



Electricity interconnections with neighbouring countries

Second report of the Commission Expert Group
on electricity interconnection targets

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Electricity interconnections with neighbouring countries

Second report of the Commission Expert Group on electricity
interconnection targets

The European Council of October 2014¹ endorsed the proposal by the European Commission of May 2014² to extend the 2020 electricity interconnection target (defined as import capacity over installed generation capacity in a Member State) to 2030 while taking into account the cost aspects and the potential of commercial exchanges in the relevant regions.

To make the 2030 target operational, the European Commission decided to set up a Commission Expert Group to provide specific technical advice, among others, and to examine any relevant elements that can have an impact on the interconnection target and the development and implementation of interconnectors.

The Expert Group on electricity interconnection targets was established by the Commission Decision of March 2016³. The Expert Group started its work in October 2016, following a public call for applications. In line with Article 5 of the Commission Decision three members, the Agency for the Cooperation of Energy Regulators (ACER) and the European Networks of Transmission System Operators for electricity (ENTSO-E) and for gas (ENTSOG) did not undergo the public call and were appointed directly. The Expert Group consists of 15 members and 2 alternate members. The mandate of the Group was extended in February 2019 in line with Article 5 paragraph 2. The full list of current members is presented in Annex 2.

The Expert Group handed its first report **Towards a sustainable and integrated Europe**⁴ to Commissioner for Climate Action and Energy, Miguel Arias Cañete in October 2017 after which it continued working on different aspects related to development, assessment and implementation of interconnections. It handed its second and third reports on **Electricity interconnection with neighbouring countries** and **Public engagement and acceptance in the planning and implementation of European electricity interconnectors** to Commissioner Arias Cañete on 19 June 2019. It will now continue its work on the impact of sector coupling on the development of interconnections.

¹ Council Conclusions of 23 and 24 October 2014, available at https://www.consilium.europa.eu/uedocs/cms_data/docs/pressdata/en/ec/145397.pdf

² Communication on European Energy Security Strategy COM(2014) 330 final

³ Commission Decision of 9 March 2016 setting-up a Commission expert group on electricity interconnection targets 2016/C 94/02

⁴ Report of the Commission Expert Group on electricity interconnection targets: https://ec.europa.eu/energy/sites/ener/files/documents/report_of_the_commission_expert_group_on_electricity_interconnection_targets.pdf

The minutes of all the Expert Group's meetings are publicly available on a dedicated website⁵.

The views in this report are the sole responsibility of the members of the Expert Group and do not necessarily reflect the views of the European Commission. The European Commission cannot be held responsible for any use which may be made of the information contained therein.

⁵ You can access the summaries of all Expert Group meetings here:
<https://webgate.ec.europa.eu/playground-multisite/ener/en/topics/infrastructure/projects-common-interest/electricity-interconnection-targets/expert-group-electricity-interconnection-targets>

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Executive summary

In this report on “Electricity interconnections with neighboring countries”, the Expert Group looks into the potential of interconnections with third countries in promoting EU's external policy objectives, such as energy transition, integration of renewables, security of supply as well as regional and local socio-economic welfare, economic cooperation, peace and solidarity. The report recognises that there are a number of political and economic reasons to cooperate with neighbouring countries and benefit from existing and future interconnectors.

Eighty-two interconnections between the EU and ten neighbouring countries, affecting 22 borders were considered by the Expert Group in their analysis, defining the scope of “neighbouring countries” to countries that already have direct electricity interconnectors to the EU, those planning such interconnectors or countries to which such interconnectors could be physically considered, in all cases either on land or through subsea cables.

The cooperation frameworks within which the European transmission system operators operate interconnectors with their neighbours differ greatly in terms of technical, political and market rules. The Expert Group acknowledged that, as a consequence, interconnectors with third countries play different roles for the EU as a whole and the EU member's national electricity systems by enabling electricity trade and thus ensuring security of supply and stability of grids.

The Expert Group concludes that:

- 1) **The assessment of EU electricity interconnection levels** should be calculated based on the new formulas introduced in the Group's first report and only by taking into account the interconnectors between the EU member states as well as Switzerland and Norway.
- 2) interconnectors with countries that share a **high level of regulatory convergence** and **have reliable and well-grounded political, technical and environmental cooperation** with the EU should be particularly prioritised and promoted by the European Union and the concerned neighbouring countries. The Expert Group assesses that such high level of cooperation can be observed with the Energy Community contracting parties, i.e. in the Western Balkans as well as, increasingly, with Ukraine and Moldova.

- 3) the European Union should continue **promoting interconnectors with its neighbours if such interconnectors help to significantly enhance security of supply**. The Expert Group is of the opinion that adequacy to meet demand must be primarily pursued within a fully integrated area with the same market and environmental rules and their full enforcement.
- 4) the European Union should, in general, promote interconnectors that help increase the **consumption of electricity from renewable sources** in the EU but at the same time also encourage a growing renewable generation and consumption in the neighbouring countries with the overall objective to **intensify energy transition towards long-term decarbonisation objectives** in the EU and elsewhere;
- 5) the European Union should, in general, promote interconnections with neighbouring countries where **market level playing field** exists for imports and the rules for environmental protection, safety and sustainability are in line with the European standards or converge towards such standards.
- 6) the Expert Group also strongly encourages the EU member states, the European Commission, ENTSO-E, the relevant transmission system operators, national regulators, ACER and relevant national and regulatory authorities of all neighbouring countries including their TSOs **to step-up and continue the cooperation in order to align energy market rules and create a level playing field** for electricity trade and clean energy transition in the EU and its neighbourhood.
- 7) the Expert Group strongly recommends sharing good practices on **effective involvement of the general public and local communities** in the neighbouring countries.
- 8) the Expert Group recommends **exploiting and mainstreaming the transferability of good practices developed within the TEN-E framework** in the cooperation between the EU and other third countries.

1. The role of electricity interconnectors

In its first report “Towards a sustainable and integrated Europe” published in November 2017⁶, the Expert Group concluded that the socio-economic value of electricity interconnectors comes from their ability to increase the efficiency of the electricity systems. It comes about by reducing the costs of meeting electricity demand and in parallel improving security of supply and facilitating the cost-effective integration of the growing share of renewable energy sources. Interconnectors are therefore a vital physical component of Europe’s energy transition.

More specifically, the Expert Group identified five main clusters of benefits that electricity interconnectors bring along in the European Union. Firstly, interconnectors integrate the European electricity markets in a number of ways, which results in better prices for Europeans. Interconnectors help reveal the investment signals for generation capacity, allow for a better use of the complementarities that exist between the differing generation mixes across Europe and contribute to generation adequacy by lowering the needs for operational security margins and reducing grid losses. Secondly, interconnectors help reap the benefits of renewables by enabling accommodation of their increasing production levels. Insufficient interconnection levels together with renewables generation growth could increase the level of curtailment. Thirdly, interconnectors increase security of supply across Europe as additional capacity can be available to neighbouring markets as well as indigenously produced electricity can be taken up and reduce energy dependency.

Fourthly, interconnectors, as indispensable elements of the trans-European networks and particularly as developed by Projects of Common Interests, are truly European projects that strengthen regional cooperation between Member States. Finally, investment in interconnectors offer, as a positive spill over, opportunities for uptake of European technologies and thus strengthen employment, industrial competitiveness and global leadership of Europe’s clean, low-carbon industries⁷.

At the same time, the Expert Group considers four clusters of prerequisites that need to be fulfilled in order for interconnectors to reveal their full potential. Firstly,

⁶ Report of the Commission Expert Group on electricity interconnection targets: https://ec.europa.eu/energy/sites/ener/files/documents/report_of_the_commission_expert_group_on_electricity_interconnection_targets.pdf

⁷ For example, the companies in the sector of the electricity transmission and distribution equipment and services industry, as represented by T&D Europe association, account for a production worth over €25 billion a year and employ over 200,000 people in Europe.

a well-functioning internal market is a key condition for the efficient use of interconnectors; it holds true both for the EU and for third countries, which are already, or planned to be, interconnected with the European Union. Secondly, addressing public concerns related to perceived risks to health or intrusiveness of electricity infrastructure in the natural landscape is crucial to avoid delays. Thirdly, interconnectors are usually capital-intensive projects and in some justified cases might require public lending hand to lift a project off the ground. Lastly, elements such as national energy mix, size of the energy market and geographical location can influence the socio-economic potential of interconnectors. Such potential should be therefore well reflected in the planning of new interconnectors, especially through a solid analysis of the social, environmental and sustainable benefits brought by each new electricity infrastructure in relation to its costs.

The new approach for setting interconnection targets as proposed by the Expert Group in November 2017 takes into account the benefits that interconnectors can bring to the economy and society as well as the preconditions that must be met for interconnectors to unfold their full potential. To operationalise the 15% electricity interconnection target by 2030, the Expert Group proposed the interconnection level to be measured based on two new formulas: the ratio of the nominal transmission capacity to the peak load and the ratio of the nominal transmission capacity to the installed renewable generation capacity. Therefore, the new interconnection formulas and the relevant thresholds of 30% remain valid for this report. The Expert Group welcomes the inclusion of the operationalisation of the 15% target through the new indicators of urgency in the framework of the Regulation on the Governance of Energy Union⁸ and the integrated national energy and climate plans.

In its first report, the Expert Group also noted that benefits brought by interconnectors can be achieved by cooperation with third countries beyond EU borders. Interconnections to third countries, apart from Switzerland and Norway⁹, but for instance with the neighbours of the Energy Community or the

⁸ See Regulation (EU) 2018/1999 of the European Parliament and of the Council of 11 December 2018 on the Governance of the Energy Union and Climate Action,

⁹ In its first report, the Expert Group concluded that Norway and Switzerland should be included in the calculation of EU member countries' interconnection levels thus not treated as third countries. This is justified by the fact that the two countries are connected only to the EU electricity systems and do not have any other interconnectors with the electricity systems of third countries. The same criteria could feasibly apply to any other country that is only connected to the EU electricity system and could continue to be included in the calculation of EU member states' interconnection levels. Norway does have a production-radial crossing the Russian border, connecting two Russian hydro power plants with a total of 56MW. However, connecting the Norwegian system to the synchronous Russian system is not possible.

Mediterranean, have the potential of promoting EU's external policy objectives, such as energy transition, fostering integration of renewables, enhancing security of supply as well as promoting regional and local socio-economic welfare, economic cooperation, peace and solidarity. In that context, the Expert Group concluded that further work would be needed to investigate the relevance and role of such interconnectors.

Following that conclusion, this report presents the Expert Group's considerations and assessment of the role of existing and future electricity interconnectors with the EU neighbouring countries and their impact on the EU energy landscape. As the cooperation with EU neighbours hinges on different rules and agreements, the Expert Group considers necessary to review the current situation and identify conditions under which interconnectors with third countries – existing as well as planned interconnectors – can reliably help achieve the objectives of the EU climate and energy policy. For the purpose of this analysis, the Expert Group considers neighbouring countries as countries that already have direct electricity interconnectors to the EU, countries that are planning such interconnectors or countries to which such interconnectors could be physically considered, in all cases either on land or through subsea cables.

2. Existing interconnectors with third countries and their current role

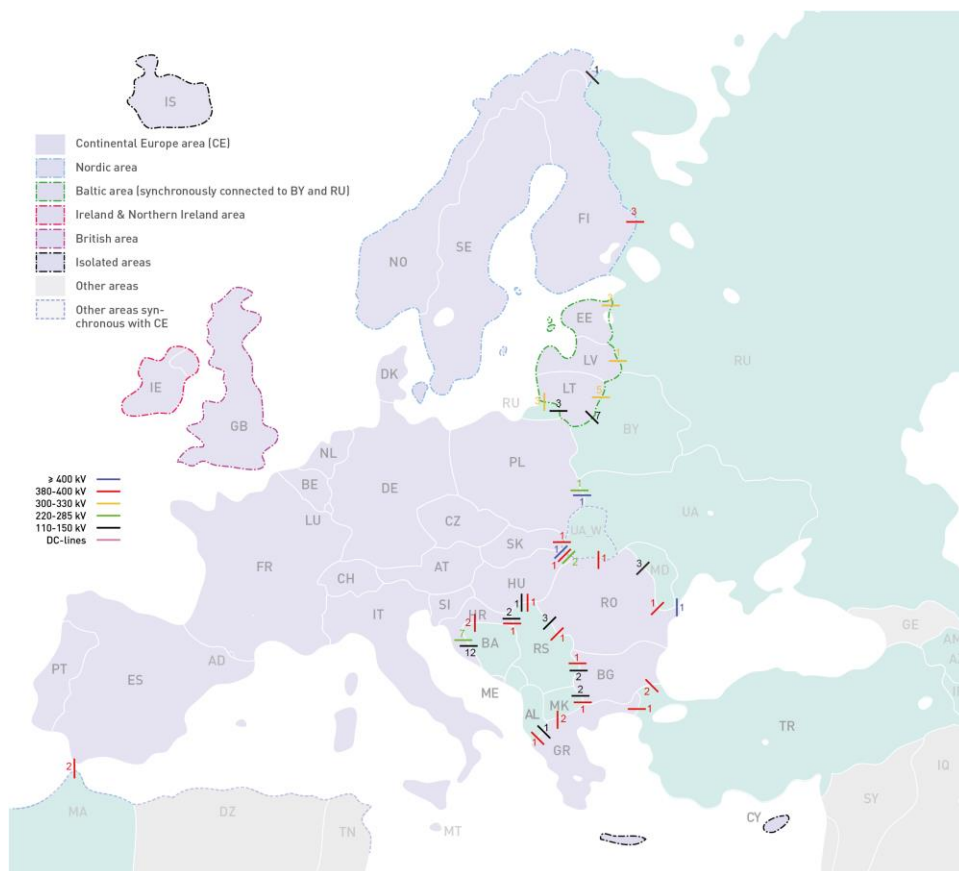
In its previous report, the Expert Group recommended that the calculation of the interconnection levels should account for interconnectors within the EU including Norway and Switzerland. However, European Union member countries are connected to a number of neighbouring countries where electricity is exchanged and traded.

Based on the latest data by ENTSO-E, there are 82 interconnections between the EU and its ten neighbouring countries, affecting 22 borders: Belarus, Moldova, Russia, and Ukraine at the Eastern EU border, Albania, Bosnia-Herzegovina, North Macedonia and Serbia in the Balkans, Turkey, as well as Morocco in the Southern Mediterranean.

As shown in the below map, the EU member countries have:

- 12 interconnections with **Belarus** – all to Lithuania;
- Four interconnections with **Moldova** – all to Romania;
- 12 interconnections with **Russia** connecting Finland (2), Estonia (3), Latvia (1) and Lithuania (6);

- Eight interconnections with **Ukraine** connecting Poland (2, however one of them not in operation), Slovakia (1), Hungary (4), and Romania (2);
- Two interconnections with **Albania** – all to Greece;
- 21 interconnections with **Bosnia and Herzegovina** – all to Croatia;
- Five interconnections with **North Macedonia** connecting Greece (2) and Bulgaria (3);
- 12 interconnections with **Serbia** connecting Bulgaria (3), Croatia (3), Hungary (2) and Romania (4);
- Three interconnections with **Turkey** connecting Bulgaria (2) and Greece (1); as well as
- Two interconnectors with **Morocco** – all to Spain.



Interconnections between EU member countries and their neighbours (Source: ENTSO-E)

The physical transmission capacity, the physical electricity flows and the scheduled commercial flows vary greatly depending on the border, the electricity lines being also characterised by different voltage and capacity. In few cases, the interconnectors are either in liquidation (between Poland and Belarus), or are not operational (between Romania and Moldova).

The interconnectors with **Russia** enable import of electricity to Finland; in this case, trade takes place purely on a bilateral basis and is not governed by any rules related to the EU market framework. In case of Estonia and Latvia, there are no commercially scheduled flows at the border. The lines are used only for physical flows as the countries are still synchronised with Russia, being part of the Integrated/Unified Power System (IPS/UPS). Interconnectors with Lithuania are used for commercial import from Kaliningrad Region but also enable electricity transit between mainland Russia and its Kaliningrad Region exclave.

Similarly, the interconnectors between Lithuania and **Belarus** are used for system services within the synchronous area (frequency control, power balancing and loop flows) as well as for electricity transfer. In both countries, Russia and Belarus, electricity is mainly generated from thermal and nuclear capacities. The conventional fuel prices are subsidised for internal Russian and Belarusian producers and less stringent environmental requirements apply, such as those related to CO₂ emissions and market transparency rules. Considering the substantial differences of market and environmental rules, a level playing field for electricity trade between those countries and the EU in the framework of the EU energy and climate objectives does not exist.

Following the signature¹⁰ of the Political Roadmap on the synchronisation of the Baltic States' electricity networks with the Continental European Network via Poland (June 2018), technical work has been carried out in order to implement the synchronisation option that was agreed. Consultations are being held with Russian and Belarussian operators in that respect. The continued security of the electricity system and the necessary system services possibilities for the Kaliningrad region will be guaranteed based on currently available network infrastructure complemented preferably with two HVDC back to back stations suitable for transit to the Kaliningrad region if such technical necessity will be proven.

As regards interconnections to **Ukraine**, Slovakia, Hungary and Romania are connected with the so-called Burshtynska TPP Island, a small part of Ukraine that

¹⁰ http://europa.eu/rapid/press-release_IP-18-4284_en.htm

operates synchronously with the grid of Central Europe and is disconnected from the IPS/UPS network. The interconnectors are used for electricity imports and thus reinforce the EU's security of supply. Due to their synchronisation, four lines also facilitate electricity trade between Slovakia and Hungary, as well as help manage unscheduled flows in North-South direction in that part of Europe. The line between Ukraine and Poland enables direct access to the Ukrainian power plant Dobrotvirska TPP and thus enables import of electricity from Ukraine's Burshtyn island. It does not connect the asynchronous systems of Poland and Ukraine as a whole. Another, very high-voltage interconnector of 750kV between Ukraine and Poland, is not in operation and dates back to a time before Poland was synchronised with continental European network in 1995. The three interconnectors between Romania and **Moldova** are not in operation and were used in the past only for passive island operation¹¹.

The several interconnectors with the Western Balkan neighbours are actively used for commercial purposes, both for import and export; many of them were constructed as internal network of former Yugoslavia. The lines between Croatia and **Bosnia and Herzegovina** offer security of supply in form of adequacy for Croatia and trade possibilities. The lines are of particular relevance given the geographical shape of the country; they offer in total almost 5.5 GW nominal interconnection capacity, which is the largest capacity between a single EU member state and its neighbour. Similar role play interconnectors from **Serbia** to Croatia, Hungary, Romania (one line is not in operation) and Bulgaria, which ensure security of supply and electricity trade in both directions, with exports and growing shares of renewables prevailing from all four member states. Interconnectors from **North Macedonia** to Bulgaria and Greece are equally used for trade and security of supply purposes with exports considerably prevailing from Bulgaria and imports to Greece. Also, the interconnector between **Albania** and Greece is regularly used for electricity trades and offers imports of cheaper electricity.

Turkey is synchronously connected with continental Europe through one electricity line to Greece and two lines to Bulgaria. Both EU member states trade electricity with prevailing imports contributing to the security of supply.

¹¹ The interconnector between Romania and Moldova (400 kV OHL Vulcanesti – Issacea) crossing Ukraine has been identified as Project of Mutual Interest (PMI) in 2016 in the framework of Energy Community. Moldova committed in 2018 to its rehabilitation based on the EU, EIB and EBRD joint financing support. The relevant loan agreements were ratified for this purpose by the Moldovan Parliament in the summer 2018.

The two electricity lines with a combined nominal capacity of 1.4 GW between Spain and **Morocco** remain the only links between Europe and North Africa. Until recently, almost all electricity flows are from Spain helping Morocco meet its growing electricity demand.

Technical information on the capacity and use of the existing interconnectors with third countries¹²

Border	Nominal capacity of the interconnectors in MW	Actual electricity flows (Exchanged flows in 2017 in GWh)		Scheduled commercial flows (in 2017) [GWh]	
		EU --> 3rd country	EU <-- 3rd country	EU --> 3rd country	EU <-- 3rd country
Russia-Estonia	2464	1766	486	no commercial schedules	no commercial schedules
Russia-Latvia	696	36	955	no commercial schedules	no commercial schedules
Russia-Finland	data not available	-	5796	Publication of commercial schedules with 3rd countries optional	Publication of commercial schedules with 3rd countries optional
Russia-Lithuania	2490	136	2816	-	2517
Belarus-Lithuania	4553	742	1621	-	776
Ukraine-Poland	2094	-	894	-	899
Ukraine-Slovakia	789	3055	9	Publication of commercial schedules with 3rd countries optional	Publication of commercial schedules with 3rd countries optional
Ukraine-Hungary	3590	22	4562	-	3940
Ukraine-Romania	5040	62	1682	6	318
Moldova-	not in	-	-	not in	not in

¹² Situation in November 2018

Romania	operation			operation	operation
Albania-Greece	533	1692	79	874	1209
Bosnia and Herzegovina - Croatia	5429 *	1631	2910	570	1436
North Macedonia-Bulgaria	950	2451	1	1583	59
North Macedonia - Greece	1632	422	1718	929	2095
Serbia-Hungary	1054	972	305	6482	4804
Serbia-Romania	1132	2095	138	3737	741
Serbia-Bulgaria	1073	2124	9	2004	683
Serbia-Croatia	1423	117	830	1570	1219
Turkey-Bulgaria	2485	2081	102	566	1253
Turkey-Greece	1900	1	3194	16	516
Morocco-Spain	1359	5756	8		Common bidding zone

Planned interconnectors with third countries

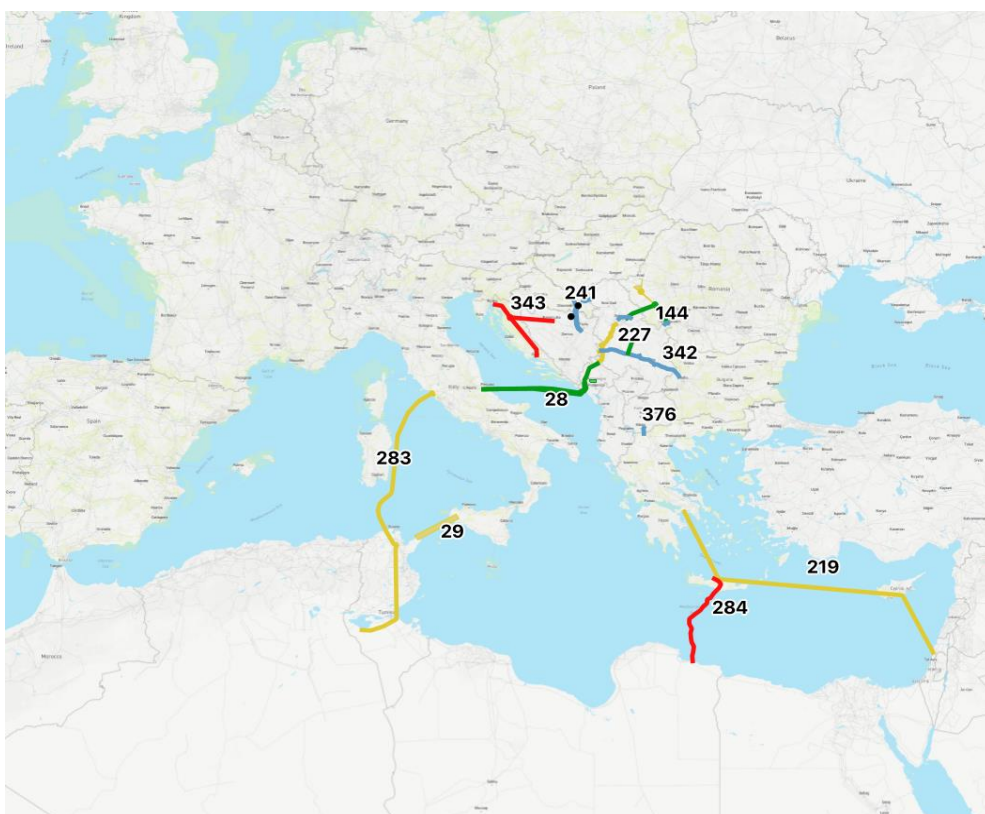
Besides the existing electricity interconnectors, several new lines are planned between the EU member states and their neighbours and twelve concrete projects are included in the latest ENTSO-E Ten Year Network Development Plan 2018¹³.

Two of these projects are refurbishments of existing lines. The upgrade of the existing interconnector between Croatia and Bosnia and Herzegovina with an additional, higher voltage line aims to improve system flexibility and stability and will require further pre-feasibility studies. The refurbishment of the interconnector between Meliti in Greece and Bitola in North Macedonia aims at increasing its transfer capacity. In this way, the upgraded interconnector will enable the reduction of price differentials, mitigate curtailment of renewables and improve accommodation of flows, which will improve system flexibility and stability.

¹³ <https://tyndp.entsoe.eu/tyndp2018/projects/>

Six projects aim at enhancing interconnectivity between the EU and the Western Balkan. The interconnector between Italy and Montenegro is part of the Transbalkan corridor that will further continue to connect Montenegro, Bosnia and Herzegovina and Serbia. The project will help lower the price differentials between Italy and South Eastern Europe through the Balkans, integrate renewables and reduce system adequacy deficiencies. Other projects in the Balkan region such as the interconnectors between Croatia and Serbia and Croatia and Bosnia and Herzegovina are expected to support market integration (particularly between Croatia and Bosnia and Herzegovina) by improving security of supply (also for emergency situations), allowing for higher penetration of renewables in the area and increasing resilience and flexibility of the transmission network. The interconnector between Bulgaria and Serbia is part of the Central Balkan corridor and aims at improving East-West flows and reduce price differentials, while two interconnectors between Romania and Serbia are also expected to enhance energy flows, notably from renewable sources.

Planned interconnectors with third countries included in the TYNDP 2018



Four projects are planned to increase the interconnection capacity of the Euro-Mediterranean system and enhance the integration of renewables and electricity trade. The planned interconnector between Italy (Sicily) and Tunisia, currently known as ELMED, will be an HVDC submarine cable that would enable exports, in particular of renewable energy, from Italy to Tunisia. The project, which has the potential to help creating a Euro-Mediterranean grid, is subject to a detailed feasibility study. Another planned interconnector between Italy (connection point in Montalto do Castro, North of Rome) and Tunisia, currently known as TuNur, aims to connect a concentrated solar power plant with a storage located in Rejim Maatoug, Kebili, Tunisia to the European network. The transmission project would comprise not only of the submarine HVDC cable but also of converter stations and necessary reinforcement lines in Tunisia. For a number of countries, supporting further interconnections with the EU could become a positive driver for wider development and modernisation of national transmission system infrastructure to ensure more shared benefits from the renewables resources. The planned interconnector between Greece (Crete) and Libya, currently known as LEG1, would allow for electricity exchange between Europe and the South-Eastern Mediterranean countries. It is part of a bigger project that would also comprise the development and operation of a large solar power generation plant in Tobrouk, Libya. The last planned project in the Mediterranean region is the Eurasia Interconnector between Greece (Crete), Cyprus and Israel. Most notably, the project can end the full electricity isolation of Cyprus and enhance electricity exchange between the three participant countries.

The Expert Group concludes that interconnectors with third countries play different roles for the EU as a whole and the EU member's national electricity systems. Some of them were developed under past political administrative conditions but still play an important role in enabling electricity trade and thus ensuring security of supply and stability of grids. However, the recent ongoing and planned reinforcements of existing interconnectors and the development of new ones are increasingly driven by the need to integrate growing share of variable renewables and improve the accommodation of internal and cross-border commercial flows.

3. Cooperation frameworks with neighbouring countries

The Expert Group notices that the cooperation frameworks, within which the European transmission system operators operate interconnectors with their neighbours, differ greatly in terms of technical, political and market rules. The

cooperation rules mostly reflect the intensity of the overall economic and political relations with the neighbouring countries.

In the assessment of the Expert Group, by far the most advanced and comprehensive cooperation is the one between the EU and countries in the framework of the **Energy Community**¹⁴: Albania, Bosnia and Herzegovina, North Macedonia, Montenegro, Moldova, Serbia, Ukraine and Georgia. The objective of the Energy Community is to bring together the European Union and its neighbours to create an integrated pan-European energy market. The organisation was founded by the Treaty establishing the Energy Community signed in October 2005 in Athens, Greece, and it is in force since July 2006. The Energy Community aims to extend the EU internal energy market rules for cross-border energy trade and integration with the EU, attract investments in power generation and networks, enhance the security of supply, improve the environmental situation and enhance competition at regional level. To achieve its goals, the contracting parties in the Western Balkan implement the provisions of the TEN-E regulation to provide a regulatory framework coherent with the EU and the projects of common interest. More specifically, the contracting parties select and prioritise a limited number of strategic transmission infrastructure projects, so called Projects of Energy Community Interest (PECI) among the members of the Energy Community, as well as Projects of Mutual Interests (PMI¹⁵) between the Energy Community members and the EU. On the list adopted in 2018¹⁶, there are two electricity PEGI projects. Besides, there are two electricity PMI projects between Romania and Moldova and Ukraine and Slovakia. In both cases, however, the projects are upgrades of existing lines.

In 2016, the six Western Balkan contracting parties and a number of EU member states agreed on a Roadmap for a regional electricity market for the Western Balkan¹⁷. The agreement outlines steps to develop an electricity market through spot trading and links between markets in the region. The overall purpose is to create a regional electricity market. The cooperation was further reinforced by the

¹⁴ More about the Energy Community: <https://www.energy-community.org/>

¹⁵ R1201811MC-EnC on Projects of mutual interest between Contracting Parties and Member States of the European Union. Please also refer to Annex I for the overview of PEGI and PMI projects.

¹⁶ D12018111/MG-EnC on the establishment of the list of projects of Energy Community interest ('Energy Community list'), available at: <https://www.energy-community.org/regionalinitiatives/infrastructure/selection/2018.html>

¹⁷ Roadmap for a regional electricity market for the Western Balkan 6, available at <https://ec.europa.eu/energy/sites/ener/files/documents/Roadmap.pdf>

Sofia Declaration¹⁸, which among others, aims at increasing the interconnectivity and expanding the Energy Union to the Western Balkans, including by completing the regional electricity market, creating single regulatory space and ensuring its integration with the EU internal energy market.

The **Eastern Partnership** is the political framework for cooperation with **Ukraine, Belarus and Moldova** as well as with non-neighbouring countries such as **Armenia, Azerbaijan and Georgia**. In the Joint Declaration¹⁹ made at the 5th Eastern Partnership Summit in November 2017 in Brussels, the participants “recognise the importance of secure, sustainable, reliable and affordable energy for all and are committed to bolstering energy security through interconnections and the sustainable use of energy resources, including enhanced energy efficiency and use of renewable energy, reduce dependency and bolster resilience”.

Besides, Ukraine (2016), Georgia (2014) and Moldova (2014) signed Association Agreements with the EU that set out to reform their energy policies based on the EU model. Modernisation and enhancement of existing energy infrastructure of common interest is one of the key objectives of cooperation.

In addition, a Memorandum of Understanding on a Strategic Energy Partnership, signed in 2016, specifically reinforces the energy cooperation with Ukraine. The Memorandum aims to achieve full integration of EU and Ukraine energy markets, for which development of infrastructure is essential and supports the energy reform process of Ukraine based on the Energy Union. This work is supported by the development of Annual Work Plans that focus on specific actions to advance the integration and reform process. The Expert Group notes that there is no active energy dialogue with Belarus at the moment.

As regards **Russia**, the Expert Group notes that the energy dialogue with Russia is currently frozen.

Energy cooperation with **Turkey** received more attention with the launch of the High Level Energy Dialogue in 2015 as a complement and support to Turkey's accession process. The dialogue's objective is to cooperate further for securing and diversifying energy supplies and for ensuring competitive energy markets.

¹⁸ Sofia Declaration, EU-Western Balkans Summit, 17 May 2018, available at http://www.consilium.europa.eu/media/34776/sofia-declaration_en.pdf

¹⁹ Joint Declaration of the Eastern Partnership Summit, Brussels, 24 November 2017, available at <http://www.consilium.europa.eu/media/31758/final-statement-st14821en17.pdf>

As regards the EU accession negotiations, the Chapter on trans-European Networks has remained open since 2007 and no progress has taken place. In this regard, the Expert Group notes, that Turkey's accession negotiations have effectively come to a standstill as stated in the conclusions²⁰ of the General Affairs Council of June 2018.

The political cooperation between the European Union and the Mediterranean countries takes place in the framework of **The Union for the Mediterranean (UfM)**. The UfM promotes economic integration across 15 neighbours to the EU's South in North Africa, the Middle East and the Balkans region. The direct EU neighbours and members of the UfM Sea are Algeria, Egypt, Israel, Lebanon, Morocco and Tunisia. Such cooperation has a considerable potential to contribute to the economic and political stability of the region.

Cooperation in the energy and climate related sectors is a major element of the Euro-Mediterranean partnership in order to deal with energy and climate change challenges in the region while advancing towards more secure and sustainable energy models. The latest energy ministerial of December 2016²¹ emphasised the need to focus the UfM work among others on facilitating the planning and development of interconnections, inter alia through the promotion and exchange of information, energy storage and other infrastructures, as well as through the assessment of energy markets and different demand and supply challenges. Furthermore, strengthening the interconnections, including those necessary to complete the EU internal energy market, in order to facilitate the integration of renewable energies, strengthen energy security within the UfM region and promote interconnections development at regional and Euromed level.

The Expert Group notes that the political frameworks translate into a wide range of technical cooperation at multilateral, European and bilateral levels, which all enable the operation of existing interconnectors with third countries, notably in the ENTSO-E framework. ENTSO-E and its predecessor organisations had been formed to foster close cooperation in interlinked electricity grids in Europe from a technical and economic point of view. Therefore, the perimeter of ENTSO-E membership reflects well the special relevance and role of interconnectors linking ENTSO-E members.

The Western Balkans have the most advanced technical cooperation with the European electricity systems as the Transmission System Operators (TSOs) from

²⁰ <http://www.consilium.europa.eu/media/35863/st10555-en18.pdf>

²¹ <http://ufmsecretariat.org/wp-content/uploads/2016/12/UfM-Ministerial-Declaration-on-Energy.pdf>

the neighbouring countries in that area are members of the European Network of Transmission System Operators for electricity (ENTSO-E): Albania, Bosnia and Herzegovina, Serbia, North Macedonia and Montenegro²². It implies that the TSOs are fully involved in the preparation and adoption of ENTSO-E strategic documents such as the Ten Year Network Development Plan, are represented in all bodies of the association and participate in the preparation of the closed network and other related methodologies. They also have to comply with the Operational Handbook and be solely responsible for the frequency containment reserve (FCR) and the frequency restoration reserve (FRR) and for maintaining the power interchange within their control area. As regards Turkey, it has an ENTSO-E observer status.

ENTSO-E has concluded a number of other agreements with TSOs beyond the membership to cooperate on a range of technical issues with countries and TSOs. In 2016, it signed an Agreement on the Conditions for Future Interconnection of Power System of Ukraine with Power System of Continental Europe with Ukraine's Ukrenergo and Moldova's Moldelectrica, which creates a framework for analysis and preparation of synchronisation of respective power systems within a set timeframe of 6 years.

ENTSO-E has also established cooperation with Med-TSO – the voluntary Association of the Mediterranean TSOs for electricity, whose members operate the high voltage transmission networks of 19 Mediterranean Countries. Ten Med-TSO Members are also members of ENTSO-E (Albania and Montenegro in the Western Balkan as well as Croatia, Cyprus, France, Greece, Italy, Portugal, Slovenia and Spain on the EU side), while eight are not (Morocco, Algeria, Tunisia, Libya, Egypt, Israel, Jordan, Palestine).

Med-TSO has been set up as a technical platform that, using multilateral cooperation as a strategy for regional development, facilitates the integration of the Mediterranean power systems and fosters security and socio-economic development in the Region. Its members share the primary objective of promoting the creation of a Mediterranean energy market, ensuring its optimal functioning through common methodologies, rules and practices for optimising the operation of the existing infrastructures and facilitating the development of new ones. The results of the cooperation should be the development of new interconnectors and harmonised regulatory framework. In that regard, a similar cooperation exists between the relevant regulators in the framework of MEDREG²³ – the Association

²² Montenegro is considered a neighbouring country as it has a sea border with the EU despite not having a land border.

²³ <http://www.medreg-regulators.org/Home.aspx>

of Mediterranean Energy Regulators. MEDREG primarily promotes a transparent, stable and compatible regulatory framework in the Mediterranean Region to foster market integration and infrastructure investments. The Expert Group notes that, currently, no physical interconnectors exist between the EU member states and Southern and Eastern Mediterranean countries, except for one interconnector between Spain and Morocco. At the same time, the Expert Group notes that several specific projects are already identified by the Ten Year Network Development Plan for electricity to integrate the electricity of the system, enhance its stability and promote larger uptake of renewables including from the Northern African countries. In this respect, Med-TSO has recently published the first Master Plan of the Mediterranean Transmission Grid²⁴. The document will be updated regularly and should become a reference point for any further assessment of Mediterranean projects in the frame of the next editions of the TYNDP.

The Expert Group notes that there are no specific technical agreements between Russia and Belarus on the one side and ENTSO-E on the other side. Electricity exchange between these countries and the EU takes place purely on a bilateral basis.

The Expert Group also observes that integration of regional electricity markets has been taking place outside the EU. For example, regional integration is gaining ground among Central American countries, ASEAN countries²⁵, in Africa²⁶ or in Asia-Pacific region²⁷. Efforts are also made to develop global electricity interconnectors as promoted by the Chinese Global Energy Interconnection Development and Cooperation Organization (GEIDCO). This is a positive trend and should be further encouraged whenever the benefits of interconnectors can be realised, i.e. more renewable energy can be generated and consumed, the security of supply is improved and prices become more affordable for citizens. In that context, the Expert Group recognises that the European framework for energy networks development, significantly reinforced by the Guidelines for trans-European energy infrastructure (TEN-E Regulation), offers an advanced toolbox to streamline and speed up the process of infrastructure development which could be transferred to other regions in the world.

²⁴ <http://www.med-tso.com/publications2.aspx>

²⁵ For instance <https://www.iea.org/publications/freepublications/publication/Interconnection.pdf>

²⁶ West African Power Pool, <http://www.ecowapp.org/en>

²⁷ Ministerial Declaration on Regional Cooperation for Energy Transition towards Sustainable and Resilient Societies in Asia and the Pacific <https://www.unescap.org/resources/ministerial-declaration-second-asian-and-pacific-energy-forum>

4. Assessment and recommendations

The Expert Group recognises that there are a number of political and economic reasons to cooperate with the neighbouring countries and benefit from existing and future interconnectors.

As underlined in its first report, the work of the Expert group takes place in the framework of the climate and energy objectives of the European Union for 2020, 2030 and 2050 as laid down in the Energy Union Framework Strategy, the Clean Energy Package and the Paris Agreement.

Therefore, the Expert Group is of the opinion that the underlying principles for the assessment framework should be the main objectives of the EU energy policy strategy i.e. the security of supply, sustainability and competitiveness, the latter one in terms of market integration and trade of electricity. In addition and particularly as regards the planned interconnections, they should be assessed by their political relevance in promoting energy and climate objectives in the spirit of economic stability, peace and security. More specifically:

1) As regards the role of interconnectors with neighbouring countries in contribution to reaching the 2030 electricity interconnection targets, the Expert Group reaffirms that EU electricity interconnection levels should be calculated based on the new formulas introduced in the Group's first report and only by taking into account the interconnectors between the EU member states as well as Switzerland and Norway.

2) The Expert Group is of the opinion that interconnectors with countries that share a high level of regulatory convergence and have reliable and well-grounded political, technical and environmental cooperation with the EU should be particularly prioritised and promoted by the European Union and the concerned neighbouring countries. The Expert Group assesses that such high level of cooperation can be observed with the Energy Community contracting parties, i.e. in Western Balkans as well as, increasingly, with Ukraine and Moldova. Existing interconnectors with these countries, planned Projects of Common Interest (PCI), Projects of Energy Community Interest (PECI) and Projects of Mutual Interests (PMI) should be given the highest priority.

3) As regards planned interconnectors with neighbouring countries, the Expert Group recommends that the European Union should continue promoting interconnectors with its neighbours if such interconnectors help to significantly enhance security of supply, mainly used for system flexibility and system

stability services such as e.g. frequency control and power balancing. Interconnectors should not however be used primarily for security of supply in terms of adequacy to meet internal demand. In that regard, the Expert Group is of the opinion that adequacy to meet demand must be primarily pursued within a fully integrated area with the same market and environmental rules and their full enforcement.

4) The European Union should, in general, promote interconnectors that help increase the consumption of electricity from renewable sources in the EU but at the same time also encourage a growing renewable generation and consumption in the neighbouring countries with the overall objective to intensify energy transition towards long-term decarbonisation objectives in the EU and elsewhere, taking into account the operational life-time of the interconnectors.

5) The European Union should, in general, also promote interconnections with neighbouring countries where market level playing field exists for imports and the rules for environmental protection, safety and sustainability are in line with the European standards or converge towards such standards. This is to avoid that interconnectors bring electricity generated on a basis that can distort competition on the internal energy market or even enhance “carbon leakage”.

6) The Expert Group also strongly encourages EU member states, the European Commission, ENTSO-E, the relevant transmission system operators, national regulators, ACER and relevant national and regulatory authorities of all neighbouring countries including their TSOs to step-up and continue the cooperation in order to align the energy market rules and create a level playing field for electricity trade and clean energy transition in the EU and its neighbourhood.

7) The Expert Groups reiterates that interconnectors with third countries have realistic potential of promoting EU's external policy objectives such as fostering renewable integration, security of supply, regional and local-socio economic welfare, economic cooperation, environmental standards, wide involvement of stakeholders as well as peace and solidarity. In that regard, the Expert Group strongly recommends sharing good practices on effective involvement of the general public and local communities in the neighbouring countries. Large-scale infrastructure projects have the potential to mobilise local societies for democratic and constructive participation during the

planning and development phases and to raise awareness on the need of and challenges related to energy transition and climate actions. The Expert Group recommends the Commission's and Member States activities in this regard to be open to third countries in order to increase their transferability potential.

8) The Expert Group also notes the need for intensifying efforts in order to develop and reinforce electricity networks in other regions in the world. The Expert Group recognises that large-scale electricity interconnectors and integration of other regional markets is the right direction to harness the benefits of interconnectors as it has been taking place in Europe and advance with the clean energy transition. In that context, the transferability potential of good practices developed by the TEN-E framework should be better exploited and mainstreamed in the cooperation between the EU and other third countries. At the same time, the Expert Group recognises that the focus in the EU should be on completing a strong and fully functioning European regional market. Only in a later future, consideration could be given to extend the cooperation and analyse options for connecting regional markets at a global stage.

ANNEX 1: Projects of Energy Community Interest (PECI) and Projects of mutual interest (PMI) in electricity

Projects of Energy Community Interest in electricity

EL_01	Transbalkan corridor
EL_02	400 kV OHL Bitola (North Macedonia) - Elbasan (AL)

Projects of Mutual Interest in electricity

EL_06	400 kV OHL Vulcanesti (MD) - Issacea (RO)
EL_07	400 kV Mukacheve (Ukraine) – V.Kapusany (Slovakia) OHL rehabilitation
EL_09	750 kV Pivdennoukrainska NPP (Ukraine) – Isaccea (Romania) OHL rehabilitation and modernisation

ANNEX 2: Projects involving interconnections with neighbouring countries and the needs they address as identified by ENTSO TYNDP 2018

West Balkan 6

Id	Name	Market Node A	Market Node B	The needs addressed ²⁸
144	Mid Continental East corridor	RO	RS, HU	Cross-border impact, RES integration, Market integration. Mitigates RE curtailment and improves accommodation of flows. Enables the reduction of price differentials (by adding capacity) across EU: Between synchronous systems; Between Areas (eastern and western part of Balkan) Between Countries (EU and non-EU).
227	Transbalkan Corridor	RS, ME	BA, ME, IT	Cross-border impact, RES integration, Market integration, Security of supply in WB6 region and support of export and import within the region and to/from outside. Infrastructure to mitigate RES curtailment and to improve accommodation of flows. Infrastructure to enable the reduction of price differentials (by adding capacity) across EU: Between synchronous systems; Between Areas (eastern and western part of Balkan), Between

²⁸ As per project sheets in the TYNDP2018, that can be consulted at <https://tyndp.entsoe.eu/tyndp2018/>

Id	Name	Market Node A	Market Node B	The needs addressed ²⁸
				Countries (EU and non-EU).
241	Upgrading of existing 220 kV lines between HR and BA to 400 kV lines	BA	HR	Security of Supply in the WB6 area. Infrastructure to improve system flexibility and stability, e.g. can ramp quickly to meet system needs.
243	New 400 kV interconnection line between Serbia and Croatia	HR	RS	SEW due to market integration. Mitigates RES curtailment and improves accommodation of flows.
341	North CSE Corridor	RO	RS	Cross-border impact, RES integration, Market integration, Security of supply in WB6 region and support of export and import within the region and to/from outside.
342	Central Balkan Corridor	BG	RS	Increase of Transfer Capacities and Market Integration facilitation. Enabling the reduction of price differentials (by adding capacity) across EU: Between synchronous systems; Between Areas (eastern and western part of Balkan) Between Countries (EU and non-EU).

Id	Name	Market Node A	Market Node B	The needs addressed ²⁸
343	CSE1 New	BA	HR	Infrastructure to mitigate RES curtailment and to improve accommodation of flows. Infrastructure to improve system flexibility and stability, e.g. can ramp quickly to meet system needs.
350	South Balkan Corridor	AL	MK	Increase of Transfer Capacities and Market Integration facilitation
376	Refurbishment of the 400kV Meliti(GR)-Bitola(MK) interconnector	GR	MK	Enabling the reduction of price differentials (by adding capacity) across EU: Between synchronous systems; Between Areas (eastern and western part of Balkan) Between Countries (EU and non-EU). Mitigates RES curtailment and improves accommodation of flows. Improve system flexibility and stability, e.g. can ramp quickly to meet system needs .

Italy-Tunisia

Id	Name	Market Node A	Market Node B	The needs addressed ²⁹
29	Italy-Tunisia	ITsic	TN00	RES integration, Security of Supply, Soci-Economic Welfare. Infrastructure to enable the reduction of price differentials (by

²⁹ As per project sheets in the TYNDP2018, that can be consulted at <https://tyndp.entsoe.eu/tyndp2018/>

Id	Name	Market Node A	Market Node B	The needs addressed ²⁹
				adding capacity) across EU: Between synchronous systems; Between Areas (eastern and western part of Balkan) Between Countries (EU and non-EU). Infrastructure to mitigate RES curtailment and to improve accommodation of flows. Infrastructure to improve system flexibility and stability, e.g. can ramp quickly to meet system needs. Infrastructure to address system adequacy deficiencies.
283	TuNur	ITcs	TN00	RES integration, Security of Supply, Socio-Economic Welfare. Infrastructure to mitigate RES curtailment and to improve accommodation of flows. Infrastructure to address system adequacy deficiencies.

Greece – Cyprus – Israel

Id	Name	Market Node A	Market Node B	The needs addressed ³⁰
219	EuroAsia Interconnector	CY-IL	GR	SEW, RES integration. Cheaper energy will be transferred due to higher integration of renewable energy sources from the region.

³⁰ As per project sheets in the TYNDP2018, that can be consulted at <https://tyndp.entsoe.eu/tyndp2018/>

Greece - Lybia

Id	Name	Market Node A	Market Node B	The needs addressed ³¹
284	LEG1	GR	LY	<p>SEW, RES integration. Main impact as expected and assessed is high RES integration which drives the Socio-Economic Welfare. RES integration. Europe has identified CO2 emissions reduction objectives along with the desire to connect its islands to the continent. LEG1 provides a significant source of "green" energy, affordable which connects a major European island (Crete). It is designed to offer more supply options to isolated areas (Crete). Enables the reduction of price differentials (by adding capacity) across EU:↵ Between ↵ synchronous systems;↵ Between Areas (eastern and western part of Balkan)↵ Between Countries (EU and non-EU)↵. Enables cost-efficient grid connection of high volumes of RES.</p>

³¹ Idem 30

Italy - Montenegro

Id	Name	Market Node A	Market Node B	The needs addressed ³²
28	Italy-Montenegro	ITcs	ME	Infrastructure to mitigate RES curtailment and to improve accommodation of flows. Infrastructure to enable the reduction of price differentials (by adding capacity) across EU: Between synchronous systems; Between Areas (eastern and western part of Balkan) Between Countries (EU and non-EU). Infrastructure to address system adequacy deficiencies. Infrastructure to improve system flexibility and stability, e.g. can ramp quickly to meet system needs.

³² As per project sheets in the TYNDP2018, that can be consulted at <https://tyndp.entsoe.eu/tyndp2018/>

ANNEX 3: Composition of the Expert Group and profiles of its members

1. **Mr Gkizas G. Apostolos**, Head of Units(s) RES Development & Energy Storage Policy Electricity Networks & Smart Grids Technologies at Greek Regulatory Authority for Energy (RAE) representing the Agency for the Cooperation of Energy Regulators (ACER);
2. **Mr Robert Schroeder**, Manager System Development, and **Ms Concha Sanchez Perez**, System Development Advisor, representing the European Networks of Transmission System Operators for electricity ENTSO-E;
3. **Mr Anne Boorsma**, ENTSOE, Business Area Manager System Development, and **Mr Malcolm Arthur**, Business Area Manager Markets, representing the European Networks of Transmission System Operators for gas ENTSOE;
4. **Ms Paulina Beato Blanco**, member in a personal capacity, Professor of economics, former CEO of Red Electrica de Espana, former principal economist of the Interamerican Development Bank;
5. **Mr Maciej Jakubik**, Executive Director, representing Central Europe Energy Partners (CEEP);
6. **Mr Yannick Phulpin**, Senior Engineer EDF, representing Eurelectric;
7. **Mr Nikolaos Vasilakos**, Member of EREF Advisory Board, former President of the National Regulatory Authority for Energy in Greece, representing the European Renewable Energies Federation;
8. **Mr Pierre Bernard**, CEO, representing Friends of the Sustainable Grids;
9. **Mr Daivis Virbickas**, CEO, and his alternate **Mr Liutauras Varanavicius**, Director of Strategy Department, representing Litgrid AB;
10. **Mr Brian Vad Mathiesen**, member in a personal capacity, Professor in Energy Planning and Renewable Energy Systems at Aalborg University;
11. **Mr Michal Smyk**, Head of Strategy, Polska Grupa Energetyczna (PGE), representing Polish Electricity Association (PKEE);
12. **Mr Morris Bray**, Director European Business Development, representing National Grid;
13. **Ms Antonella Battaglini**, CEO representing Renewable Grid Initiative (RGI);
14. **Mr Auke Lont**, CEO and his alternate **Mr Tor Eigil Hodne**, Senior Vice President European Affairs, representing Statnett;

15. **Mr Jochen Kreusel**, Market Innovation Manager Power Grids Division and Senior Vice- President at ABB; Professor RWTH Aachen, T&D Europe Vice- President, representing T&D Europe;
16. **Ms Cécile George**, alternate member in a personal capacity, former Director of Electric Grid Access at the French energy regulatory authority;

Chair of the Expert Group: **Ms Catharina Sikow-Magny**, Head of Networks and Regional Initiatives Unit, Directorate-General for Energy, European Commission, assisted by Policy Officer **Mr Tomasz Jerzyniak**, Networks and Regional Initiatives Unit, Directorate-General for Energy, European Commission.

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