obligation manifested in equal targets set at 12 TWh each, while Norway felt that a similar target would be unfair since Norway has half the population of Sweden (and the cost is distributed among the electricity consumers) (Tove, 2013).

It is important to stress that Sweden already had a national system in operation whereas Norway had no such scheme before, and consequently the impact of a joint scheme on electricity prices had a baseline only for Swedish consumers. In addition, Norway was in a position to align with (or try to modify) an already operating system that provides an advantage in the negotiations to the incumbent country, Sweden.

The failure of the negotiation translated into general disappointment in Norway, and RES-E investors started to look for alternative locations. Even Statkraft, a Norwegian based international company, decided to move its wind power projects to Sweden (Tove, 2013). The Ministry prepared an alternative support scheme, similar to a FIT system but publicly financed, which was heavily criticised both from the energy industry and from environmental NGOs. In addition, fears of incompatibility with EU state aid rules forced Norway back to the negotiation table at which point they struck a deal in a short period of time. The main features of the joint system in operation from 1 January 2012:

- same certificate price for all renewable energy technologies in all areas of their territory (all sites and technologies in the two countries are competing with each other equally),
- the joint target is 26.4 TWh by 2020 that is distributed (financed) equally (13.2 TWh each),
- the countries agreed on the necessity of building new transmission capacity,
- the joint system ends in 2035 with a target of 198 TWh for the period of 2012- 2035.

Sweden's original goal of 25 TWh by 2020 was expected to be halfway realized by 2012, yet its ambition did not change due to the accession of Norway to the scheme. The parties also agreed on the inclusion of both old and new small scale hydro in the support scheme (Norway-Sweden, 2010).

2.2.2. Barriers of forming joint support schemes

As we have discussed before, the prime driver of joint support schemes is cost efficiency at the community level, i.e. at the level of the cooperating states. This benefit, however, does not materialise automatically and if the state intends to form such a scheme it must overcome several obstacles.

Sovereignty and general interstate relations

There is an unavoidable trade-off between the pursuit of sovereign renewable policy and other politically important issues such as industrial or spatial policy, and the cost-efficiency that can be gained via a joint support system. Cost efficiency is gained at the supranational level, and in this case politicians have to forfeit a degree of sovereignty that is meaningful at national level. The domestic capacity mix that will result from the joint system, which is somewhat exogenous to domestic decisions, is an example of this kind of surrender: RES-E investors will locate their new capacities to the most economically sensible locations across the participating countries.

The regulatory risk for RES-E investors is likely to increase with the inclusion of more political actors, who are capable of modifying the operating scheme. This is a crucial issue, as stable regulation is of great concern to RES-E investors. In the case of a two-country regime a unilateral withdrawal has considerable impact on the partner country, but the extent of such risk is more dependent on broad interstate relations and the governance of the respective countries. This risk is mitigated once another country becomes involved, making the decision process more complex and more difficult to changes, and a unilateral withdrawal less impactful to the scheme.

As the demand in a GC system is principally driven by political decision making, the long-term vision and ambition of each participating country is essential. Although the fundamentals of the joint system are universal, issues such as licensing and network access remain regulated at the national level, and this effects the functioning of the joint system. The Agreement between the two countries explicitly refers to these aspects in Art 9(1):

"The parties shall inform the council of changes to general framework conditions that may materially affect competition conditions in the common electricity certificate market. This applies particularly to:
a) changes to the permit policy applicable to plants that produce electricity from renewable sources;
b) the principles for distributing the costs of connecting power stations to the grid between the producer and the grid owner;
c) legislative amendments that may affect the electricity certificate market."

The convergence of these rules seems to be important in the long run for the efficient functioning of the system. An important benefit of a joint system is that it highlights these differences in the national practices of operation.

Policy legitimacy

The consumers of a country pay for the development of cheaper electricity within another country, which is efficient from an international perspective but will not necessarily have strong domestic support. Traditional arguments for renewables, such as industrial development or employment opportunities, are less forceful in this case. Also, local benefits such as air quality improvement will become less influential in the case of a joint support scheme.

Additional support

A well-functioning green certificate market requires the elimination of other forms of subsidies. Additional support distorts site competition, however, in a country where such regulation is favourable to an investor the national regulation governing access rules to the grid and licensing regulation can provide additional support. Other similar factors are general tax regulations, public participation rules for new investments, and general financing conditions. An additional problem is due to the transitional guidelines already applied to operating units that have acquired the right for additional support. Sweden, for example, employed an 'environmental bonus' that is a production based support for wind production (Söderholm, 2008).

Distributional issues

The decision on forming a joint support scheme should carefully consider costs and benefits associated with the baseline scenario (no cooperation) and the outcome. It is important to note that alongside the cost of direct support, associated system costs (balancing cost, network upgrades required to integrate the new generation units, transmission costs related to units not far from load centres) indirect benefits related to the new RES-E investments (the employment effect, RES-E technology advancement, industrial policy goals or security of supply effect) should also be included.

It is important to see that there is an essential trade-off between the extent of cost saving and distribution effects. If a joint support scheme is set up between Member States with similar resource potentials, as in the case between Sweden and Norway, distributional effects are minimal. At the same time, however, the overall savings will be greatest where resource endowments differ and cheaper resources can be deployed first. The establishment of any scheme should therefore be preceded by a thorough analysis of the distributional effects, which requires the modelling of the development of RES-E deployment under a joint scheme and the application of a commonly accepted CBA framework.

The Nordic Working Group for Renewable Energy commissioned a study that analyses the effect of various cooperation scenarios among the four Nordic countries. The assumption was that these countries must increase their joint RES-E production by 62.8 TWh to reach their target. The modelling included an analysis of the cost structures of the countries regarding the available RES-E technologies, revealing that Norway and Sweden have considerable wind potential that needs to be exploited in order to reach an ambitious target. In addition, Norway has more hydro potential than Sweden, which is more endowed with biomass reserves and the cost of wind in Norway is lower than in Sweden; 100 EUR/MW 80 TWh can be utilised whereas in Sweden only 30 TWh is utilized. If the two countries form a joint support scheme, it is expected that Norway will experience an increased level of investment, most notably in wind. This expectation is confirmed by the modelling results (Figure 12).

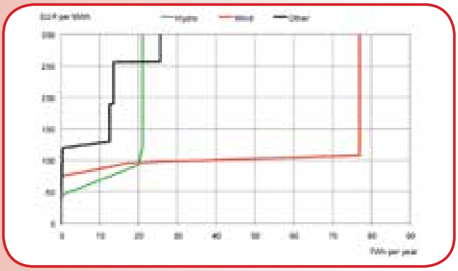

Figure 10. Technology specific long run marginal cost curves in Norway

Source: Greenstream (2010)

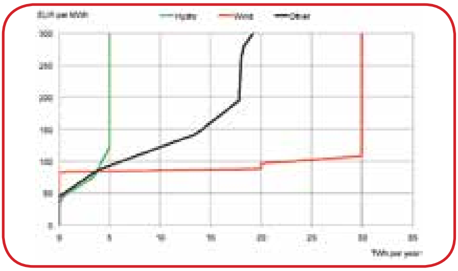

Figure 11. Technology specific long run marginal cost curves in Sweden

Source: Greenstream (2010)

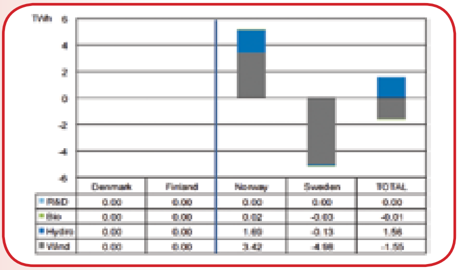

Figure 12. The difference in RES-E production in Sweden and Norway between the 'no cooperation' and the 'joint support scheme' scenarios

Source: Greenstream (2010)

If Sweden and Norway form a joint support scheme then, compared with 'non-cooperation,' Norway will have more wind and hydro production at the expense of wind production in Sweden. The cost saving due to this shift is not very significant up to 32 TWh, where there is no considerable difference between the national marginal cost curves for additional RES-production (that is the joint target of two countries).

The decision to form a joint support scheme for each country can be represented in the following equation:

$$\Delta CS + \Delta PS - \Delta Cn{+}b + \Delta Bi \geq 0$$, where

ΔCS: the change in consumer surplus (without and with joint support scheme)

ΔPS: the change in producer surplus (without and with joint support scheme)

ΔCn+b: network and balancing cost associated with new RES-E capacities (without and with joint support scheme)

ΔBi: indirect benefits associated with the new RES-E capacities (without and with joint support scheme)

	ΔCS	ΔPS	ΔC_{n+b}	ΔB_i
Norway	(-)	(+)	(+)	(+)
Sweden	(+)	(-)	(-)	(-)

Table 4. The change in costs and benefits for the two countries between the 'non-cooperation' and the 'joint GC scheme' scenarios

Considering the 50-50% cost sharing of the joint scheme, the Norwegian consumers will pay more compared to the 'non-cooperation' case because the average support cost will increase and the new capacities are likely to induce additional network costs for reinforcement and balancing (while this latter is probably not so important in the Nordic electricity market). This must be counterbalanced by the producer surplus increase due to higher RES-E production and the associated local benefits such as employment, industrial development and the local supply chain. Sweden faces just the opposite effects, and while lower RES-E instalments do not necessitate measures for network reinforcement, there are foregone local benefits.

The fact that Norway and Sweden decided that against a redistribution mechanism shows that the distributional effects of this joint support scheme are limited or that the additional benefits can balance the additional costs in both countries. This is often the case in countries with similar electricity market structures; they share similar resource potential, network conditions and balancing needs. In this case the potential gains are similar in the two participating countries, while in joint initiatives between more heterogeneous countries the potential gains are much higher, as are distribution costs and benefits.

3. RES TARGET ACHIEVEMENT IN THE EU

3.1. Positioning EU member states in RES target achievement

This section assesses the ability of each EU Member State to achieve its RES target. This provides an indication as to which countries will likely fall short of reaching their targets and would be possible candidates for acquiring RES 'credits' through the flexible mechanisms. At the same time, those countries that might exceed their targets are potential sellers of RES 'credits'.

First, we collected available information from the estimates of the Member States and from the European Commission Transparency Platform on the member state progress in achieving their respective targets.

Table 5 shows the Member States' own forecast on their deficit or surplus compared to their RES targets.

SUMMARY TABLE OF INTENDED USE OF COOPERATION MECHANISMS

ktoe	2011-2012	2013-2014	2015-2016	2017-2018	2020	2020 target
Austria	0	0	0	0	0	34%
Belgium	475	857	812	331	-279	deficit [illegible]
Bulgaria	1-144	180-548	[illegible]	[illegible]	-140 to +289	surplus [illegible]
Cyprus	0	0	0	0	0	13%
Czech Rep.	0	0	0	0	0	13%
Denmark	[illegible]	[illegible]	[illegible]	[illegible]	-337	deficit [illegible]
Finland	0	0	0	0	0	38%
France	0	0	0	0	0	23%
Estonia	[illegible]	[illegible]	[illegible]	[illegible]	3	surplus [illegible]
Germany	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	surplus [illegible]
Greece			[illegible]	[illegible]	[illegible]	surplus [illegible]
Hungary	0	0	0	0	0	13%
Ireland	[illegible]	[illegible]	[illegible]	[illegible]	0	16%
Italy		-86	-880	-1170	-1170	deficit [illegible]
Latvia	0	0	0	0	0	40%
Lithuania	[illegible]	[illegible]	[illegible]	[illegible]	18.3	23.3% Vs 23%
Luxembourg					-40 to -300	deficit [illegible]
Malta	28	62	71	14.1	-43.5	deficit [illegible]
Netherlands	0	0	0	0	0	14%
Poland	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	surplus [illegible]
Portugal	0	0	0	0	[illegible]	surplus [illegible]
Romania	0	0	0	0	0	24%
Slovenia	0	0	0	0	0	25%
Slovak rep.	56	112	134	187	[illegible]	surplus [illegible]
Spain	4306		4791		2700	surplus [illegible]
Sweden	1674	1273	1286	1105	480	surplus [illegible]
UK	-119	-219	-254	40		15%
+ surplus	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
+ deficit	-119	-296	-1134	-1170	[illegible]	
net surplus	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

BLUE - Member State expecting to need a transfer in its favour
GREEN - Member State expecting to have a surplus available to transfer to another Member State
WHITE - Member State not expecting to produce a surplus or require a transfer to meet its target

Table 5. Intended use of cooperation mechanisms, 2010, ktoe

Source: Summary of the Members States forecast documents. (EC Transparency Platform, 2014)

As Table 5 indicates, more than 10 countries expect surplus in RES production compared to their respective 2020 targets. The surplus in RES generation amounts to around 5.5 Mtoe, which is around 2% of the total renewable target. On the other hand, five member states expect deficits by 2020 in the range of 1.8-2.1 Mtoe, which represents less than 1 % of the EU RES target. Italy alone is responsible for more than half of this deficit (< 1.1 Mtoe).

Table 6 illustrates the achievements of the Member States in 2010, based on the energy statistics of the EU countries.

Member State	2005 RES share	2010 RES share	1st Interim target (average of 2011 and 2012)	2020 RES target
Austria	23.3%	30.1%	25.4%	34%
Belgium	2.2%	5.4%	4.4%	13%
Bulgaria	9.4%	13.8%	10.7%	16%
Cyprus	2.9%	5.7%	4.9%	13%
Czech Republic	6.1%	9.4%	7.5%	13%
Germany	5.8%	11.0%	8.2%	18%
Denmark	17%	22.2%	19.6%	30%
Estonia	18%	24.3%	19.4%	25%
Greece	6.9%	9.7%	9.1%	18%
Spain	8.7%	13.8%	10.9%	20%
Finland	28.5%	33%	30.4%	38%
France	10.3%	13.5%	12.8%	23%
Hungary	4.3%	8.8%	6.0%	13%
Ireland	3.1%	5.8%	5.7%	16%
Italy	5.2%	10.4%	7.6%	17%
Lithuania	15%	19.7%	16.6%	23%
Luxembourg	0.9%	3%	2.9%	11%
Latvia	32.6%	32.6%	34.1%	40%
Malta	0%	0.4%	2.0%	10%
Netherlands	2.4%	3.8%	4.7%	14%
Poland	7.2%	9.5%	8.8%	15%
Portugal	20.5%	24.6%	22.6%	31%
Romania	17.8%	23.6%	19.0%	24%
Sweden	39.8%	49.1%	41.6%	49%
Slovenia	16.0%	19.9%	17.8%	25%
Slovakia	6.7%	9.8%	8.2%	14%
UK	1.3%	3.3%	4.0%	15%
EU	8.5%	12.7%	10.7%	20%

Table 6. Overview of Member States' progress

>2% above interim target

<1% from or <2% above interim target

>1% below interim target

Source: EC Renewable Energy Progress Report, Communication (2013c) 175 Final

Only two Member States were not able to reach the interim target of 2010 (Latvia and Malta) both demonstrating slow progress in their RES developments. Thirteen Member States were more than 2% above their target while the remaining 12 Member States were more than 1 % above their respective targets. Overall, the EU was 2% above its target, a positive signal for the health of RES development.

The two tables show that the EU as a whole progressed well in the first years to fulfil the overall RES target which would indicate limited demand for cooperation mechanisms. The Member States forecasts substantiate this idea, as most characterize themselves as having surplus RES production or an even balance in the long term. However these projections have to be assessed. First, these estimates were based only on few year's data, and in the first few years Member States were able to take advantage of 'low hanging fruits' e.g. biomass co-firing in fossil fuel plants in Hungary and Poland. Second is the lower than expected growth in overall energy consumption. The 2008 crisis left the energy consumption of the Member States at a lower level than was anticipated in the National Renewable Energy Action Plans (NREAP). In 2010 and 2011 gross final energy was 3.7% and 8.7% respectively less than was estimated in the NREAPs at the EU level.[9]

[9] Four countries: Netherlands, Malta, Slovenia and Finland were excluded in this calculation, as they did not report final energy consumption in their NREAPs.

3.2. Options for statistical transfer based on the 2011 data

In this section we follow another method to identify countries that would want to use flexibility mechanisms to balance their RES targets. If the actual (2011) RES share of a given country was below the share determined in their NREAP for 2011, then the country is a potential buyer. The other proxy for the future position of a country is the distance between the 2020 RES target and the actual (2011) share of RES. These two dimensions are exhibited in the following figure. Estonia has already met its 2020 target, which means that Estonia could start to sell RES quotas immediately. Romania, Bulgaria, Latvia and Sweden are also potential seller countries. These countries were not far from their 2020 target in 2011 (~2 % point), and also the differences between the actual share and the 2011 target determined in their NREAPs are quite high (2.5-3.5 % points). France, Malta, Ireland and Cyprus might be potential buyer countries. Interestingly Italy - which plans to use the flexibility options and is already one of the countries that currently use them - is in the group of countries that are rather close to their NREAP target. This is due to the very fast RES capacity development in the last few years. However the budgetary cap introduced in Italy on RES support might reduce the future penetration level of RES.

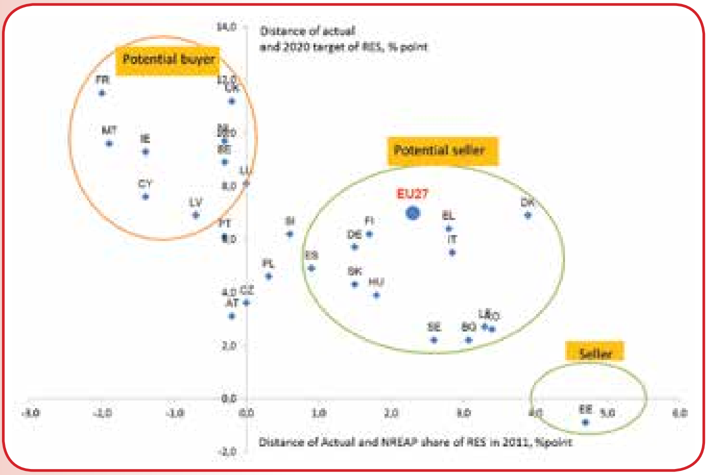

Figure 13. Identification of potential buyers/sellers of RES quota

Source: NREAPs (2010), Eurostat (2013)

A further indication of market position is the difference between the target which is set in the Directive itself, which is compulsory and enforceable, and the target levels the countries undertook in their NREAPs. Table 7 shows this difference for the EU 27.

	NREAP	Directive	Difference
AT	34,2	34,0	0,2
BE	13,0	13,0	0,0
BG	16,0	16,0	0,0
CY	13,0	13,0	0,0
CZ	13,5	13,0	0,5
DE	19,6	18,0	1,6
DK	30,0	30,0	0,0
EE	25,0	25,0	0,0
EL	18,0	18,0	0,0
ES	22,7	20,0	2,7
FI	38,0	38,0	0,0
FR	23,0	23,0	0,0
HU	14,7	13,0	1,7
IE	16,0	16,0	0,0
IT	17,0	17,0	0,0
LT	24,0	23,0	1,0
LU	11,0	11,0	0,0
LV	40,0	40,0	0,0
MT	10,2	10,0	0,2
NL	14,5	14,0	0,5
PL	15,5	15,0	0,5
PT	31,0	31,0	0,0
RO	24,0	24,0	0,0
SE	50,2	49,0	1,2
SI	25,3	25,0	0,3
SK	14,0	14,0	0,0
UK	15,0	15,0	0,0

Table 7. Difference in targets set by the NREAP and Directive

Eleven countries instituted higher 'voluntary' targets in their NREAP than was set by the Directive. Amongst them there are four countries from the Danube Region, Austria, the Czech Republic, Germany and Hungary. This excess could in theory be sold through the flexibility mechanism if they reach their national targets.

4. THE POTENTIAL BENEFIT OF JOINT REGIONAL RES-E TARGETS

Here we estimate the potential net benefit of a joint RES target if compared to the default non-cooperation scenario, i.e. countries complying with their national target individually. First we assess this impact on a smaller group of countries on the basis of Levelized cost of energy (LCOE) calculations, including Czech Republic, Slovakia, Hungary and Romania. We have limited our analysis to these countries on the basis of their electricity market connectivity, since they are coupled with the exception of Romania which has expressed its intention to join. As this is only an initial assessment, we focus our analysis to the wind and PV RES-E technologies.

Second, we enlarge the geographical coverage of the analysis to seven Danube Region countries, and assess their Renewable support scheme with another method, the internal rate of return (IRR) calculation. In this way we can identify those countries and technologies that could be the most attractive for hosting joint projects.

It has to be emphasized that both calculations are only for demonstration purposes, and a more detailed assessment should be carried out for actual project identification.

4.1. Levelized cost of energy (LCOE) method to calculate benefits of joint schemes

In order to estimate the impact of a joint target, first we have to calculate the average cost of electricity production based on onshore wind and PV technologies. Because these technologies are global, most of the cost elements (investment and OPEX costs) are very similar in each country, and only the yearly utilization rates are country specific. We exclude from the analysis the cost differences that are due to the specific country risks.

Levelized cost of energy (LCOE) is used to determine the average cost of electricity production. LCOE indicates the level of minimum electricity price, at which the investment is paid back. The following equation shows the calculation of LCOE:

$$LCOE = \frac{\sum_{t=1}^{n} \frac{I_t + Fuel_t + OM_t}{(1+r_t)^t}}{\sum_{t=1}^{n} \frac{E_t}{(1+r_t)^t}}$$, where

n: project lifetime

It: Investment cost in year t

Fuelt: Fuel cost in year t

OMt: Operation and Maintenance cost in year t

rt: discount factor in year t

Et: Electricity generation in year t

Several studies estimate the cost of electricity generation from wind and photovoltaic power plants. Each of them calculates the LCOE value with various assumptions, e.g. different yearly utilization rate, discount rate, etc. We recalculate the LCOE value applying a 10% discount rate and used a country specific utilization rate. These rates are based on Joint Research Centre and EEA calculations (Table 8) (JRC, 2012; EEA, 2009). The assumed lifetime of wind plants is 20 year, of PV installations it is 30 years.

	Yearly utilization rate		LCOE, 2012; €/MWh	
	Wind	PV	Wind	PV
AT	18.3%	11.4%	134.2	231.5
BA	16.0%	14.6%	153.3	181.5
BG	25.1%	14.6%	97.6	181.5
CZ	16.0%	10.7%	153.3	246.2
DE	27.4%	11.4%	89.4	231.5
HR	20.5%	16.0%	119.3	165.3
HU	18.3%	12.6%	134.2	210.4
MD	22.8%	13.7%	107.3	192.9
ME	16.0%	12.8%	153.3	206.7
RO	22.8%	13.7%	107.3	192.9
RS	16.0%	13.7%	153.3	192.9
SI	20.5%	12.6%	119.3	210.4
SK	18.3%	11.4%	134.2	231.5
UA	16.0%	11.4%	153.3	231.5

Table 8. Yearly utilization rates and LCOE value of wind and PV generation in Danube Region countries

Source: REKK calculations based on EEA (2009), JRC (2012), NREL (2012), DECC (2012c), EIA (2013), Fraunhofer (2013), IRENA (2012)

To determine the effect of a joint target, first we have to collect the present installed capacities of PV and wind power plants and also the projected capacity targets set by the NREAPs. This is shown in Table 9.

	Installed capacity, MW					
	2012		Target, 2020		Difference	
	Wind	PV	Wind	PV	Wind	PV
AT	1378	418	2578	322	1200	-96
BA	0	n.a.	n.a.	n.a.	n.a.	n.a.
BG	684	908	1256	303	572	-605
CZ	260	2072	743	1695	483	-377
DE	31308	32411	45750	51743	14442	19332
HR	180	0,2	n.a.	n.a.	n.a.	n.a.
HU	329	4	750	63	421	59
MD	0	0	n.a.	n.a.	n.a.	n.a.
ME	0	0	n.a.	n.a.	n.a.	n.a.
RO	1905	30	4000	260	2095	230
RS	0	0	n.a.	n.a.	n.a.	n.a.
SI	0	198	106	139	106	-59
SK	3	523	350	300	347	-223
UA	n.a.	373	n.a.	n.a.	n.a.	n.a.

Table 9. Installed capacity, targets of wind and PV installed capacities in Danube Region countries

Source: EPIA (2013), EWEA(2013), NREAP (2010)

Most DR countries (e.g. Austria, Bulgaria, Czech Republic, Slovenia and Slovakia) have already meet their PV targets, while none of the DR countries meet their wind capacity targets. In order to answer what the potential benefit of a joint target is, we analyse the CZ-SK-HU-RO market.

By 2020, 3346 MW of installed capacity is needed in the four countries to meet the 2020 targets announced in their NREAPs. Using the benchmark yearly average utilization rates, we can estimate the yearly electricity generation. By multiplying this generation with the LCOE value we can determine the yearly average cost of electricity generation from new wind installed capacities. If no joint target exists and countries fulfil their targets individually, then the estimated cost of wind generation is 718 m€/year. With a joint target, the wind farms are built in the country with the best yearly utilization rate. In the case of wind, this would be Romania. If all the required electricity is produced by wind power plants situated in Romania, the cost is only 654 m€/year. This means that the net benefit of the joint target is 64 m€/year, which means a joint system would be 9 % cheaper. This value is only 6 % if we limit the calculation to the three countries already participating in the market coupling.

	Required new wind capacity by 2020	Electricity generation, GWh/year	Yearly average cost of wind generation, m€
CZ	483	676	104
HU	421	674	90
RO	2 095	4 190	450
SK	347	555	74
RO+SK+CZ+HU with four targets	3 346	6 095	**718**
RO+SK+CZ+HU with a joint target	3 346	6 095	**654**
SK+CZ+HU with three different targets	1 251	1 905	**269**
SK+CZ+HU with a joint target	1 251	1 905	**256**

Table 10. Calculation of the yearly net benefit of a joint wind energy target, m€

Source: REKK calculation

This simplified calculation shows that if the joint scheme (or joint project) is restricted to the four selected countries, the expected gains would be limited to 9% or 6% of the total cost. This 'benefit' must be shared between two countries, so it further reduces the incentives to apply the mechanisms. In addition, the cost margin has to cover other indirect costs such as grid integration and balancing costs in the host country. For the purchasing country, gains have to cover foregone benefits such as increased local employment and security of supply effects, which are not taking in the more resource efficient host country.

In summary, our analysis shows that these four countries have to look for partner countries outside the V4 for a joint project to be viable, even if it means accepting the rules applying to projects with third countries (e.g. physical transfer).

4.2. Internal rate of return calculation to identify possible host countries for joint projects

In the previous section, we calculated the potential benefits of a joint, regional RES-E target instead of country specific targets. In this section we execute a basic calculation on the rate of return of different

RES-E technology. In this analysis we focus on seven Danube region countries that are expected to have attractive RES-E potential. Four different RES-E technologies are analysed: wind, biomass, solar and hydro.

Our calculation is based on, the current (2013) unit support costs of RES-E in the analysed countries. In each technology the calculations are only using the minimum and maximum unit support, and in nearly all countries there are dozens of different unit support fees (e.g. Feed-in tariffs usually differ by technology/size/etc.). These values are presented in Table 11.

RES-E support fee, €/MWh	Croatia		Romania		Serbia		Bosnia and Herzegovina (Republic of Srpska)		Bosnia and Herzegovina (FBiH)		Montenegro		Bulgaria	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Wind	92	91	100	100	92	92	57	85	78	78	96	96	54	93
Solar	143	260	290	290	160	230	130	186	188	470	150	350	82	181
Biomass	117	205	120	160	69	157	123	151	73	97	125	150	88	212
Hydro	74	156	130	160	74	124	64	79	63	63	50	104	80	124

Table 11. Present minimum and maximum RES-E support levels, €/MWh

In order to identify those RES-E investments that are the most attractive from an economic point of view, we have to calculate LCOE for the analysed countries and technologies. These costs are different in the case of PV, wind and hydro, because the utilization rates differ country to country. In the case of biomass, the same fuel prices are assumed. Using the LCOE values and the RES-E unit support levels, we can estimate the internal rate of return (IRR) value for the various technologies. Figure 14 depicts the calculated IRR ranges for the selected technologies and countries. Highest and lowest values are presented, based on the minimum and maximum feed-in tariff levels.

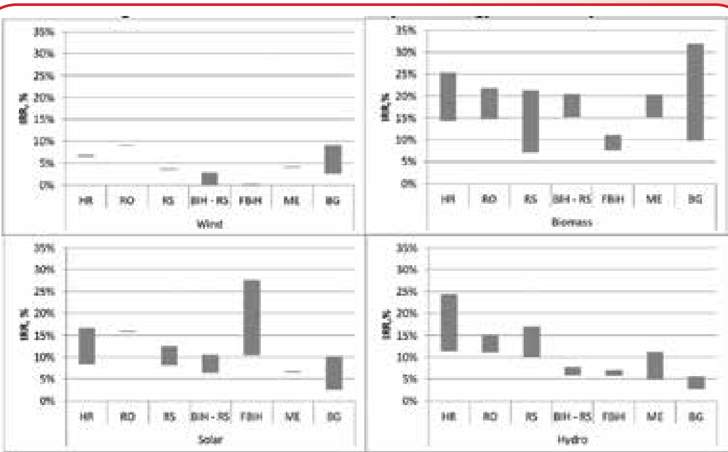

Figure 14. Internal rate of return by technology and country, %

Biomass has the highest internal rate of return (IRR), with an average rate of 20%, while in Bulgaria it is 30%. The lowest IRR values are for wind, due to the relatively small support level (see Figure 14 above). In hydro and solar electricity generation a wide range of IRR values were revealed; in Croatia investment into hydro power plants at the present support levels is quite profitable, but in Bulgaria the rates are less attractive. We have to note that this is a very simplified calculation, so it only generalizes those areas where more detailed analysis should be carried out in order to identify the most promising locations for joint projects. In addition, only the direct costs are considered, while the additional cost elements such as possible grid reinforcement and balancing cost are not included.

5. CONCLUSIONS AND RECOMMENDATIONS

5.1. Conclusions

The heterogeneity of the electricity systems and the RES resource potentials of the Danube Region countries offer opportunities for the use of flexible mechanisms. Our preliminary assessment shows that several Members States have potential to become a host country for joint projects, in addition to EnC members once they comply with their RES targets.

Our initial calculations show that higher cost savings could be achieved with wider geographical coverage, which is in line with the theoretical considerations. On the other hand, increasing coverage means increasing heterogeneity of energy systems and the regulatory environment, which makes it more difficult to reach a broadly acceptable agreement among the parties. Interstate relations are decisive factors, and without the cooperative attitude of governments flexible mechanisms would not be initiated or sustained. In the case of statistical transfer, the agreement and operation is fully in hands of the governments. Although the other two mechanisms - joint projects and joint support schemes - envision private participation the framework for cooperation must be established by the respective governments and public authorities.

The complexity is intensified when shifting from statistical transfers to joint support schemes. The latter requires more time and resources to settle, but offer benefits over a longer period of time. In addition, joint projects and joint support schemes can pave the way for a more accountable and reliable RES development within the EU and the Danube Region.

The use of flexibility mechanisms could lead to significant wealth redistribution between the participating states and between stakeholders (e.g. producers and consumers of electricity). The use of commonly accepted cost-benefit assessment (CBA) methodology and other modelling tools to assess the direct and indirect costs and benefits is an indispensable element in the initial phase preceding the inter-governmental agreements.

5.2. Recommendations

The DR countries are at the initial stage of exploring the use of flexible mechanisms, when they should collect information that would enable them to identify efficient joint projects.

First, information should be collected from the private entities (project developers) that are interested in developing joint projects with other Member states or third countries. They are better informed about the possible sites and techno-economic feasibility of such projects and as such, their knowledge is of essential value to the policy makers. They could be approached, and asked to share this information (on the possible locations, costs and, expected returns) with the relevant decision makers. This was the approach of the Department of Energy and Climate Change (UK) in 2012. The Ministry surveyed private stakeholders about their view on the applicability of flexible mechanisms, and these survey questions are included in the Annex. (DECC, 2012a)

Second, regulators and ministries could also express their preferences toward the flexibility mechanisms, and the type of instrument they would be willing to support in their regulatory framework. In addition, the reasons for inaction should be explored.

A possible initiative in the DR could explore the opportunity for a common tendering process for selected RES-E technologies (e.g. for wind or reserves to balance intermittent RES-E production). This way regulators and TSOs could share information with neighbouring countries on the available grid connection points and capacities, costs of grid access, total unit support cost required to attract investors etc. This would help to identify those locations where joint projects could be feasible and attractive.

6. ANNEX

The main questions of the DECC survey on the use of flexible mechanism are the following (DECC, 2012b)

1. 'Should the UK make use of one or more of these mechanisms, and for what reasons?
2. what do you consider to be the potential costs, benefits and risks to the UK of making use of each of these mechanisms to import and export renewable energy?
   - Statistical transfers
   - Joint Projects
   - Joint Support Schemes
3. What do you consider to be the potential across Europe, for the UK to make use of the statistical transfer mechanism to buy or sell renewable 'credits' with other Member States in the next few years and the period approaching 2020?
4. Do you consider there to be a role for the private sector in implementing the statistical transfer mechanism and, if so, how would that work?
5. What do you consider to be the potential costs, benefits and risks to the UK of making use of the statistical transfer mechanism?
6. Do you consider there to be any financial or non-financial barriers to the UK's use of the statistical transfer mechanism, and how could these be addressed?
7. How do you think the market for statistical transfer could develop in Europe and how would Member State Governments, the private sectors and others work together to put an agreement in place?
8. Do you know of specific Joint Project opportunities which may exist for the:
   - import of renewable energy from another territory,
   - export of renewable energy generated in the UK to another territory,
   - generation of renewable energy in another territory, where the energy can be consumed in another Member State?
9. What are the costs, benefits and risks of this specific project – we would ask you to provide a high-level summary using Annex A, or if possible, more detailed information using the spreadsheet in Annex B.
10. How do you consider the market for Joint Projects could develop in Europe and would Member State Governments, the private sectors and others work together to put in place the framework to develop such projects?
11. Do you think there is a role for the European Commission to facilitate and administer renewables Joint Projects?
12. What do you consider to be the financial and non-financial barriers (including any technical issues) which will need to be addressed to enable Joint Project opportunity to a) import renewable energy and b) export renewable energy to proceed, and how could these be resolved?'

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Notes

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