Chapter 2

International Experiences: The Nordic and the European Union

This chapter should be cited as
Study team (2019), 'International Experiences: The Nordic and the European Union', in Noord Pool Consulting (eds.), *Study on the Formation of the ASEAN Power Grid Transmission System Operator Institution.* ERIA Research Project Report FY2018 No. 24, Jakarta: ERIA, pp.3-14.

Chapter 2

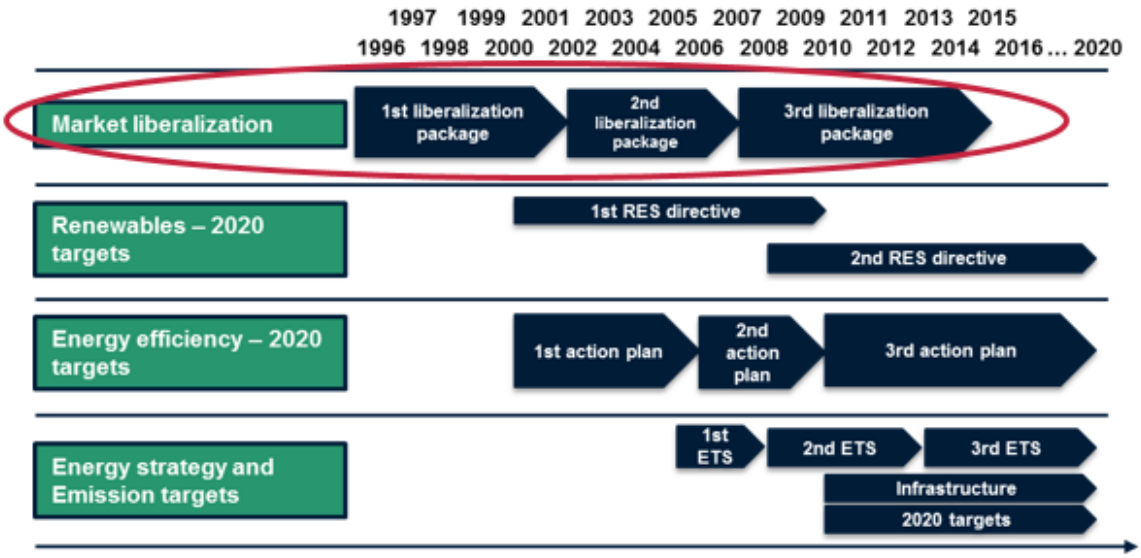
International Experiences:

The Nordic and the European union

1. Background

The Nordic region and Europe has long roots in the area of cooperation among the Transmission System Operators (TSO). Cooperation among the European TSOs has been guided by legislation within the European Union (EU). The push for electricity market liberalization in Europe originates mainly from the EU. The process towards liberalized national markets started already in the late 1996 (Figure 1), when the European Parliament introduced the first electricity market liberalization package. This directive provided progressive market opening scheme so that from 1999 to 2003, member states were required to liberalize 25%–33% of their national markets. This further began the unbundling of the electricity market activities.

Figure 1: Overview of the European Union's Energy Policy



Source: Overview compiled by Author.

The most extensive energy package was introduced in 2009. It continued from where the second package left off and extended the national electricity market opening. Directive 2009/72/EC further continued efforts to unbundle the different actors in the electricity market. All customers were given the right to choose their electricity provider and to change it easily within 3 weeks. In other words, all customers were deemed eligible. In addition, access to transmission system network was required to be granted to all third parties.

National authorities were given rights to participate in electricity undertakings, but these activities were required to be kept separate from the transmission and distribution services. The aim was to unbundle energy production and supply interests from the network. One important point was also to establish independent national regulatory authorities. Their roles are to (i) determine transmission and distribution tariffs, (ii) cooperate in cross-border issues, (iii) monitor the transmission system operators, and (iv) ensure user access to customer consumption data. Finally, an institution called the European Network of Transmission System Operators for Electricity (ENTSO-E) was established and given legal mandates to function.

TSOs are entities operating independently from the other electricity market players and are responsible for the bulk transmission of electric power on the main high-voltage electric networks. TSOs provide grid access to the electricity market players (i.e. generating companies, traders, suppliers, distributors, and directly connected customers) according to non-discriminatory and transparent rules. To ensure the security of supply, they also guarantee the safe operation and maintenance of the system. In many countries, TSOs are also in charge of the development of the grid's infrastructure.

The members of ENTSO-E consist of 42 companies in 34 countries. ENTSO-E's operations are regulated by the EU's cross-border transmission regulation EC No. 714/2009. The European TSOs must work together to promote the functioning of the electricity market and cross-border trade of electricity within the EU, ensure the optimal management and coordinated operation of the transmission system, as well as its technically sound development. In accordance with the cross-border transmission regulation, ENTSO-E must contribute to the preparation of network codes and 10-year network development plans for the European transmission system.

The supreme decision-making body of ENTSO-E is the general assembly where all members are represented. The general assembly is headed by a board, which has 10 members from all over Europe. The practical work is organized into four committees: Market Committee, Operations Committee, System Development Committee, and Research and Development Committee. Various working groups and regional committees work under these groups. Law and information technology specialists support the activities through their own group. The ENTSO-E secretariat is located in Brussels.

1.1. Governance in ENTSO-E

ENTSO-E is governed by a general assembly with representatives from 43 TSOs and by a board consisting of 12 elected members. ENTSO-E was formally established and given legal mandates by the EU's Third Energy Package, which was adopted in July 2009. Although the Third Energy Package did not formally apply until March 2011, ENTSO-E was created in December 2008 and was fully operational as of July 2009.

In December 2010, in order to be fully compliant with the obligations under Article 5 of Regulation (EC) No 714/2009 on the establishment of the association, ENTSO-E submitted its

Articles of Association and Internal Regulations to the Agency for the Cooperation of Energy Regulators (ACER) and to the EC. Based on opinions formulated by ACER and the EC, the general assembly of ENTSO-E adapted the documents in June 2011.The Articles of Association and Internal Regulations were further reviewed and improved in September 2014.

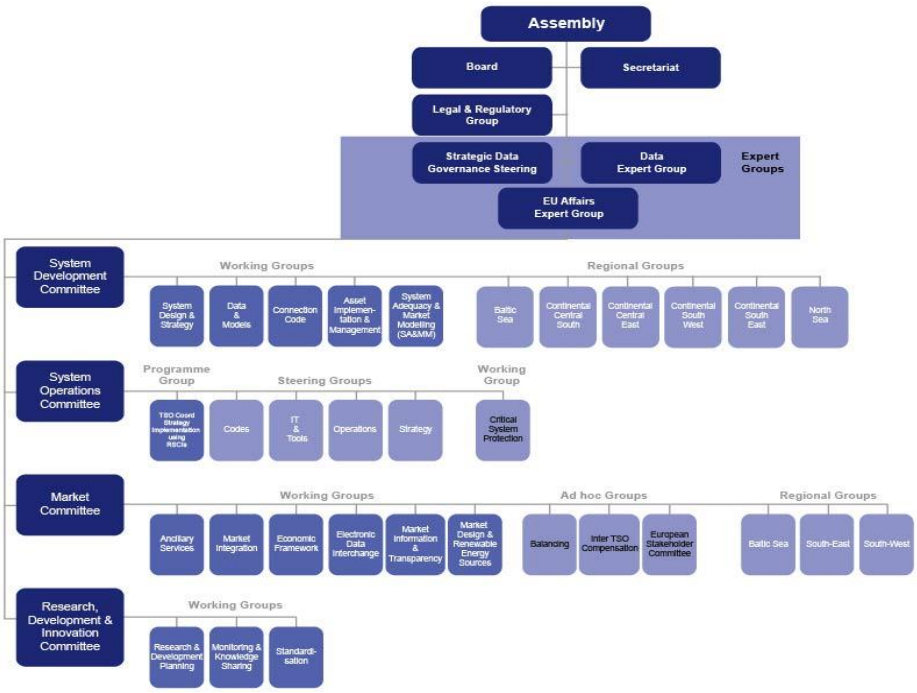
The Articles of Association govern, among others, the operation of ENTSO-E, its membership, the roles and relationships among the various ENTSO-E bodies, and the distribution of voting rights among the members. The Internal Regulations complements the Article of Association by defining the practical and technical rules and procedures governing the operations of ENTSO-E.

2. General Overview of ENTSO-E

ENTSO-E has four core secretariat teams to implement and develop guidelines, and other packages relevant to the core mission of ENTO-E. The organizational structure in Figure 2 presents four major work categories, as follows: [2]

- System development
- System operations
- Market
- Research, development, and innovation

Figure 2. ENTSO-E Organization



Source: https://www.entsoe.eu/

[2] The information presented in this chapter can be found at https://www.entsoe.eu/

The ENTSO-E Secretariat's **system development team** supports two of the four ENTSO-E committees: (i) the System Development Committee and (ii) the Research, Development, and Innovation Committee, as well as all of the associated working and regional groups. The System Development Committee is in charge of TSO cooperation on network development and planning. Its main mission is to coordinate the development of a secure, environmentally sustainable, and economic transmission system, which aims to create a robust European grid that can facilitate the creation of a well-functioning European electricity market and, from the planning point of view, a high standard of interoperability, reliability. and security.

System operations is the core activity of any TSO. It covers the actions taken to ensure the optimal and secure operation of the grid in real time. The ENTSO-E System Operations activities are about the following:

- Developing European operational standards notably through network codes,
- Protecting critical infrastructure systems,
- Developing and maintaining a common system operation channel: the electronic highway,
- Developing a common model of the grid that can be used for system operation,
- Defining a methodology for dealing with operational reserves – power reserves that can be activated to maintain the grid's balance,
- Classification and follow up of operational incidents, and
- Promotion and enhancement of coordinated system operation and services notably through the regional service providers.

ENTSO-E's **market team** supports TSO members in all areas relating to the development and harmonization of market rules. The progressive harmonization of electricity market rules is at the heart of promoting an effectively competitive internal market, delivering benefits to electricity customers, and opportunities to generators and energy traders. The objectives of the Market Committee are to ensure that the objectives of the third Internal Energy Market package are realized, and to facilitate the development of a well-functioning European electricity market. This is achieved by contributing to market design and developing market-related network codes in cooperation with ENTSO-E's 43 members, and in close consultation with stakeholders.

The **research, development, and innovation** performed by TSOs are complementary to the work performed by universities, research institutes, or equipment manufacturers. TSOs focus more on the integration of technology than on innovation or the production of new technologies. ENTSO-E plays a key role in developing the pan-European grid and in achieving the ambitious European decarbonization goals by 2050. ENTSO-E and its TSO members share a common vision for tackling the key challenges. TSOs are aware of the need to accelerate technological innovation. The development of new grid equipment technologies, modelling methods, and grid architecture will enable TSOs to fulfil their mission in an evolving energy

system. This mission is shared by the Council of European Energy Regulators to encourage network operators to seek innovative solutions.

Table 1. List of ENTSO-E Members

Country	Member Company
Albania	OST sh.a – Albanian Transmission System Operator
Austria	Austrian Power Grid AG VorarlbergerÜbertragungsnetz GmbH
Belgium	Elia System Operator SA
Bosnia and Herzegovina	Nezavisni operator sustava u BosniiHercegovini
Bulgaria	ElectroenergienSistemen Operator EAD
Croatia	HOPS d.o.o.
Cyprus	Cyprus Transmission System Operator
Czech Republic	ČEPS, a.s.
Denmark	Energinet.dk
Estonia	Elering AS
Finland	FingridOyj
France	Réseau de Transport d'Electricité
FYR of Macedonia	Macedonian Transmission System Operator AD
Germany	TransnetBW GmbH TenneT TSO GmbH Amprion GmbH 50Hertz Transmission GmbH
Greece	Independent Power Transmission Operator S.A.
Hungary	MAVIR Magyar Villamosenergia-iparíÁtviteliRendszerirányító Zártkörűen Működő Részvénytársaság
Iceland	Landsnethf
Ireland	EirGrid plc
Italy	Terna - Rete ElettricaNazionaleSpA
Latvia	AS AugstspriegumatĪkls
Lithuania	Litgrid AB
Luxembourg	Creos Luxembourg S.A.
Montenegro	Crnogorskielektroprenosnisistem AD
Netherlands	TenneT TSO B.V.
Norway	Statnett SF
Poland	Polskie Sieci Elektroenergetyczne S.A.
Portugal	RedeEléctrica Nacional, S.A.
Romania	C.N. Transelectrica S.A.
Serbia	AkcionarskodruštvoElektromrežaSrbije
Slovak Republic	Slovenskáelektrizačnáprenosovásústava, a.s.
Slovenia	ELES, d.o.o., sistemskioperaterprenosnegaelektroenergetskegaomrežja
Spain	Red Eléctrica de España S.A.
Sweden	Svenskakraftnät
Switzerland	Swissgrid ag
Turkey	TEİAŞ (observer member)
United Kingdom	National Grid Electricity Transmission plc System Operator for Northern Ireland Ltd Scottish Hydro Electric Transmission plc Scottish Power Transmission plc

Source: See https://www.entsoe.eu/

2.1. Specifics

In Europe, the TSO harmonization is mainly driven by the EC as the lawful entity with decision and intergovernmental enforcement right. For the TSO aspects, the most relevant codes are the Capacity Allocation and Congestion Management (2015), Forward Capacity Allocation (2016), and Electricity Balancing (2017).

Europe's cross-border electricity networks are operated according to these rules, which govern the actions of operators and determine how access is given to users. In the past, these grid operation and trading rules were drawn up nationally, or even sub nationally. With increased interconnections among countries in the internal energy market, EU-wide rules have become increasingly necessary to effectively manage electricity flows. These rules, known as network codes or guidelines, are the Commission Regulations, which contain legally binding rules. They govern all cross-border electricity market transactions and system operations alongside the EU regulation on conditions for accessing the network for cross-border electricity exchanges.

These codes and guidelines are developed based on EC procedures. The EC begins by drafting an 'annual priority list' of areas to be included in the development of network codes for electricity. It does this based on a public consultation and with the input of the ACER and the ENTSO-E. Once the annual priority list is established, ACER develops 'framework guidelines' that set principles for developing specific network codes. These framework guidelines are used by ENTSO-E to prepare a network code, which is submitted back to ACER for its opinion. If ACER deems that the code fulfils its framework guidelines and the EU's internal market objectives, and is fair and balanced, it recommends that the EC adopts the code. The ultimate responsibility for the text and content of the network codes lies with the EC. The EC studies it and then sends it to an Electricity Cross-Border Committee, made up of specialists from national energy ministries, for an opinion. Once the EC accepts the draft network code, it is adopted with the approval of the Council of the European Union and the European Parliament. Sometimes the regulations are adopted as 'guidelines' rather than 'network codes'. These are adopted under a different provision of the Electricity Regulation, but they have the same status – they are both legally binding regulations. [3]

In terms of ENTSO-E's authority in Europe, the institution does not have legal authority over governments and national TSOs. The work is focused on promoting completion and functioning of the internal energy market in electricity and cross-border trade. Furthermore, it has an active and important role in the European rule-setting process, in compliance with EU legislation (network codes, 10-year network development plans). TSOs within the EU are free to create their own grid operational procedures as long as they comply with the relevant codes and guidelines and any other regional agreement put in place. However, one important note is ENTSO-E's 10-year net development plan. The regulation defines the European's Projects of Common Interest, which are electricity projects that have significant benefits for at least two member states. It also stipulates that ENTSO-E's Ten-Year Net Development Plan

[3] See European Commission at https://ec.europa.eu/energy/en/topics/wholesale-market/electricity-network-codes

be the sole basis for the selection of Projects of Common Interest. ENTSO-E is also mandated to develop a corresponding cost–benefit methodology for assessing transmission infrastructure projects.

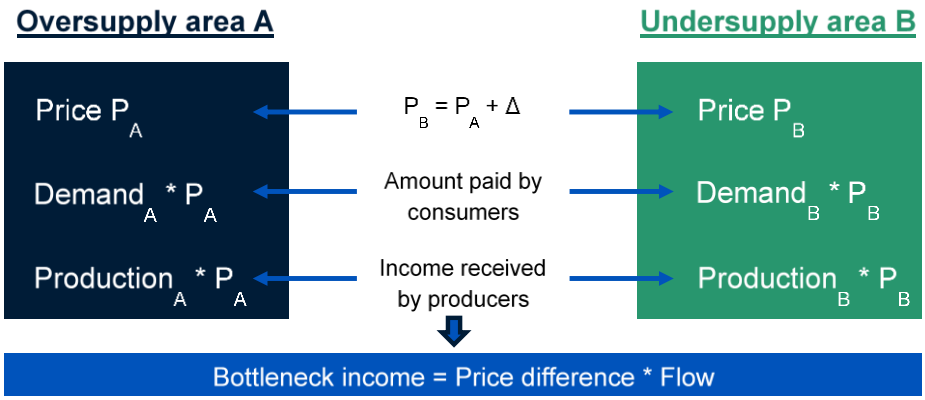
ENTSO-E also has a guiding role in other European-level regional sphere electricity projects, most notably in the following projects: Price Coupling of Regions (PCR), PX cooperation-owning Euphemia, and the PCR Matcher-Broker application; and in the following projects: Multi-Regional Coupling, Day Ahead coupling arrangement for TSOs, and Nominated Electricity Market Operators. However, ENTSO-E does not have formal decision-making role in these projects since these are EU guideline implementation projects, concerning mainly the national TSOs and the Nominated Electricity Market Operators.

3. Bottleneck income / congestion rent in Nordics

With implicit capacity auctioning, no additional wheeling charges are used between coupled systems. However, in the Nordics, the so-called bottleneck income or congestion rent is applied when there are price differences between market areas. Price differences between market areas occur when the surplus volume in one or more bidding area is greater than the total export capacity from this/these areas. The sales and purchase curves then have to be balanced by taking the transmission capacity into account. This will lead to a relatively low price in the surplus area and a relatively high price in the deficit area – utilizing the maximum capacity between the areas. These price differences generate an ownerless income on the spot market trading flow – from the area with a lower price to the area with a higher price.

This income (or cost) is referred to as the congestion rent and is aggregated within Nord Pool from the DAM settlement. Within the Nordic region, this income is allocated to the TSOs as owners of the transmission grid. Bottleneck income belongs to the interconnector owner. Since 2012, bottleneck incomes from an interconnector have been equally divided among the respective TSOs. EU legislation governs that bottleneck incomes must be used for cross-border capacity projects to aid in the relief of bottlenecks.

Figure 3. Bottleneck income



Source: Author.

4. Transparency and Data Collection

TSOs are often the primary source of relevant fundamental information. They are also used to collect and assess large amounts of information for system operation purposes. To provide an overall view of relevant information across the EU, TSOs should facilitate the collection, verification, and processing of data; and ENTSO-E should make the data available to the public through a central information transparency platform. [4]

Transparency has improved markedly in Europe over the past few years, culminating in Regulation (EU) No 5 43/2013 of 14 June 2013 on submission, which mandates a minimum common level of data transparency; publication of data on a non-discriminatory basis across Europe; and development of a central information platform, managed by ENTSO-E, to provide all market participants with a coherent and consistent view of the market. Through this regulation, it has now become mandatory for European member state data providers and owners to submit fundamental information related to electricity generation, load transmission and balancing for publication through the ENTSO-E Transparency Platform. In accordance with Regulation 543/2013, the ENTSO-E Transparency Platform was launched on 5 January 2015.[5] Generally, since the data collection is governed by EU- level law, ENTSO-E can dispute any misconduct of data collection through the European Commission dispute resolution process.

5. ENTSO-E Voting Rights and Budgeting

Most of legal and budgetary measures of ENTSO-E organization are governed in the Articles of Association. The rules on voting rights and budgeting were from this document.

5.1. Voting rights

In the ENTSO-E governance, the assembly members have voting rights while observer members do not have any voting rights. The ENTSO-E voting power has two parts: the first is the 'One country, one vote' principle and the second part is based on the population of the country. An average percentage shall be derived from the two-part voting power for each country. For example, in the votes for the president of the organization and the board members of the same, an average percentage of the proportional vote shares shall be calculated whereby 50% is determined based on the First Part of the Voting Power, and 50% is based on the Second Part of the Voting Power.

The first part of voting shall be attributed collectively as proportionate to the assembly members (i.e. full ENTSO-E members) and based on the number of votes that that country has as an EU member state in the Council of the European Union under the voting mechanism defined by the Lisbon Treaty. For non-EU member states, the voting power shall be defined according to the same mechanism (as if these countries were EU member states). The second part of the voting power shall be reviewed annually, as of the date of the publication in the

[4] See the Commission Regulation (EU) No 543/2013
[5] See the ENTSO-E articles of association

Official Journal of the European Union, based on the figures of the total population of each member state. For non-EU member states, the figures mentioned in the Statistical Papers of the United Nations shall become the bases. The first and second parts of the voting rights are presented in Table 2.

Table 2. Voting Power of the Members of the Association

Country	Member	First Part of the Voting Power ('one country, one vote' principle)	Second Part of the Voting Power (population of the country)
Austria	APG - Austrian Power Grid AG VUEN-Vorarlberger Übertragungsnetz GmbH	10 2	8 079,3 372,6
Belgium	Elia - Elia System Operator SA	12	11 161,6
Bosnia Herzegovina	NOS BiH - Nezavisni operator sustava u Bosni I Hercegovini	12	4 377,0
Bulgaria	ESO – Electroenergien Sistemen Operator EAD	12	7 284,6
Croatia	HOPS - Croatian Transmission System Operator Ltd	12	4 262,1
Cyprus	Cyprus TSO - Cyprus Transmission System Operator	12	865,9
Czech Republic	ČEPS - ČEPS, a.s.	12	10 516,1
Denmark	Energinet.dk IPC - Energinet.dk Independent Power Entreprise	12	5 602,6
Estonia	Elering - Elering AS	12	1 324,8
Finland	Fingrid - Fingrid OyJ	12	5 426,7
France	RTE - Réseau de Transport d'electricité	12	65 633,2
Germany	Amprion – Amprion GmbH TenneT GER – Tennet TSO GmbH TransnetBW -TransnetBW GmbH 50Hertz - 50Hertz Transmission GmbH	3 3 3 3	29 008,56 24 113,20 9 762,58 17 639,36
Greece	IPTO SA - Independent Power Transmission Operator S.A.	12	11 062,5
Hungary	MAVIR ZRt. - MAVIR Magyar Villamosenergia-ipari Átviteli Rendszerirányító Zártkörűen Működő Részvénytársaság	12	9 908,8
Iceland	Landsnet – Landsnet hf	12	281,1
Ireland	Eirgrid - EirGrid plc	12	4 591,1
Italy	Terna - Terna, Rete Elettrica Nazionale SpA	12	59 685,2
Latvia	Augstsprieguma tïkls - AS Augstsprieguma tïkls	12	2 023,8
Lithuania	LITGRID - LITGRID AB	12	2 971,9
Luxembourg	CREOS Luxembourg - CREOS Luxembourg S.A.	12	537,0

Montenegro	CGES AD - Crnogorski elektroprenosni sistem AD	12	620,0
Netherlands	TenneT TSO - TenneT TSO B.V.	12	16 779,6
Norway	Statnett - Statnett SF	12	4 979,9
Poland	PSE - PSE S.A.	12	38 533,3
Portugal	REN - Rede Eléctrica Nacional, S.A.	12	10 487,3
Romania	Transelectrica - C.N. Transelectrica S.A.	12	20 057,5
Serbia	EMS - JP Elektromreža Srbije	12	7 186,8
Slovak Republic	SEPS - Slovenská elektrizačná prenosovú sústava, a.s.	12	5 410,8
Slovenia	ELES - ELES, d.o.o., sistemski operater prenosnega elektroenergetskega omrežja	12	2 058,8
Spain	REE - Red Eléctrica de EspaÑa S.A.	12	46 704,3
Sweden	Svenska Kraftnät - Affärsverket Svenska Kraftnät	12	9 555,9
Switzerland	Swissgrid - Swissgrid AG	12	7 288,0
the former Yugoslav Republic of Macedonia	MEPSO - Macedonian Transmission System Operator AD	12	2 022,5
TOTAL		**408**	**531 906,4**
United Kingdom	National Grid - National Grid Electricity Transmission plc SONI – System Operator for Northern Ireland ldt SHE Transmission - Scottish Hydro Electric Transmission plc SP Transmission – Scottish Power Transmission plc	9 1 1 1	56 605,1 1 781,2 1 362,1 3 981,7

Source: ENTSO-E's Articles of Association.

5.2. Budgeting Measures

ENTSO-E is in principle a non-profit organization and entirely funded through membership fees paid to the association by its member TSOs. Its annual budget for 2014 was €17.7 million. The fees are divided into the following three categories:[5]

- Membership subscription fee,
- Associated membership fee, and
- Observer membership fee.

Membership subscription fee is paid annually by members by paying the amount as determined by their voting power – with 30% being proportionate to the first part of their voting power while 70% being proportionate to the second part of their voting power. Following its approval of the budget for the following year, the ENTSO-E assembly shall approve the amounts to be paid by the members for the ensuing financial year.

The associated member fee shall contribute to the budget of ENTSO-E at an equivalent amount of **€100,000 per year**.

The observer membership fee shall contribute to the budget of ENTSO-E at an equivalent amount of **€10,000–€70,000 per year,** as determined in the observer membership agreement.

6. Third-Party Access in the Nordics and the European Union

6.1. European Internal Electricity Market[6]

Directive 2009/72/EC of the European Parliament, dated 13 July 2009,[7] sets down a number of key provisions for the internal electricity market in Europe. On third-party access (TPA), Article 32 says the following:

'Member States shall ensure the implementation of a system of third party access to the transmission and distribution systems based on published tariffs, applicable to all eligible customers and applied objectively and without discrimination between system users. Member States shall ensure that those tariffs, or the methodologies underlying their calculation, are approved prior to their entry into force in accordance with Article 37[8] and that those tariffs, and the methodologies — where only methodologies are approved — are published prior to their entry into force'.

The transmission or distribution system operator may refuse access where it lacks the necessary capacity. Duly substantiated reasons must be given for such refusal, in particular with regard to Article 3, and based on objective and technically and economically justified criteria. The regulatory authorities shall ensure that those criteria are consistently applied and that the system user who has been refused access can make use of a dispute settlement procedure. The regulatory authorities shall also ensure, where appropriate and when refusal of access takes place, that the transmission or distribution system operator provides relevant information on measures that would be necessary to reinforce the network. The party requesting such information may be charged a reasonable fee, reflecting the cost of providing such information.

Several important principles are covered by this high-level directive, as follows:

- Access to transmission and distribution systems for the purposes of trading electricity across borders should be granted to all parties who are enabled to trade electricity freely under the applicable market rules;
- This should be provided without discrimination;
- Tariffs may be charged for access to the transmission and distribution systems, but these are subject to national regulatory approval; and

[6]This section was supplied by Ricardo, subconsultant of Nord Pool Consulting during this project.

[7] See the Directive 2009/72/EC of the European Parliament and of the Council, 13 July 2009, concerning common rules for the internal market in electricity and repealing Directive 2003/54/EC. http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32009L0072&from=EN

[8] This Article 37 of the directive addresses the responsibilities of national regulatory authorities.

- Third-party agreement may be refused in situations where there is insufficient network capacity available, however, transmission and distribution system operators who refuse access to their networks are required to provide information on the technical measures that would be required to facilitate TPA and the associated costs.

The provisions of Directive 2009/72/EC are applicable to all European Union member states, however, it is the responsibility of the governments of each member state to implement the relevant measures within the law of their own countries.

6.2. Regulation (EC) No. 714/2009

Another EC regulation is in place – Regulation (EC) No. 714/2009 on 'conditions for access to the network for cross-border exchanges in electricity'.[9] This contains a number of key provisions that member states are required to comply with to facilitate TPA, including the following:

- A requirement for 'increased cooperation and coordination among transmission system operators … to create network codes for providing and managing effective and transparent access to the transmission networks across borders' (Recital [6]);
- The rights for transmission system operators to be 'compensated for costs incurred as a result of hosting cross-border flows of electricity on their networks by the operators of the transmission systems from which cross-border flows originate and the systems where those flows end' (Recital [11]);
- The development of a set of 'network codes', overseen by the Agency for the Cooperation of Energy Regulators (ACER), and developed 'for cross-border network issues and market integration issues' (Article 8[7]). Technical provisions of the network codes include the following:
    - network connection rules,
    - third-party access rules,
    - capacity allocation rules,
    - transparency rules, and
    - rules regarding harmonized transmission tariff structures; and
- The application of transparent access charges to networks (Article 14).

It is important to note that across the EU, legislation to ensure TPA is available and put in place at the highest level through a directive, and then implemented through regulations and through national legislation. The role of ACER as a regional agency is to advise on the content of regional network codes, in consultation with the national regulators – it does not, however, have any enforcing powers. These rest with the European Parliament, through which directives are enforced.

[9] See Regulation (EC) No. 714/2009 of the European Parliament and of the Council, 13 July 2009, on conditions for access to the network for cross-border exchanges in electricity and repealing Regulation (EC) No. 1228/2005. http://eur-lex.europa.eu/legalcontent/EN/TXT/PDF/?uri=CELEX:32009R0714&from=EN