ENTSO-E ANNUAL REPORT 2018

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European Network of
Transmission System Operators
for Electricity

entsoe

ENTSO-E IN FIGURES

43 TSOs

operating electricity systems & facilitating power markets in

36 countries

(EU + 8)

± 435 TWh

of electricity exchanged across borders

± 480,000 km

high voltage power network

This is more than the distance between the Earth and the Moon

Highest load
581 TW 18/1/2017

Lowest load
265 TW 11/6/2017

ABOUT ENTSO-E

ENTSO-E, the European Network of Transmission System Operators for Electricity, represents 43 electricity transmission system operators (TSOs) from 36 countries across Europe.

ENTSO-E was established in 2009 and was given legal mandates by the EU's Third Legislative Package for the Internal Energy Market, which aims to further liberalise the gas and electricity markets in the EU.

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ABOUT THIS ANNUAL REPORT

ENTSO-E's Annual Report is a legally mandated deliverable, submitted to ACER for opinion. In line with ENTSO-E's key activity areas, it is structured as follows:

1 and 2. Internal Energy Market: this part is divided into activities related to i) network codes and ii) the future power system;

3. Develop a new ICT approach and capability, including cyber-security;

4. Develop the DSO partnership;

5. Coordinate and facilitate regional developments;

6. Develop transparency and trust, including stakeholder engagement activities.

The resources used to deliver these objectives are detailed in Annex 1.

The activities described in this report were delivered thanks to the collective work of ENTSO-E's 43 member TSOs and ENTSO-E's Secretariat based in Brussels.

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EXECUTIVE SUMMARY

2018 IN MILESTONES

- TSOs developed important proposals to implement the **Electricity Balancing Guideline**, including implementation frameworks for all **Balancing Platforms**. This is a major step towards the integration of European electricity balancing markets. Electricity Balancing in Europe, a simplified overview aimed at non-experts, was among our most commented-upon publications in 2018.

- The **1st Edition of the Bidding Zone Review** and a new **technical report on the current bidding zone configuration** were released. The definition of bidding zone boundaries is a question of major relevance for efficient congestion management and a well-functioning market; Regular assessments and possible reviews are key requirements of the CACM Regulation.

- The implementation of the **System Operation Guideline** is ongoing, with the delivery by TSOs of important proposals, including the methodologies for coordinating operational security analysis and for assessing the relevance of assets for outage coordination, and the proposal for key organisational requirements, roles and responsibilities in relation to data exchange.

- The 2018 edition of the **scenarios**, developed jointly with ENTSOG, outlines three markedly different possible paths towards a low-carbon energy system - in line with EU targets - and one additional perspective based on the European Commission EUCO30 policy scenario. ENTSO-E was present at **COP24** in Katowice to present the scenarios and a new publication, *PowerFacts Europe*.

- The TYNDP 2018 tested how **166 transmission projects and 15 storage projects** respond to the 2025 and 2030 scenarios. For the first time, the TYNDP 2018 package features a pan-European analysis of future system investment needs and analyses the cost of no-grid, i.e., the costs – financial, environmental and in terms of electricity supply – of not investing in the power networks.

- At the end of 2018, data exchange via ENTSO-E's **Operational Planning Data Environment** - the information platform that will support the data exchange associated with the **Common Grid Model** merging process - was automated for **9 TSOs and 2 RSCs**. The development of the physical communication network is also ongoing.

- The **XBID** solution went live in June 2018. Marking an important step towards the creation of a single integrated European intraday market, the go-live with the 10 Local Implementation Projects delivers continuous trading of electricity across 14 countries. It was developed jointly by NEMOs and TSOs.

- ENTSO-E and **DSO** associations CEDEC, E.DSO, Eurelectric and Geode have signed up to continue the cooperative work that has been going on since 2015. The priority is to achieve a common vision on **active system management**, so as to integrate all distributed resources and new service providers in the electricity system and market. This will ensure system security and create value for the customer.

- ENTSO-E's Transparency Platform reached **13000 users** in 2018. **10 million files** are uploaded annually. The implementation of ENTSO-E's new data policy to the Platform allows part of the data to be freely re-used without restriction, and improvements to the graphical user interface have begun to be implemented on parts of the Platform.

- In October 2018, the **first long-term auctions of transmission rights** were performed on the Single Allocation Platform as per the Forward Capacity Allocation Regulation. Operated by the Joint Allocation Office, the SAP performs the yearly, monthly and daily auctions of transmission rights on 27 borders throughout Europe.

- The **INTERRFACE** project was awarded with EU funding. The project gathers a consortium of **42 partners** from network and market operators, aggregators, service and technology providers and universities, and will connect market platforms by designing, developing and exploiting a common architecture with standardized products and processes.

- The **7th** edition of the **InnoGrid** conference, organised with E.DSO, showcased 30 DSO and TSO R&D projects. Other major events were the **#PowerCoordination Europe** conference with Coreso, and ENTSO-E's **4th regional conference** looking this year at **Alpine Power Links** and organized with regional TSOs.

- **Over 150** innovators have already joined ENTSO-E's **Business Network for Innovation**, which was launched in October 2018. The Network aims at creating a bridge between the world of start-ups and citizen initiatives on the one hand, and suppliers, opinion leaders, institutions and ENTSO-E on the other, so as to shorten the time from idea to market.

- Throughout 2018, TSO representatives and ENTSO-E secretariat staff delivered collectively on ENTSO-E's mandates. Stakeholders provided input through 59 public consultations, 22 workshops, 7 webinars and 4 conferences. Over **200** staff members from TSOs and RSCs participated in various *training initiatives*.

IMPLEMENT THE NETWORK CODES

Working toward a secure, competitive and low-carbon European electricity sector and the Internal Energy Market is an ambitious target, that needs a common set of rules. The European network codes are technical rules, that complement existing legislation by defining a common basis for all stakeholders and market parties to adopt the same practices and business processes across Europe. Between 2009 and March 2017, ENTSO-E has developed, jointly with ACER, policy-makers and stakeholders, eight network codes and guidelines.

The network codes are grouped into three families:

- Market codes move market integration forward, to increase competition and resource optimisation. They set rules for capacity calculation and allocation, day-ahead and intraday markets, forward markets and balancing markets.
- Operational codes reinforce the reliability of the system through state-of-the-art and harmonised rules for operating the grid. They cover system operation, regional cooperation and emergency situations.
- Connection codes establish the EU-wide conditions for linking all actors safely to the grid, including renewables and smart consumption. They include the technical requirements for generation and demand facilities and high-voltage direct current (HVDC) connections.

To keep network codes up-to-date with market and technological developments, and learn from the implementation experience, the codes may be reviewed.

All codes have entered into force and ENTSO-E is now focussing on their implementation, which is a demanding undertaking for all parties involved.

Allocation of implementation tasks

Implementing the codes requires a specific combination of national, regional and pan-European implementation measures and tools. All market participants, DSOs, TSOs, NEMOs and regulators, at the EU, regional and national levels, are involved in various ways.

With respect to tasks allocated to system operators, the codes define which entity is responsible for each implementation task[1].

Task attributed to...	Responsibility	Approval
ENTSO-E	ENTSO-E	ACER
Pan-European 'All TSOs'	All TSOs (with ENTSO-E acting as facilitator)	All NRAs
Regional 'All TSOs'	TSOs of the region (with ENTSO-E acting as facilitator for some tasks)	NRAs of the region
National	Depending on national legislation (TSO, DSO ...) (ENTSO-E may provide supporting documents and guidance)	National NRAs

Figure 1: Network codes - Entities responsible for pan-European, regional and national tasks

1 When the ACER Regulation enters into force in mid-2019, 'all NRAs' decisions on all TSOs deliverables will become ACER decisions.

'All TSOs' refers to the TSOs of all EU countries (pan-European 'all TSOs'), or to the TSOs of a specific EU region (regional 'all TSOs'). Because TSOs have decided that ENTSO-E's structures are the most suitable vehicle to facilitate the delivery of pan-European tasks and some regional tasks, ENTSO-E facilitates the European implementation process.

The codes beyond the EU

For non-EU countries, modalities of implementation of the codes and guidelines depends on the legal framework governing their relationship with the EU:

- Energy Community countries: the Energy Community has already begun the transposition of the network codes and guidelines in its acquis and with those in the contracting parties' national legal orders.
- European Economic Area (EEA) countries: Iceland and Norway are, though the EEA agreement, implementing the Third Energy Package and the network codes.
- Switzerland: In the absence of a specific agreement between the EU and Switzerland, the application of the network codes and guidelines by the Swiss TSO Swissgrid is undertaken on a voluntary and, where relevant, contractual basis.

To ensure the smooth implementation of the network codes in non-EU countries in the future, TSOs members of ENTSO-E whose countries are not members of the EU participate in the development of 'all TSOs' (pan-European and regional) deliverables. However, only EU TSOs formally approve the proposed deliverables before their submission to regulators.

Stakeholders involvement in ENTSO-E's implementation tasks

European Stakeholders Committees help inform the decision-making process for the implementation deliverables, and serve as a platform to discuss issues of EU-wide importance. They include a Market Stakeholders Committee, a Grid Connection Stakeholders Committee and a System Operations Stakeholders Committee, as well as a Balancing Stakeholder Group focusing on the implementation of the Electricity Balancing Guideline.

ENTSO-E supports the committees by facilitating, in conjunction with ACER, the preparation and development of meetings. ENTSO-E also maintains, with the support of ACER, the European Commission, and Committees members, the Issue Logger Tool, where the questions on the codes' implementation raised by Committees members are centralised and answered in a transparent manner.

Set up in Q3 2018, the TSO–DSO Network Code/Guideline Implementation Group discusses issues of interest to DSOs related to the implementation of network codes.

Spreading knowledge of network codes

Launched in October 2018, the E Codes application for smartphones provides easy access to the articles of all eight network codes and guidelines. It makes it possible to track the implementation tasks, access implementation deliverables, and view codes-related public consultations, news and events. The app was downloaded by 1400 users in 2018 and has over 600 daily uses of the app.

In addition, to help stakeholders better understand network codes, the related challenges and solutions, ENTSO-E and the Florence School of Regulation, have developed an online training on EU electricity network codes. The second training took place in the fall of 2018 and included 166 participants from 28 different countries.

THE CAPACITY ALLOCATION AND CONGESTION MANAGEMENT REGULATION

The rules set by the CACM Regulation provide the basis for the implementation of a single energy market across Europe. The CACM Regulation establishes the methods for allocating capacity in day-ahead and intraday timescales, and outlines how capacity will be calculated across the different zones. Putting in place harmonised cross-border markets in all timeframes will lead to a more efficient European market and will benefit customers.

CACM was the first code to enter into force in August 2015 and its implementation is well advanced. All pan-EU methodologies and most of the regional methodologies have been submitted.

Market coupling

Day-to-day management of the single day-ahead and intraday coupling

According to CACM Article 10, TSOs and NEMOs shall jointly organise the day-to-day management of the single day-ahead and intraday coupling. Throughout 2018 TSOs and NEMOs agreed on the overall principles of the governance structure of the single intraday and day-ahead coupling. Discussions continue to further specify the details of the governance.

This work will help to jointly organise the further development of the market coupling by defining the responsible bodies and elaborating a classification of the decisions to be made by each body, as well as helping to define the criteria for prioritising the functionalities to be developed.

Amendment to the determination of Capacity Calculation Regions

Attributing new bidding zone borders in a timely fashion is essential for providing the clearest possible framework for the implementation of the CACM (Article 15) and FCA (Article 8) regulations. All TSOs' initial proposal for Capacity Calculation Regions (CCR) delimitation, approved by ACER in 2016, only considered bidding zone borders due to interconnections that were planned to be commissioned before 2018. Consequently, the bidding zone borders created by newly established interconnectors were not yet attributed to a CCR.

Changes to the CCR determination, proposed by TSOs in 2018, aim at accommodating the Denmark 1 – The Netherlands (DK1–NL) border resulting from the Cobra cable interconnection, two future interconnections of the France-Great Britain (FR-GB) bidding zone border and the ALEGrO interconnection on the bidding zone border Belgium-Germany/Luxembourg.

KEY DATES & DOCUMENTS

17 APR 2018

Submission of all TSOs' draft **proposal** including changes to the Hansa, Core and Channel CCRs

All TSOs' methodologies for calculating scheduled exchanges resulting from single day-ahead or intraday coupling (Articles 43 & 56 CACM)

Following two requests for amendments from NRAs, a third version of the proposals were submitted by all TSOs to all NRAs in December 2018.

KEY DATES & DOCUMENTS

4 DEC 2018

All TSOs proposals submitted **Methodology for Calculating Scheduled Exchanges resulting from single day-ahead coupling (Art 43), and a Methodology for Calculating Scheduled Exchanges resulting from single intra-day coupling** (Art 56)

Relieving congestions: bidding zones

Cross-zonal electricity trades and exchanges are organised between bidding zones based on available transfer capacities or a so-called flow-based method calculated by TSOs, while internal trades inside bidding zones are considered to be unrestricted. The definition of bidding zone boundaries is therefore a question of major relevance for efficient congestion management and a well-functioning market. To analyse the robustness of this structure, and whether it is appropriate for future market needs, the CACM Regulation foresees regular assessments and possible review of the existing configuration.

The 2018 technical report on bidding zones configuration

Article 34 of the CACM Regulation requires ACER to conduct an efficiency assessment of the current bidding zone configuration every three years. For that purpose, in January 2018 ACER requested ENTSO-E to deliver a technical report on the current bidding zone configuration. The technical report released in October 2018 is a transparent and exhaustive account of present congestions and their future evolution, power flows not resulting from capacity allocation, and congestion incomes and firmness costs for the years 2015, 2016 and 2017, for all EU bidding zones.

The technical report is a mere collection of facts and does not provide a recommendation on future bidding zone configuration changes. Based on this report, and on its own yearly Market Monitoring Report, ACER may assess the efficiency of bidding zones and may ask TSOs to launch a review of an existing bidding zone configuration as per Article 32(1).

KEY DATES & DOCUMENTS

18 JAN 2018

Official request from ACER to ENTSO-E

15 OCT 2018

ENTSO-E published and submitted to ACER the **Bidding zone configuration technical report 2018**

The 2018 bidding zones review of Central Europe

In December 2016, ACER issued a request for a review of an existing bidding zone configuration as specified in CACM Article 32(1). This review covered Austria, Belgium, the Czech Republic, Denmark, France, Germany, Hungary, Italy, Luxembourg, the Netherlands, Poland, Slovakia and Slovenia, with a legal deadline of 21 March 2018.

KEY DATES & DOCUMENTS

9 FEB – 9 MAR2018

Public consultation on the draft Bidding Zone Review

5 APRIL 2018

Publication of the **First Edition of the Bissing Zone Review**

The approach chosen by the participating TSOs was based on a selection of ex ante defined configurations, encompassing a splitting or merging of the existing bidding zones. They include a separation of Austria from Germany / Luxembourg, a split of the 'big countries' France and Germany / Luxembourg and Poland, and a further split of France and Germany / Luxembourg into three zones. To also consider the implications of merging zones, the combinations of Belgium with the Netherlands and the Czech Republic with Slovakia have also been considered.

For the first time, these configurations were analysed and compared over large physical areas using a flow-based methodology. The participating TSOs used detailed grid and market models to simulate market and system operations for the different configurations analysed. Assumptions had to be made regarding the future grid, generation and demand developments, as well as on the future generation cost structures. ENTSO-E played a facilitating role, supporting the participating TSOs in the process.

This first report analysing bidding zone configurations in Europe demonstrated the significant technical, and even more so political, complexity of the task. The participating TSOs considered that the evaluation presented in the first edition of the Bidding Zone Review did not provide sufficient evidence in support of either modifying or maintaining the current bidding zone configuration. Therefore, they recommended that, given the lack of clear evidence, the current bidding zone delimitation be maintained[2]. Further work is ongoing on the TSOs' side to assess and learn from the current review, so that more concrete recommendations can be made in the future.

2 This recommendation should in no way be interpreted as an endorsement of or an objection against the split of the German/Luxembourgian and Austrian bidding zones where TSOs respect all relevant regulatory decisions, e. g. the decision of the Agency for the Cooperation of Energy Regulators no 06/2016 of 17 November 2016 on the electricity transmission system operators' proposal for the determination of capacity calculation regions and the requests of the regulatory authorities of Germany and Austria.

Figure 2: Bidding zones configuration

Capacity Calculation Region level

The CACM Regulation tasks CCRs with delivering regional methodologies for capacity calculation (Art. 20), methodologies for redispatching and countertrading (Art 35 and 74) and fallback procedures (Art. 44).

Figure 3 provides an overview of the current status of regional methodologies.

	CACM CapCalc	RD&CT	RD&CT Cost Sharing
Nordic	**Approved 16-Jul-2018**	Submitted 1st Amendment 14-Nov-2018	Submitted 1st Amendment 14-Nov-2018
Hansa	**Approved 19-Dec-2018**	Submitted 1st Amendment 20-Dec-2018	Submitted 1st Amendment 20-Dec-2018
Core	ACER desision 21-Feb-2019	Submitted 1st proposal 28-Feb-2019	Submitted 1st proposal 28-Feb-2019
Italy North	Submitted 1st Amendment 18-Feb-2019	Submitted 1st Amendment 18-Feb-2019	Submitted 1st Amendment 18-Feb-2019
Greece Italy	**Approved 26-Jul-2018**	**Approved 25-Jan-2019**	**Approved 12-Sep-2018**
SWE	**Approved 15-Nov-2018**	Submitted 16-Mar-2018	Submitted 1st Amendment 14-Nov-2018
IU	**Approved 23-Jul-2018**	2nd Request for Amendment 13-Mar-2019	2nd Request for Amendment 13-Mar-2019
Channel	**Approved 23-Nov-2018**	Submitted 1st Amendment 26-Nov-2018	Submitted 1st Amendment 25-Sep-2018
Baltic	**Approved 16-Nov-2018**	Submitted 1st Amendment 19-Nov-2018	Submitted 1st proposal 13-Dec-2018
SEE	Submitted 2st Amendment 7-Feb-2019	Reffered to ACER Feb-2019 / Decision by 11-Aug-2019	Submitted 1st proposal 06-Sep-2018

Figure 3: Status of regional methodologies

Fallback procedures

They were all submitted in 2017. By September 2018, all proposals except for the Channel CCR had been adopted by NRAs (by ACER for the Core CCR).

Go-live of XBID

NEMOs and TSOs launched XBID in June 2018. Marking an important step towards creating a single integrated European intraday market, the go-live with the 10 Local Implementation Projects delivers continuous trading of electricity across the following countries: Austria, Belgium, Denmark, Estonia, Finland, France, Germany, Latvia, Lithuania, Norway, The Netherlands, Portugal, Spain and Sweden. Most other European countries are due to take part in a second 'wave' go-live with XBID in 2019.

European-wide intraday coupling is a key component for completing the European Internal Energy Market. As the intraday market develops it will enable increased optimisation of the use of generation – especially variable renewable energy sources, it will enable demand response products to develop and will also lead to welfare benefits.

THE FORWARD CAPACITY ALLOCATION REGULATION

The FCA Regulation, which entered into force on 17 October 2016, outlines the rules regarding the type of long-term transmission rights that can be allocated via explicit auction, as well as the way holders of transmission rights are compensated in case their rights are curtailed. The overarching goal is to promote the development of liquid and competitive forward markets in a coordinated manner across Europe and provide market participants with the ability to hedge risks associated with cross-border electricity trading.

The single allocation platform

The Single Allocation Platform (SAP) facilitates the allocation of long-term transmission rights and the transfer of these rights among market participants at the European level. In addition, it should contribute to a transparent and non-discriminatory allocation of long-term transmission rights. FCA Article 48(1) requires TSOs to ensure that the SAP is operational and complies with the functional requirements by December 2018 (one year after the approval of the proposal for the establishment of the SAP).

The first long-term auctions under the SAP cooperation agreement were performed at the beginning of October 2018. The SAP is operated by the Joint Allocation Office (JAO), a joint service company of 20 TSOs from 17 countries, performing the yearly, monthly and daily auctions of transmission rights on 27 borders in Europe.

Congestion income distribution methodology

All TSOs had up to six months after the approval of the CID methodology under CACM, i. e., until July 2018, to jointly develop a proposal for a methodology for sharing congestion income from forward capacity allocation (FCA Article 57). All TSOs submitted their joint proposal in June 2018. All NRAs sent a request for amendment in December 2018 and all TSOs submitted an amended proposal in March 2019.

THE ELECTRICITY BALANCING GUIDELINE

Electricity balancing is the process by which TSOs ensure, in real time, sufficient energy to balance inevitable differences between supply and demand. The Guideline on Electricity Balancing (EBGL) aims to move Europe from electricity balancing performed on a national level, to a situation in which balancing resources available all across Europe are used in the most effective way within the constraints.

The Electricity Balancing Guideline entered into force on 18 December 2017. Implementation began in 2018 even though pilot implementation projects were already ongoing.

European balancing platforms

The EBGL foresees the implementation of common European platforms for each balancing market process: imbalance netting (IN), automatic Frequency Restoration Reserves (aFRR), manual Frequency Restoration Reserves (mFRR) and replacement reserves (RR). TSOs are developing these platforms via four implementation projects IGCC, PICASSO, MARI and TERRE.

- European platform for replacement reserves (EBGL Art. 19): All TSOs performing the replacement reserve process submitted a proposed implementation framework to all NRAs by the deadline. It was approved by NRAs.

- European platform for Imbalance netting (EBGL Art. 22): All TSOs submitted the proposed implementation framework to all NRAs, which requested amendments in December 2018. All TSOs are reviewing their proposal for resubmission in early 2019.

- European platforms for mFRR (manual Frequency Restoration Reserves) and aFRR (automatic Frequency Restoration Reserves (EBGL Art. 20 and 21): All TSOs submitted proposed implementation frameworks to all NRAs by the legal deadline of 18 December 2018.

KEY DATES & DOCUMENTS

15 JAN – 15 MAR, 21 FEB – 4 APR, 26 APR – 29 JUN, 15 MAY – 16 JUL

public consultations

18 JUN

submission of the **RR proposal** and **IN proposal**

18 DEC

submission of the **aFRR proposal** and **mFRR proposal Network Codes Issue Logger**

Further EBGL deliverables in 2018

Further EBGL deliverables in 2018	Deadline	Key dates & documents
EBGL Art. 12(5): ENTSO-E shall update the manual of procedures of its Transparency Platform and submit it to ACER for opinion	**By 18 Apr / 4 months after EIF**	**17 Apr:** Submission of updated MoP to ACER **13 Jun:** ACER Opinion 4 **Dec:** Resubmission of updated MoP to ACER
EBGL Art. 29.3: All TSOs shall develop a proposal for a methodology for classifying the activation purposes of balancing energy bids	**18 Dec**	**12 Sep – 13 Nov:** public consultation **18 Dec:** Proposal submitted to all NRAs
EBGL Art. 30(1): All TSOs shall develop a proposal for a methodology to determine prices for the balancing energy that results from the activation of balancing energy bids for the frequency restoration process and the reserve replacement process.	**18 Dec**	**12 Sep – 13 Nov:** public consultation **18 Dec:** Proposal submitted to all NRAs
EBGL Art. 50(1): All TSOs shall develop a proposal for common settlement rules, which will be applicable to all intended exchanges of energy as a result of each of the 4 balancing processes	**18 Dec**	**18 Dec:** Proposal submitted to all NRAs

Figure 4: Further EBGL deliverables in 2018

Electricity balancing in Europe

To promote understanding of the future integrated European balancing market, ENTSO-E released 'Electricity balancing in Europe' in December 2018. The paper provides a simplified overview of the European balancing energy market target model and explains the main concepts and processes related to balancing energy markets and European platforms. It specifically focuses on the interaction between the different balancing processes and briefly describes the legal framework of the European balancing energy target model.

THE SYSTEM OPERATION GUIDELINE

The System Operation Guideline (SOGL) establishes harmonised rules on how to operate the grid to ensure the security of supply with increasing renewables. Its implementation entails several challenging tasks for TSOs at pan-European and regional (synchronous area and CCR) levels. Work at the pan-European level, including tasks performed by the Regional Security Coordinators (RSCs), is facilitated by ENTSO-E, while regional activities are decided by TSOs in the respective regional groups within ENTSO-E.

Activities at pan-European level

A large part of the implementation of the SOGL is prepared through the rollout of three of the five standard tasks of Regional Security Coordinators. The relevant 'all TSOs' deliverables in 2018 are listed in Figure 3.

In addition, all TSOs' proposal for key organisational requirements, roles and responsibilities in relation to data exchange (KORRR) was developed in accordance with SOGL Article 40(6) (see KORRR proposal version of November 2018 after NRAs request for amendment).

RSC tasks	Related SOGL deliverables in 2018	Key dates & documents
Coordinating operational security analysis: Identify operational security violations in the operational planning phase. Identify the most efficient remedial actions and recommend them to the concerned TSOs.	**SOGL Article 75.1:** Methodology for coordinating operational security analysis, aiming at enhancing the standardisation of operational security analysis at least per synchronous area. **Deadline:** 14 Sep 2018 / one year after entry into force	**26 Feb – 6 Apr:** public consultation **1 Oct 2018:** all TSOs submitted their proposal to all NRAs
Regional outage planning coordination: Detect outage planning incompatibilities and possible solutions.	**SOGL Article 84.1:** Methodology for assessing the relevance of assets for outage coordination. The common methodology for all synchronous areas will be the basis for identifying which power generating modules, demand facilities and grid elements located in a transmission system or distribution system need to be considered in the outage coordination process. **Deadline:** by 14 Sep 2018 / one year after entry into force	**26 Feb – 6 Apr 2018:** public consultation **1 Oct 2018:** all TSOs submitted their proposal to all NRAs
Building of common grid model: Provide the common grid model for all timeframes and applications, to all TSOs served by an RSC.	**SOGL Article 67.1** Methodology for building the year-ahead common grid models from the individual grid models and for saving them **SOGL Article 70.1** Methodology for building the day-ahead and intraday common grid models from the individual grid models and for saving them **SOGL Article 65** Process for developing a common list of year-ahead scenarios TSOs' individual grid models, and consequently the CGMs, are being built in accordance with the defined scenarios. The IGMs and CGMs serve several purposes, including seasonal security calculations, operational planning coordination, capacity calculation and other applications such as computation of the influence factors for observability area or OPC relevant asset definition.	**11 June 2018:** all NRAs approved the proposed methodologies for building year-ahead/day-ahead/intraday common grid models from individual grid models. (There are 3 versions of the methodologies, in compliance with CACM, FCA and SOGL. (CGM and GLDPM methodologies)) **16 July 2018:** all TSOs delivered the first set of Y-1 scenarios, for 2019.

Figure 5: RSC tasks and SOGL deliverables in 2018

Activities at the regional level

Progress was also achieved for several deliverables at the synchronous area level, most notably, the development of proposals for the methodologies, conditions and values included in the respective synchronous area operational agreements (SAOA) for the Continental Europe, Great Britain, Nordic and Ireland/Northern Ireland synchronous areas (Article 118 SOGL). These SAOA will replace and supersede in 2019 the existing operational agreements between TSOs, such as the Operation Handbook in Continental Europe.

Through these SAOA, TSOs commit to comply with the SOGL and, at the synchronous area level, agree on a number of topics relevant for load-frequency control and reserve, e.g. load-frequency control structure for the synchronous area, common rules for the operation of load-frequency control in the normal and alert states, frequency quality defining and target parameters, dimensioning rules for frequency containment reserves, limitations on the amount of frequency restoration and replacement reserves exchanged between synchronous areas. For each synchronous area, the commonly proposed methodologies, conditions and values to be approved by regulatory authorities were submitted to public consultation and delivered in 2018 to the concerned regulators (Article 6(3) SOGL). SAOA for CE (SAFA) signature has been completed and the contract entered into force on 14 April 2019.

THE EMERGENCY AND RESTORATION NETWORK CODE

The Emergency and Restoration Network Code establishes rules on how to effectively handle emergency situations and restore the system as efficiently and as quickly as possible. It entered into force on 18 December 2017 and will be implemented at the national or TSO level.

An expert team supported by ENTSO-E has been drawn from TSO representatives involved in drafting the original Code. ENTSO-E has monitored the national implementation of the network code and supported TSOs in the delivery of their proposals for National Defence and Restoration Plans and the terms and conditions required of service providers by 18 December 2018. The expert team has provided guidance documents and, moreover has developed a coordinated approach for the TSOs to provide the information to RSCs by July 2019, to fulfil their required consistency assessments of system Defence and Restoration Plans by September 2019. Additionally, the expert team has established guidelines for TSOs for situations in which the market activities are suspended and restored. Drafting and implementation of these rules is the responsibility of each TSO and is subject to NRA approval.

THE CONNECTION CODES

Connection codes set the EU-wide conditions for linking all actors safely to the grid, including renewables and smart consumption. They include the technical requirements for generation (Requirement for Generators – RfG code), demand facilities (Demand Connection – DC code) and high-voltage direct current (HVDC code) connections.

2018 was the last year for defining and submitting the proposals i.e. non-exhaustive requirements and boundary thresholds according to national processes. These needed to be submitted by May 2018 for RfG and September 2018 for DC and HVDC.

Although the implementation of the connection codes is the responsibility of each EU member state, ENTSO-E continued to actively support the TSOs and relevant stakeholders by providing the last set of non-binding Implementation Guidance Documents (IGDs) before the end of the implementation. In early 2018 several frequency-related IGDs were published. Soon after this launch, IGDs on Cost Benefit Analysis and HVDC-related aspects were made available.

For all these technical documents, there was a dedicated period for consultation (one month) and, in certain cases, public discussions with stakeholders occurred through ENTSO-E's technical groups. The results of each consultation and the replies by ENTSO-E can be found here. The Grid Connection European Stakeholder Committee (GC ESC) was also used as a platform for further discussion and communication.

In addition, TSOs are responsible to coordinate, when establishing certain connection codes requirements at the national level. ENTSO-E released a public report on the explicitly required coordination or reasonably undertaken collaboration between TSOs when implementing the connection network codes at the national level, because of the cross-border impact of these specifications mostly at the synchronous area level.

During the second half of 2018, the GC ESC established dedicated Expert Groups chaired by ENTSO-E addressing topics that require particular attention: "Requirements for pump-storage hydro power generation modules (EG PSH)", "Identification of storage devices (EG STORAGE)" and "Mixed customer sites with generation, demand and storage, and definition of system users (EG MCS)". Outcomes are expected in Q2 2019.

KEY DATES & DOCUMENTS

Implementation guidance documents

Public consultations and comments received

JAN 2018
Report on Inter-TSO coordination in connection network codes implementation

Grid connection Expert Groups

Network Codes Issue Logger

MONITORING THE IMPLEMENTATION

ENTSO-E is entrusted with monitoring and analysing the implementation of the network codes and guidelines, and their effect on the harmonisation of applicable rules aimed at facilitating market integration (Article 8(8) of Regulation (EC) No 714/2009). This section provides an overview of ENTSO-E's monitoring activities in 2018.

Monitoring activities entail the elaboration of monitoring plans and monitoring reports, as well as the collection of data (so-called 'Lists of information'), including the identification of data to be collected and the design and implementation of interfaces for data collection.

In 2018, ENTSO-E has been preparing the monitoring of the implementation of the Electricity Balancing Guideline, System Operation Guideline and Emergency and Restoration Network Code. The EBGL Monitoring Plan was submitted to ACER on 6 June 2018. Regarding SOGL, the list of relevant information to be communicated by ENTSO-E to ACER will be developed over the course of 2019.

Market codes

1st Joint report on the progress and potential problems with the implementation of intraday and day-ahead coupling, as well as forward capacity allocation.

The fourth in a series of reports where ENTSO-E monitors the progress and potential problems with the implementation of the day-ahead and intraday coupling, this report covers the period from August 2017 to August 2018 and, for the first time, also covers forward capacity allocation, including fair and transparent access for market participants to long-term transmission rights.

The report provides an account of the current state-of-play and challenges in the implementation of single day-ahead and intraday coupling in terms of all TSOs and all NEMOs deliverables. The report also takes stock of the progress achieved thus far in the coupling of electricity markets, by the Multi-Regional Coupling project (MRC) and the Czech-Slovak-Hungarian-Romanian Market Coupling project (4M MC) for day-ahead, and the intraday market coupling project (XBID). The 'go-live' of continuous cross-zonal trading of XBID/SIDC in 14 European countries was the highlight of 2018. The SIDC is expected to extend, with up to five local implementation projects in preparation to 'go-live' in 2019.

Regarding the single day-ahead coupling (SDAC), the report notes that both the MRC and the 4M MC project experienced no incidents of partial or full decoupling in 2017/2018. TSOs and NEMOs are progressing towards the signature of a DAOA setting their respective rights and obligations, in respect to the implementation of the SDAC.

KEY DATES & DOCUMENTS

14 AUG 2018

Publication of the **1st Joint report on the progress and potential problems with the implementation of single-day-ahead coupling and single intraday-coupling, as well as forward capacity allocation** (as per 82(2)(a) of the CACM Regulation and 63(1)(a) of the FCA Regulation).

The report also takes stock of the status of the implementation deliverables under the FCA Regulation. The Single Allocation Platform was expected to effectively allocate forward capacity well in advance of the legal deadline of December 2018.

Capacity calculation and allocation

ENTSO-E's first Biennial report on forward capacity calculation and allocation was delivered to ACER on 14 August 2018, as per Article 63(1) (c) of the FCA Regulation. The FCA Regulation specifies ACER must decide whether to publish the report.

Data collection and provision to ACER

As previously mentioned, monitoring activities include the collection of data from TSOs or other entities, and subsequently providing these data to ACER for its monitoring tasks. In 2018, the documentation for the list of information to be provided based on the CACM Regulation was prepared in close cooperation with ACER. The IT project to support the data collection and provision kicked off and will be deployed in 2019. In the meantime, the discussion on the list of information stemming from the FCA Regulation continues.

System operation codes

Incident Classification Scale annual report

As a yearly deliverable, according to Article 15 of the SOGL, ENTSO-E's incident classification scale annual report provides a detailed review of any incident on the network operated by ENTSO-E's members. It aims at identifying needed improvements to support sustainable and long-term operational security, including improvements related to network operation tools, real-time operation and operational planning.

Based on the 2017 report, a total of 1072 incidents reported by TSOs over the year, of which 680 were classified as a 0 according to the incident classification scale, 390 were classified as a 1, and 2 were classified as a 2, both in isolated systems. No incident of scale 3 was reported. All synchronous areas reported incidents on transmission network elements. Incidents pertaining to the power generating facilities at scale 1 occurred only in isolated systems.

ENTSO-E updated its incident classification scale methodology in 2018, so that it is compliant with the SOGL.

KEY DATES & DOCUMENTS

ENTSO-E Incident classification scale

28 SEPT 2018

Publication of the **Incident classification scale annual report 2017**

Monitoring the implementation at national level of the connection codes

ENTSO-E is tasked with monitoring the implementation of the three connection codes, looking in particular at divergences in the national implementation and whether the choice of values and ranges in the requirements specified in each regulation continue to be valid (Article 76, HVDC; Article 57, DC; Article 59, RfG).

Striving for more transparency, ENTSO-E continued its efforts to monitor the national implementation processes and provide updated information regarding the status of the selected proposals for all non-exhaustive requirements throughout 2018.

To collect all relevant information necessary to monitor their implementation, ENTSO-E continued using and upgrading the so-called 'Active library', which compiles relevant information and documents from each country.

In 2018, ENTSO-E worked on improving the monitoring excel file – developed in 2017 – wherein all non-exhaustive requirements (values, ranges and status) are incorporated as soon as they become available. This table aims to provide a high-level view of any possible divergences among the TSOs. This activity is still ongoing and will be completed by Q3 2019 – at which point all approved proposals for all three connection codes are expected.

Monitoring the implementation of the connection codes has proven to be a challenge, due to the multiple national implementation processes. Thus, retrieving information is a continuous effort.

BUILD THE FUTURE POWER SYSTEM

The power system is undergoing profound changes. Renewables are replacing thermal, demand-side response and storage provide a new dynamic, and digitalisation influences the entire electric value chain. ENTSO-E aims at providing leadership for the future power system, by contributing its vision of market design and operations, grid planning and development with the TYNDP, supporting innovation and, in the short term, ensuring system adequacy in accordance with the new mandates set in the Clean Energy Package.

Upon its creation in 2009, Regulation 714/2009 tasked ENTSO-E with elaborating a pan-European network development plan, or TYNDP. The TYNDP package includes scenarios, system needs assessment reports including regional investment plans, the TYNDP report itself and the Mid-Term Adequacy Forecast.

Additionally, in 2013, Regulation 347/2013 on guidelines for trans-European energy infrastructure made the TYNDP the basis for the selection of European projects of common interest. It also mandated that ENTSO-E develop a cost-benefit methodology for the assessment of transmission infrastructure projects.

IMAGINE AND MODEL FUTURE SYSTEM SCENARIOS

To understand what new investments or measures would be the most effective moving forward, it is first necessary to define scenarios that depict the energy system that the EU is striving to achieve.

2018 scenarios

The 2018 edition of the scenarios was developed jointly with the European network of TSOs for gas, ENTSOG. This joint gas and electricity approach enables a more integrated view of the electricity system and will in time improve our understanding of how infrastructure in both energies impact one another.

The scenarios outline three markedly different paths towards the achievement of a low-carbon energy system in line with EU targets. They are complemented, for the horizon 2030, by an additional perspective based on the European Commission EUCO30 policy scenario.

KEY DATES & DOCUMENTS

30 MAR 2018

Publication of the ENTSOs **2018 scenarios** report, its annexes on **country results** and **methodology** and ENTSO-E's **datasets**

18 OCT 2018

ACER Opinion

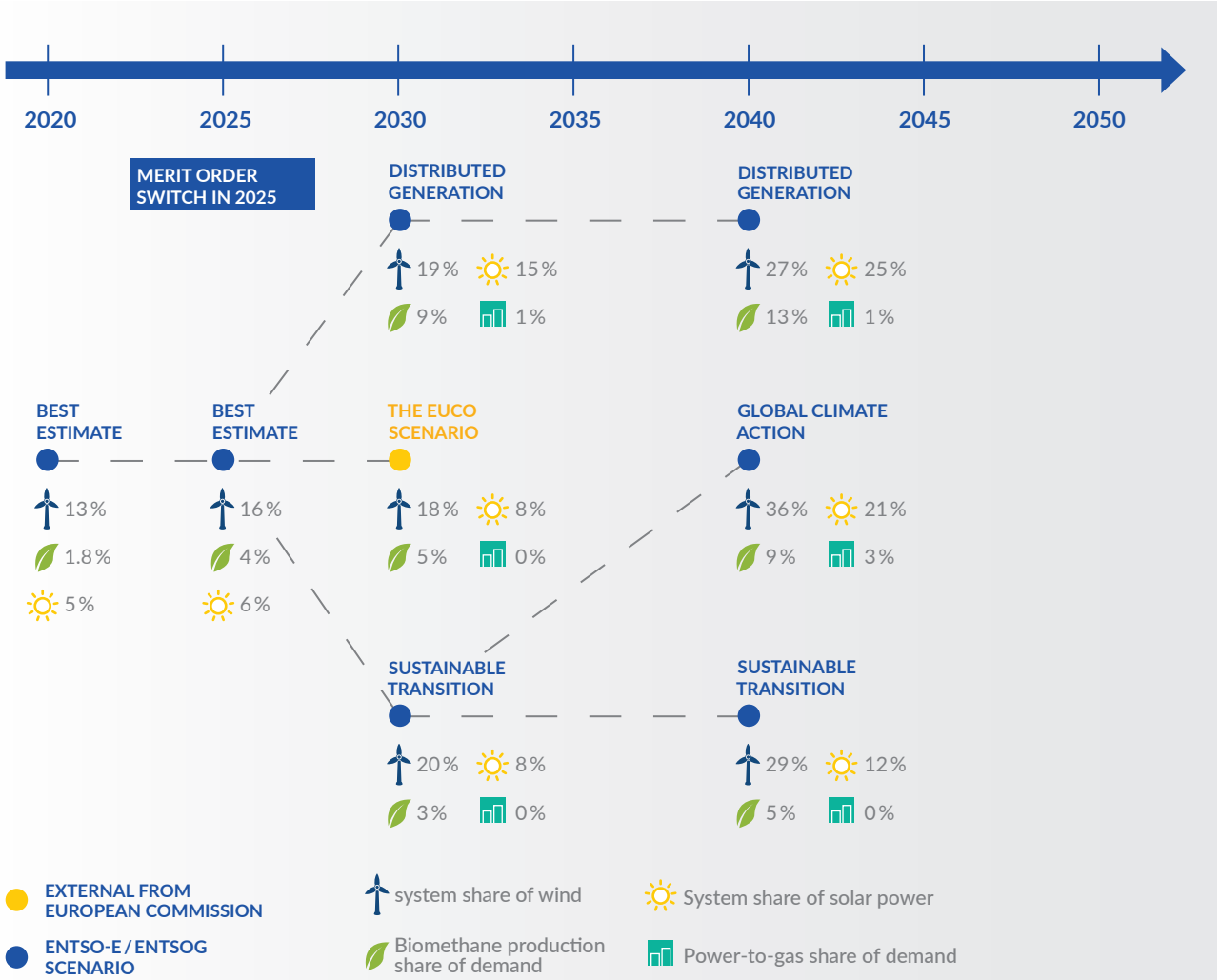


Figure 6: The scenario building framework for TYNDP 2018. Renewable Energy Systems (RES) share of demand for electricity and gas

The scenarios were released, for the first time, separately from the TYNDP 2018 report and were the subject of a formal Opinion from ACER. Overall, ACER finds that the Scenario 2018 Report's contribution to meeting the objectives of Regulations (EC) No 714/2009 and No 715/2009, concerning the efficient functioning of the market and non-discrimination is rather weak, and notes several shortcomings with regard to, for example, the transparency of the datasets and the length of the scenario development process.

ENTSOs scenarios & the EU's climate targets

Elaborated between 2016 and 2018, the 2018 scenarios are in line with the EU's targets for 2030 set by the European Council in 2014, of 27 % share of RES, 27 % improvement in energy efficiency (30 % for the EUCO scenario) and 40 % GHG emission reduction.

The targets for RES and energy efficiency were revised in 2018, to 32 % and 32,5 % respectively. These new targets will be considered in the 2020 edition of the scenarios.

In addition, on 24 December 2018, the Regulation on the governance of the Energy Union and climate action, part of the Clean Energy Package, entered into force. This Regulation requires Member States to develop National Energy and Climate Plans (NECPs), that will set each Member States' contribution to meeting the EU's climate targets. ENTSO-E intends to align the 2020 scenarios with the NECPs as much as possible.

The Scenarios at COP24

ENTSO-E presented the 2018 scenarios, along with the new publication *PowerFacts Europe*, at the COP24 in December 2018 at two joint events, with the International Renewable Energy Agency IRENA and with the Renewables Grid Initiative (RGI) and ENTSOG.

The planning of the grid infrastructure needs to reflect the decarbonisation requirements, to ensure that the Paris Agreement will be implemented. The ENTSOs and RGI have initiated a project with the objective that at least one of the scenarios used in future TYNDPs will be compliant with the Paris Agreement's objective of limiting global temperature increases to well below 2 degrees Celsius by 2100.

Building the storylines for the 2020 scenarios

The storylines form the basis of the scenarios. They are developed to capture multiple trajectories that illustrate plausible pathways to achieve a low carbon, affordable, and secure energy system for Europe.

Five storylines were proposed in 2018, covering a wide range of possible futures in different time horizons. The draft storylines are developed jointly with ENTSOG.

The draft storylines were submitted to stakeholders' comments in the summer of 2018, and the final set of scenario storylines for the TYNDP 2020 will be proposed by the ENTSOs in the spring of 2019. The draft scenarios will follow in the second half of 2019. Not all storylines will become an actual scenario.

KEY DATES & DOCUMENTS

28 MAY 2018

Public workshop

2 July – 14 Sept

Public consultation on the draft TYNDP 2020 scenario building storylines

THE FIVE DRAFT STORYLINES

NATIONAL TRENDS National focus on climate change, driven by ETS and national subsidies. Moderate economic growth. Growth of RES depends on national policies.

GLOBAL AMBITION - SUSTAINABLE GROWTH. Global emission trading. Low-carbon technologies are competitive without subsidies. Wind and solar become leading sources of electricity. Carbon-free gas (P2G) replaces fossil gas

EUROPEAN FOCUS - FAVOURABLE ECONOMIC ENVIRONMENT. Global emissions scheme. RES is built on commercial conditions. RES is built where the best resources are found. High growth of P2G and Bio Methane

DISTRIBUTED ENERGY – HIGH ECONOMIC GROWTH. High innovation of small-scale generation and commercial storage. Strong climate policy. Electricity and renewable gases covering residential heating demand.

DELAYED TRANSITION – BEHIND TARGETS. Low economic growth. Low climate action and limited national subsidies. Low potential for growth of renewable technologies. Gas and oil significant in the shipping and heavy good transport sectors, oil and hybrid technologies for transport.

PLAN THE GRID OF TOMORROW

The TYNDP is a pan-European network development plan that provides a long-term vision of the power system. Published by ENTSO-E every two years, it is the foundation of Europe's grid planning and the basis for transmission projects that are eligible to be labelled 'projects of common interest' (PCI).

The TYNDP aims to provide a benchmark for transmission network development (scenarios, system needs, development solutions, and project assessment). It is developed over a two-year timeframe, including an assessment of the power system's needs and the development of regional investment plans, in addition to the development of the storylines and scenarios described previously.

Europe Power System 2040: completing the map

Released in early 2018, *'Europe power system 2040: completing the map'* presents, for the first time, a pan-European analysis of future system investment needs. It shows future capacity needs for the three 2040 scenarios of the TYNDP 2018 and indicates where grid projects should be considered. Most importantly, the report analyses the 'cost of no-grid', that is the costs – financial, environmental and in terms of electricity security of supply – of not investing in the power networks.

The findings indicate that the benefits for Europeans of doing the right investments in the right places, with the right technologies and regulations, far outweigh the efforts needed in the next decades for the system's update.

Released alongside *Europe power system 2040*, the six regional investment plans examine the system's needs from a regional perspective, thus accounting for regional specificities.

KEY DATES & DOCUMENTS

2 - 28 FEB 2018

Public consultation on the six Regional Investment Plans and on the first pan-European report Europe Power System 2040 | Answers received

The TYNDP 2018

Based on the scenarios and pan-European and regional system needs assessment, the TYNDP identifies the most relevant infrastructure projects for Europe. It provides a foundation upon which to compare European projects through a series of indicators.

The TYNDP 2018 tests how 166 transmission projects and 13 storage projects respond to the 2025 and 2030 scenarios. These projects would allow € 2 bn to € 5 bn annual savings in generation costs, while cutting CO_2 emissions by 65 to 75 % compared to the 1990 levels.

Following a public consultation period, wherein 27 organisations provided comments, the TYNDP 2018 package was edited to accommodate some of these comments. Notable changes include the addition of a new document explaining how the CBA was followed by ENTSO-E. Comments dealing with methodological points, scenarios, or other structural elements of the TYNDP will be addressed in future TYNDPs.

KEY DATES & DOCUMENTS

3 AUG - 21 SEPT 2018

Public consultation on the draft TYNDP 2018

28 NOV 2018

Submission to ACER of the draft TYNDP 2018 main report, insight reports, datasets and project sheets

The draft TYNDP 2018 was published and submitted to ACER with a delay in November 2018. The delay was due to unforeseen difficulties in calculating losses, following a change in the calculation process.

The TYNDP 2018 package will only be final after publication of ACER's Opinion.

Other stakeholders involvement activities throughout 2018	
14 May	TYNDP 2018 Project Promoters Workshop on Project Sheets finalization (Brussels)
17 May	ENTSO-E and ENTSOG joint workshop on inter linkage between gas and electricity scenarios and infrastructure projects assessment (Brussels)
18 May	TYNDP 2018 Project Promoters Workshop on Project Sheets finalization (Rome)
23 May	TYNDP 2018 Project Promoters Workshop on Project Sheets finalization (Berlin)
29 May	ENTSOs for gas and electricity: TYNDP 2020 scenario development workshop (Brussels)
14 Nov	Connecting Europe: Electricity Future(s) 2020 – 2040 MAF & TYNDP 2018 launch event (Brussels)
21 Nov	ENTSO-E and ENTSOG Webinar on scenario development process update

The next cost-benefit analysis methodology

Infrastructure and storage projects are assessed in the TYNDP using a Cost Benefit Analysis (CBA) methodology drafted by ENTSO-E, in consultation with stakeholders, and subsequently submitted to the European Commission for approval. The CBA results are also used by the European Commission to select the European projects of common interest (PCI).In September 2018, the European Commission approved the CBA 2.0 proposed by ENTSO-E. Throughout 2017 and 2018, ENTSO-E started developing a third version of the CBA methodology, to improve on the previous versions specifically in regard to security of supply, socio-economic welfare and storage.

KEY DATES & DOCUMENTS

27 SEPT

European Commission approved the **2nd ENTSO-E Guideline for cost-benefit analysis of grid development projects**

18 DEC

Workshop with stakeholders on the draft CBA 3.0

Studies on the link between gas and electricity

The gas and electricity sectors are both impacted by the transition towards decarbonisation; developments in one sector can affect the other. Interlinkages stretch from household energy use to electricity production and storage, as well as infrastructure. What are the potential economies of scale, and what are the risks of increased links between those two network-bound energies?

In addition to the joint work on scenarios previously described, ENTSO-E and ENTSOG have also been investigating the interlinkage between gas and electricity scenarios and infrastructure project assessments with a joint focus study, examining all possible interactions between the gas and electricity sectors (including on the end-user side, or interactions related to electricity and gas prices), and exploring relevant gas and electricity infrastructure interactions. The study is supported by an ad hoc group of committed stakeholders representing European organisations. It is foreseen to be concluded by mid 2019.

ENSURE SYSTEM ADEQUACY

Assessing system adequacy – the ability of a power system to cover demand in all conditions – is one of the TSOs' tasks, and, consequently, one of ENTSO-E's most important mandates. Resource adequacy requires advanced methodologies to capture and analyse rare events with adverse consequences for the supply of electric power. ENTSO-E's yearly adequacy reports examine various time horizons, from the next season to the next decade.

The Mid-term Adequacy Forecast 2018

To account for a growing number of risks related to the evolution of the energy mix – growing development of renewable energy sources, reduction of conventional power plants, availability of interconnection capacity – Europe needs to regularly assess the adequacy situation, at time horizons of up to ten years ahead. The 'Mid-term Adequacy Forecast' (MAF) aims to provide a pan-European adequacy assessment of the risks to security of supply and the need for flexibility for the coming decade.

Art. 8(3)b of Regulation 714/2009 requires ENTSO-E to develop a European generation adequacy outlook every two years, as part of the TYNDP. Released every year, the MAF goes beyond this legal mandate to address new needs identified by the Electricity Coordination Group.[3]

The MAF is based on a probabilistic analysis, conducted using sophisticated market-modelling tools. Its elaboration involves a large number of assumptions about the future. Therefore, it is important to note that each edition of the MAF should only be seen as a best estimate of future adequacy conditions, based on the information available at the time of its elaboration.

The MAF 2018 highlights the importance of cross-border cooperation in fostering adequacy throughout the pan-European power system. There are complex interdependencies between supply, demand, storage and interconnection capacities.

The MAF 2018 indicates potential adequacy issues and provides specific views highlighting adequacy risks for each country in the different scenarios assessed. Risks of scarcity that were identified concern mainly islands e.g. Cyprus, Malta, Crete and Sicily. A 'low-carbon' scenario considers the impact of shutting down generation units by 2025 (representing 23 GW) due to an acceleration of environmental policies, including, for example, a coal phase-out. The results confirm that the decommissioning of polluting generation capacity should be accompanied by the development of the system in different terms e.g. demand-side response, flexibility means including storage, renewable energy sources and interconnections.

The MAF 2018 was submitted to public consultation in the fall of 2018 and submitted to ACER for opinion as part of the TYNDP 2018 package of deliverables. The comments received during the public consultation were not implemented in this edition of the MAF, but will be taken into account when elaborating the MAF 2019.

KEY DATES & DOCUMENTS

3 OCT – 16 NOV

public consultation on the MAF 2018,
Comments received

28 NOV

Submission of the **MAF 2018** to ACER (as part of the TYNDP2018 package)

3 The Electricity Coordination Group is a platform for strategic exchanges between Member States, national regulators, ACER, ENTSO-E and the European Commission on electricity policy.

The Seasonal Outlook reports

ENTSO-E's winter and summer outlooks are a pan-European, system-wide analysis of risks to electricity security of supply. They present TSOs' views on the risks to the security of supply and planned countermeasures for the coming season, either individually or in cooperation. The outlooks are elaborated based on the data collected from TSOs and using a common methodology. ENTSO-E analyses the effect on system adequacy of climate conditions, evolution of demand, demand management, evolution of generation capacities, and planned and forced outages.

Each outlook is accompanied by a review of what happened during the previous season, based on relevant qualitative information provided by TSOs. This information is compared to the forecasts and risks foreseen in the corresponding outlook.

The Winter Outlook 2018/2019 found that Europe's supply of electricity was secured under normal conditions, with a monitoring of the situation needed in case of a cold spell in an area including Belgium, France, Northern–Italy, Central–Northern Italy and Slovenia. The Summer Outlook for 2018 foresaw no expected risk to Europe's security of supply, even under severe conditions.

KEY DATES & DOCUMENTS

30 MAY

Summer Outlook 2018 and winter review 2017/2018

28 NOV

Winter Outlook 2018/2019 and summer review 2018

RESEARCH & INNOVATION

ENTSO-E's R&D activities, as legally mandated by Regulation (EC) No 714/2009 and Directive 2009/72/EC, involve promoting and coordinating research, development and innovation activities of TSOs, including monitoring their implementation and their real-life application.

ENTSO-E promotes and coordinates TSOs' innovation activities in various areas: assets and technologies; security and operations of tomorrow; flexibility and markets; future of energy systems; and digital & communication. Several workshops were organised in 2018 on the above-mentioned issues, with the aim to share the knowledge among different TSOs and to promote common projects or answer to Horizon 2020 calls.

Particular emphasis is currently placed on flexibility (including demand-side response, storage, etc.) and end-to-end digitisation to integrate different technologies and enable new market places and services, with a focus on maximising social welfare through a customer centric approach.

R&D projects and partnerships

ENTSO-E is a partner in several projects awarded by the Horizon 2020 programme, including the following:

- INTENSYS4EU, jointly developed with the ETIP SNET, aims at supporting the further integration of innovative solutions and at extending the existing R&I roadmaps, through permanent and direct interactions with the impacted stakeholders and EU member states.
- TDX-Assist aims to design and develop novel ICT tools and techniques that facilitate scalable and secure information systems and data exchange between TSOs and DSOs. Participating TSOs include Eles (Slovenia) and REN (Portugal).

– Awarded in 2018, and beginning in 2019, the INTERFACE project will design, develop and exploit an Interoperable pan-European Grid Services Architecture to act as the interface between the power system (TSO and DSO) and the customers and allow the seamless and coordinated operation of all stakeholders to use and procure common services. ENTSO-E leads the exploitation, communication and dissemination work package and contributes to the other work packages along with the 42 consortium members.

KEY DATES & DOCUMENTS

MAY 2018

Ten innovation actions to deliver the Energy Union

JUN 2018

ETIP SNET Vision 2050

DEC 2018

Improving HVDC system reliability paper

Video 'ENTSO-E is taking action on e-mobility'

Additionally, ENTSO-E aims to develop partnerships with like-minded organisations. A memorandum of understanding was signed in May 2018 with the Electric Power Research Institute (EPRI) to collaborate on critical research, development and innovation initiatives to modernise the power grid. The cooperation covers next-generation tools and processes for electric grid operations and planning, transmission and distribution system communication and information networks, and information sharing, as well as cyber-security and resilience.

Moreover, ENTSO-E engaged in a cooperation agreement with the European Space Agency and E.DSO. The cooperation will be realised through ESA's Business Applications programme, which supports the development of new services that use data from space assets. Satellite applications can support power networks in many areas, including: asset management; two-way communication between smart meters and grid operators; prediction of consumption or generation peaks; developing Internet of Things services for smart homes and electric vehicles; and the use of virtual power plants.

R&D state of play: R&D Monitoring report 2018

The 2018 R&D monitoring report, to be released in early 2019, assesses the progress of European TSO-related research and development activities defined in the 2017–2026 Roadmap and highlights key achievements.

The activities proposed in the ENTSO-E Research, development & Innovation Roadmap 2017-2026 support TSOs as key system integrators of different components and technologies, that are necessary to answer societal challenges. TSOs also integrate game-changing factors involving new stakeholders within the electricity market (i.e., digital and flexibility services, active customers, etc.).

R&D ecosystem for innovation

ENTSO-E launched its Business Network for Innovation in October 2018. Innovative business players, start-ups and thought leaders from academia and industry exchange views on the steps that need to be taken for a successful European energy transition. The initiative started with a webinar on the Common Grid Model and will continue into 2019.

In addition, ENTSO-E and E.DSO organised in May 2018 the 7th edition of InnoGrid2020+. This yearly conference provides a space for TSOs, DSOs and other innovators to showcase their R&D projects and share the results with policymakers and stakeholders alike. The 2018 edition looked at customers, market participants and policy makers' expectations on what services the electricity system and network should deliver beyond 2020. InnoGrid 2018 also handed out the first Power Network Innovation Award.

Ten innovation actions to deliver the Energy Union

ENTSO-E and E.DSO presented a joint list of 10 innovation actions for a future-proof power system. The proposed actions include putting digitization as a horizontal activity in all R&D activities, adopting an energy-system approach and increasing the research and innovation budget for energy in the future Framework Programme 9, among others.

Building the integrated energy system of the future

The European Technology & Innovation Platforms (ETIPs) were created by the European Commission in the framework of the new Integrated Roadmap Strategic Energy Technology Plan (SET-Plan) by bringing together a multitude of stakeholders and experts from the energy sector. The role of the ETIP Smart Networks for Energy Transition (ETIP SNET) is to guide RD&I to support Europe's energy transition. ENTSO-E participates in four of the six working groups, covering power system integration, storage technologies and sector interfaces, digitisation, customer participation and innovation implementation.

ENTSO-E participated in the elaboration of the 'ETIP SNET Vision 2050', which was released in June 2018. The 'Vision 2050' describes a low-carbon, secure, reliable, resilient, accessible, cost-efficient, and market-based pan-European integrated energy system that supplies the whole economy and paves the way for a fully CO_2-neutral and circular economy by the year 2050, while maintaining and extending global industrial leadership in energy systems during the energy transition. The 'ETIP SNET Vision 2050' is the basis for defining the specifications for further research and innovation needs in the transition towards Europe's future energy system.

Improving HVDC system reliability

High-voltage direct current (HVDC) is an increasingly important method for transferring large amounts of electrical power for the pan-European transmission grid. New HVDC connections play a key role in the future development plans of the European transmission grid; high reliability, availability, compatibility and robustness will be essential for the electricity market and system security.

ENTSO-E's paper highlights the need for HVDC owners, in co-operation with other relevant HVDC stakeholders, to focus on developing HVDC so that the technology and processes (HVDC grid integration studies and maintainability performed by TSOs, with appropriate tools like models and control & protection (C&P) replicas, services and life-cycle aspects) are systematically addressed.

E-mobility

E-mobility has been identified as a topic for innovation, and ENTSO-E organised an internal workshop with TSOs in December 2018 and delivered a video on the topic.

IT ARCHITECTURE AS A HORIZONTAL LAYER OF ENTSO-E'S WORK

The digital infrastructure that supports the power grid plays an increasingly important role. A digital power system provides new opportunities for system operations, market design, and regional cooperation. The IT architecture must adapt to this transformation to support Europe's energy transition. In particular, the future IT architecture should ensure interoperability and enable cyber-security. ENTSO-E's IT strategy is implemented since early 2018 by a new Digital committee, advising ENTSO-E's Board on digital.

THE COMMON GRID MODEL

The Common Grid Model (CGM) has a legal basis in three of the network codes: the SOGL (Art. 64), the CACM Regulation (Art. 17) and the FCA Regulation (Art. 18). The CGM, and its data exchange system the Operational Planning Data Environment (OPDE), are a prerequisite for several processes harmonised in the network codes, including coordinated capacity calculation, operational security analysis, outage planning coordination and adequacy analysis.

The CGM compiles the individual grid model of each TSO, covering timeframes ranging from one year before real time to one hour before real time. TSOs' individual (in most cases, national) grid models are collected by RSCs, who, following a quality assessment and pan-European alignment process, merge them into a pan-European Common Grid Model and feed the merged Common Grid Model back into the system.

KEY DATES & DOCUMENTS

Final CGM and GLDPR methodologies

Setting up the CGM requires three building blocks: ENTSO-E's Operational Planning Data Environment (OPDE); a physical communication network; and TSOs' individual grid models and methodologies describing how they should be merged into CGMs.

Achievements and challenges

A milestone was reached to a large extent in August 2018, with the delivery of a pan-European Data Exchange Capability allowing all TSOs and RSCs to publish their individual grid models and merged CGM. Program reporting and communication has also continuously improved.

On the way to fulfil its commitments, the CGM program faces challenges in synchronising its deliveries with those of the RSCs and Capacity Calculations Regions (CCRs). The RSCs and CCRs will use the data exchange capabilities to produce pan-European merged models, which in turn are the basis to provide services based on the Common Grid Model Exchange standards (CGMES). The roll out of quality software, the timely generation of individual grid models in good quality, setting up processes in TSOs and RSCs, as well as the smooth migration to CGMES-based processes, are some of the challenges which will require concerted effort from the CGM program, TSOs and RSCs.

The CGM program is a high impact, future-oriented program. In 2018 a new governance was introduced in the form of an Executive Steering Group chaired by ENTSO-E's Secretary General and representatives of ENTSO-E's System Operations and Market Committees. To support and coordinate the implementation of CGM projects within TSOs and RSCs, regular meetings and communication channels with CGM Managers at each TSO and RSC have been established.

Operational Planning Data Environment

The OPDE, specified by Art. 114 of the SOGL, is the information platform that will support the data exchange associated with the CGM merging process. It is also the foundation of the data exchange platform for fulfilling the five core tasks of RSCs. The implementation of the OPDE components by TSOs and RSCs is ongoing, and at the end of 2018, data exchange via ENTSO-E's OPDE environment was automated for nine TSOs and two RSCs.

Physical Communication Network

The OPDE will be supported by a pan-European private – (separate from the internet) – linked network based on leased lines and TSO-owned communication lines for non-real-time data exchange. Implementation of the physical communication network by all TSOs was ongoing during 2018 and at the end of 2018 four TSOs and two RSCs were connected via the physical communication network. ENTSO-E approved the Security Plan for the physical communication network and the OPDE in June 2018. The Plan went into effect in August 2018. By February 2019 TSOs have performed a self-assessment and by August 2019 they should be fully compliant with the Security Plan.

Individual grid models & methodologies

Implementation of the CGM needs to be consistent throughout the various processes outlined in the SOGL, CACM and FCA regulations, and this is why all TSOs have been tasked with the preparation of two methodologies: a CGM methodology for all three codes and a generation and load data provision methodology for CACM and FCA. As of June 2018, the versions of both methodologies for all three codes have been approved by all NRAs.

DATA EXCHANGE STANDARDS

Standards facilitate cross-border exchange and allow for the efficient and reliable identification of different objects and parties relating to the development of the system, the internal energy market and its operations. Standards support the implementation of network codes in various ways and several of ENTSO-E's IT tools and data environment, such as the OPDE, rely on standards.

ENTSO-E maintains the Electronic Data Interchange library, which regroups documents and definitions for the harmonisation and implementation of standardised electronic data interchanges between actors in the electrical industry in Europe. Standardisation activities in 2018 also included continued collaboration with the European standardisation organisation CENELEC and IEC, especially in relation to the implementation of network codes: publication of MADES (Market Data Exchange Standard) (IEC 62325-503) as international standard and a new edition of ECAN (ENTSO-E Capacity Allocation and Nomination System) (IEC 62325-451-3) and Transparency (IEC 62325-451-6).

ENTSO-E maintains and develops profiles based on the Common Information Model, in support of several of ENTSO-E and TSOs' IT projects, e.g., the Transparency Platform, the mid-term adequacy forecast, the list of information required by the CACM to be sent to ACER, European balancing platforms (once they are implemented), etc. ENTSO-E developed a roadmap for the further consolidation and development of the Common Grid Model Exchange Standard (CGMES, which is the standard used for the merging of grid models) to further enhance it and make it compliant with the requirements stemming from the network codes.

KEY DATES & DOCUMENTS

EDI Library

JAN 2018

European electricity market role model methodology

In 2018 ENTSO-E began elaborating a European electricity market role model based on the network codes and guidelines. A methodology was published as a first step. The objective is to formally identify roles, services and associations, as described in the network codes and guidelines, to build an illustrative role model of the European electricity market.

Finally, as part of a knowledge-sharing exercise, ENTSO-E organized 12 three-days workshops in 2018 that were open to staff from TSOs and RSCs. The workshops focused on network model exchange (IEC 61970 and CGMES) and covered the creation of TSOs' network models for merging into pan-European models.

CYBER-SECURITY

Protecting TSOs' systems and network operation tools against cyber-attacks is obviously of paramount importance for the security of electricity supply. It is generally expected that the frequency and severity of cyber-attacks will increase in coming years. This relates to the new trends of further interconnecting systems, where general cyber-security risk is expected to significantly increase for actors throughout the energy value chain. Decentralisation and decarbonisation, which imply more interconnection and interoperability, as well as digitalisation, and other trends such as quantum computing and the Internet of Things, all tend to increase the cyber-security risk for TSOs.

In addition, due to the interconnection of TSOs processes and IT systems, strong cooperation among TSOs (and relevant market participants) is needed. Cyber-security measures needed to safeguard the security of supply can no longer be implemented and operated solely by a single TSO.

In anticipation of this increasing risk ENTSO-E developed a cyber-security strategy in 2018. The strategy includes a new focus not only on prevention controls and compliance standards, but also on incident monitoring, detection, response, and recovery capabilities. It also emphasises the importance of developing inter-TSO and RSC cyber-security measures, in addition to TSO and ENTSO-E levels. It emphasises the need to focus on all technology and information exchange aspects that can jeopardize the security of supply and availability of the European electricity grid.

Other activities related to cyber-security in 2018 include the approval of the CGM Security Plan in June 2018, which defines the security requirements of the OPDE (see above). In addition, for several years, ENTSO-E has been acting as a platform for sharing the best practices between TSOs. ENTSO-E supports operational training with the organisation of a yearly 'red team/blue team' training event attended by TSOs' operational staff.

DEVELOP THE DSO PARTNERSHIP

CONTINUED TSO – DSO COOPERATION

ENTSO-E and the four DSO associations E.DSO, CEDEC, Geode and Eurelectric have participated in the TSO – DSO platform chaired by the European Commission since 2015. Under that Platform, a TSO – DSO Network Code/Guideline Implementation Group was set up in September 2018 to discuss issues of interest to DSOs related to the implementation of network codes.

In addition, ENTSO-E and the DSOs associations signed an updated Memorandum of Understanding in October 2018. The first priority is to achieve a common vision on active system management in order to integrate all distributed resources and new service providers in the electricity system and market, to ensure system security and to create value for the customer. Further collaboration areas will be discussed in 2019, considering the final Clean Energy Package.

JOINT TSO – DSO WORK ON ACTIVE SYSTEM MANAGEMENT

A key area for TSO – DSO cooperation is active system management and the coordinated use of distributed flexibility. Storage, distributed generation and customer participation through demand-side response have the potential to generate new services for the grid and the system. These are known as distributed flexibilities, and they are key to efficiently managing the future electrical system and developing new market products.

Starting in 2017, and throughout 2018, ENTSO-E and the four DSO associations have elaborated a joint report on active system management, released in early 2019. The joint report focuses on active power management for congestion management in both distribution and transmission grids and for balancing services. Other active system management solutions, as well as reactive power management, are not covered in the report and may be the focus of further joint TSO–DSO work.

In addition to workshops with TSOs and DSOs experts, ENTSO-E, together with CEDEC, EDSO, Eurelectric and GEODE, have held two workshops with stakeholders in March and October 2018. The objective was to share the progress of the work and collect stakeholders' views on the main key points. It was not a formal consultation process, but rather a voluntary cooperation to discuss key questions that could lead to recommendations.

KEY DATES & DOCUMENTS

23 OCT 2018

DSO associations and ENTSO-E sign new MoU Report **"An integrated approach to Active System Management"**

The report "An integrated approach to Active System Management", which focuses on TSO – DSO coordination in congestion management and balancing, aims to develop a vision for active system management, centred around TSO – DSO coordination in accessing distributed flexibilities, and related processes. It proposes several recommendations, including:

- TSOs and DSOs should pursue an integrated system approach when developing new solutions and should avoid any isolated solution. TSOs' and DSOs' roles and responsibilities as system operators and as neutral market facilitators should be recognised. An efficient level playing field for market parties is required to foster new services and value flexibility services; Neutral market facilitators will continue to ensure non-discrimination towards market parties.

- To foster competition and new services in the European electricity market, the long-term view of system operators is that congestions should be solved through a market-based allocation of flexibility services (voluntary or mandatory bidding, possibly in combination with cost-based regulation) where technically feasible and cost-efficient, rather than compulsory limitation procedures. The design should be developed with the stakeholders in a step-wise and pragmatic manner.

Based on these commitments, the report aims at defining a European frame for some key aspects of active system management:

- The congestion management processes and its main steps;

- The definition of flexibility products, with a focus on defining need and qualification process;

- The market place to trade flexibility products, and the possible models for TSO–DSO coordination;

- Some insights on the possible design of platforms to materialize these models.

TSO–DSO INTERFACE PROJECTS MAPPING

Complementary to this bottom-up vision, ENTSO-E internally developed an analysis of the main projects (national, regional or European) linked to the TSO–DSO interface, to illustrate the vision elaborated in the Active System Management report. This analysis, although not exhaustive, includes a representative sample of projects and provides some concrete examples of real-life development. It also contributes to materialising the concept of digital platforms, and the different forms it can take.

COORDINATE AND FACILITATE REGIONAL DEVELOPMENT

TSOs operate systems that are interconnected across borders. An event in one part of a synchronously interconnected area can affect the common frequency and thus all power systems within the area. Europe's largest synchronous area, the Continental Europe synchronous area, stretches from Spain to Turkey and encompasses 25 countries. To preserve security of supply, and to stay ahead of the challenge posed by Europe's energy transition, TSOs within ENTSO-E endeavour to enforce a high level of regional coordination.

Coordination and/or harmonization at regional level are also ensured by network codes, in particular the CACM and FCA Regulation and the SO Guideline (see Chapter 1). Regional coordination is typically handled by Regional Security Coordinators (RSCs), who perform tasks for TSOs (covered in Chapter 1 under System Operation Guideline). Regional coordination also involves sharing best practices and experience. In 2018, ENTSO-E organized and facilitated knowledge-sharing sessions between regions.

FREQUENCY DEVIATIONS IN CONTINENTAL EUROPE

Since late 2017, the Continental European (CE) synchronous area has been experiencing a system frequency deviation from the mean value of 50 Hz. The power deviations originate from the Serbian control area and have led to a slight decrease in the electric frequency average.

Throughout 2018 ENTSO-E has been in discussions with Serbian TSO EMS and Kosovo* TSO KOSTT in an attempt to solve the CE Deviations problem. ENTSO-E's role is to promote the reliable operation, optimal management and sound technical evolution of the European electricity transmission system to ensure security of supply.

*This designation is without prejudice to positions on status and is in line with UNSC 1244 and the ICJ Opinion on the Kosovo Declaration of Independence.

SYSTEM ANALYSIS OF A POSSIBLE SYNCHRONISATION OF BALTIC COUNTRIES TO THE CONTINENTAL EUROPE SYNCHRONOUS AREA

The power transmission systems of Estonia, Latvia and Lithuania are embedded in the IPS/UPS systems with numerous synchronous interconnections to Russia and Belarus. In addition, the Baltic States are connected via DC links to Sweden (NordBalt), Finland (Estlink 1 and Estlink 2) and Poland (LitPol).

PSE, Litgrid, AST and Elering launched a technical study on the possibility of synchronizing the Baltic States, via Poland, with Continental Europe and de-synchronizing from IPS/UPS, with the objective of analysing the dynamic stability of the interconnected system. ENTSO-E commissioned a frequency stability study in parallel.

The results of the studies were presented to the European Commission and involved Member States. In June 2018 a political roadmap on the synchronisation of the Baltic States' electricity networks with the continental European network was approved by the four countries involved and the European Commission. The roadmap sets the target date of 2025 for full synchronisation.

Following approval of the high-level group on the Baltic Energy Market Integration Plan in mid-September 2018, the Polish TSO PSE submitted a request to ENTSO-E's Regional Group Continental Europe (RGCE, uniting all TSOs of the Continental Europe Synchronous Area) for the synchronisation of the Baltic grid with Continental Europe.

KEY DATES & DOCUMENTS

Political Roadmap on the synchronisation of the Baltic States' electricity networks with the Continental European Network via Poland

TRANSPARENCY AND TRUST

TSOs, as regulated monopolies work for society at large and subscribe to the highest transparency standards. This translates into making quality information available and engaging continuously with stakeholders, regulators and the general public.

THE ENTSO-E TRANSPARENCY PLATFORM

ENTSO-E's Transparency Platform (Art. 3, Regulation 543/2013) centralises data related to the generation, transportation and consumption of electricity at the European level. The data is collected from data providers, including TSOs and other qualified third parties. Depending on the users' needs, this data can serve various purposes, such as market analysis, research or trading. The Platform is also instrumental in the monitoring and regulation of power markets.

The system processes about 10 million files per year. At the end of 2018 it had over 13,000 registered users (up from 9,000 at the end of 2017). Each day, 57 data providers (up from 50 at the end of 2017) send 45,000 to 50,000 files, of which about 5,000 are reported to ACER under the REMIT Regulation. The missing data continues to decrease, from 40 % at the launch of the Platform in 2015 to under 20 % today. Start-ups and new players increasingly use the Platform's wealth of data to deliver more value to customers.

The Transparency Platform has been updated in accordance with the requirements outlined in the updated Manual of Procedure (version of December 2016). 2018 was a transitory year during which the data providers updated their systems. In 2018 the Platform was compatible with both Manual of Procedures (old and updated). The Manual of Procedures was revised again in 2018 in accordance with the Electricity Balancing Guideline. The document was consulted via the ENTSO-E Transparency User Group, submitted to ACER in April and then modified and resubmitted in December (MoP v3.1). The Platform will be developed in 2019 to meet these new requirements.

KEY DATES & DOCUMENTS

ENTSO-E Transparency Platform

JUNE 2013

ACER Opinion on 2nd revision of MoP

DEC 2018

MoP v3.1

Moreover, the Transparency Platform is undergoing a transformation to become a more user-friendly, market-serving platform that centralises data required not only by the Transparency Regulation (reg. n.543/2013) but also by other relevant pieces of legislation related to the internal electricity market. This development was triggered by new obligations and by the feedback received from users, in particular via the ENTSO-E Transparency Platform User Group.

Improving data quality

ENTSO-E members entered into a Memorandum of Understanding (MoU) that establishes requirements for the quality of the data provided by TSOs and for the checks by ENTSO-E of these requirements. In addition, ENTSO-E develops internal reports for data providers on the completeness and quality of the data.

Allowing data re-use via open data licencing

In 2018, ENTSO-E began implementing its Data Policy, which was approved at the end of 2017, to the Transparency Platform. The Data Policy aims at increasing data quality and data re-use, with the ultimate objective of ensuring, when relevant, open data license.

The aforementioned MoU also ensures that TSOs' data can be re-used by Transparency Platform users without any restriction. The MoU covers data provided by TSOs as well as Transmission Capacity Allocators, such as the Joint Allocation Office, which is among the largest data providers of the Platform. As a result, the updated Terms and Conditions of the TP went into effect in early January 2019. The new Terms permit part of the data (see full list) to be freely re-used with no need to seek the permission of the primary owner.

Make the Platform more user-friendly

In parallel, ENTSO-E, in close cooperation with the Transparency Platform User Group, started working on the design of the new graphical user interface to make the Platform more user-friendly. The following screens were made available in 2018 in parallel with the current user interface: actual generation per production type, unavailability of production and generation units, cross-border physical flows, and actual generation per generation unit. Collection of user feedback is ongoing, and the new interface is expected to be implemented for the whole Platform in 2020.

TRANSPARENCY OF CAPACITY CALCULATION BY TSOS

Several legal texts provide for transparency in capacity calculation: Regulation 714/2009, Regulation 543/2013, but also the CACM and FCA regulations and the SO Guideline. In 2018 ENTSO-E investigated the status of data available to market parties in different CCRs and possible new indicators. ENTSO-E also consulted stakeholders on their expectations, which are to understand, ex ante, how capacities are calculated and optimised and, ex post, what limited the capacity, how the grid was used and which measures were taken to mitigate contingencies.

Several improvement opportunities were identified, and ENTSO-E is elaborating an action plan. Transparency and timely implementation of the network codes are paramount for achieving the optimal integration of the European market.

STAKEHOLDER ENGAGEMENT IN 2018

ENTSO-E engages with stakeholders via dedicated groups, public consultations, conference, workshops and other events, trainings and individual contacts. Stakeholder groups include, for example, the independent Advisory Council, the three Network Codes European Stakeholder Committees, the Balancing Stakeholders Group, the Network Development Stakeholder Group and the Transparency Platform Users Group. Overall, stakeholder satisfaction with ENTSO-E's work has increased compared to 2017, from 3.95 to 4.08 (out of a maximum of 5)[4]. Stakeholder satisfaction has particularly increased in regard to transparency.

4 Based on ENTSO-E's yearly Stakeholder Satisfaction Survey conducted from 11 January to 4 February 2019, which received 37 answers.

The independent Advisory Council

ENTSO-E's independent Advisory Council, which met three times in 2018, has provided advice to ENTSO-E's Board on ENTSO-E's agenda and strategy, on the review of our public consultation process, the implementation of network codes and related public consultations, and on a wide range of ENTSO-E's work products including on improvements to ENTSO-E's Transparency Platform. In 2018 the Advisory Council welcomed three new members: Europex, T&D Europe, and SolarPower Europe as additional representative of the RES sector.

KEY DATES & DOCUMENTS

Minutes and recomendations of the ENTSO-E Advisory Council

ENTSO-E Consultations Hub

Public consultations

While there has been an improvement in stakeholders' satisfaction with consultations, some stakeholders remain critical of our public consultations process. Critics primarily target the reduced length of some consultations, which limits the possibility for smaller organisations to provide input. Of the 59 consultations hosted on ENTSO-E's Consultation Hub in 2018, the majority (44) lasted from 4 to 6 weeks, with an average length of 37 days. This is roughly on par with 2017.

To answer these concerns (and adapt to new obligations stemming from the Clean Energy for all Europeans package (CEP)), we are reviewing our Consultation Policy with the aim to facilitate early engagement of stakeholders, provide more visibility on upcoming consultations, and, overall, make it easier for stakeholders to provide input. The draft revised Consultation Policy will be shared for consultation at the time of entry into force of the CEP, in mid-2019.

In parallel to formal online consultations that are open to all, ENTSO-E sometimes also proactively approach the main stakeholders for informal discussions, such as for our Annual Work Programme 2019. In addition, to inform stakeholders of upcoming consultations that are part of network code implementation, ENTSO-E is maintaining an overview of upcoming activities for each code, including consultations and workshops, on the website electricity.network-codes.eu.

ENTSO-E's 4th regional conference: Alpine Power Links

In April 2018 ENTSO-E organised its fourth regional conference, which focused on Alpine power links and in collaboration with the TSOs of Southern Germany Amprion GmbH and TransnetBW, APG of Austria, Swissgrid of Switzerland, RTE of France, ELES of Slovenia, and Terna of Italy, as well as the Renewables Grid Initiative and the Florence School of Regulation. Participants discussed e.g. how to develop the network to optimise the flexibility potential offered by hydro in the region, how to adapt markets to the energy transition, the role of civil society and NGOs and the need for inclusion of non-EU TSOs such as Swissgrid in the relevant coordination processes.

Power Coordination Europe conference

Every year, one of the five regional security coordinators (RSCs) and ENTSO-E organise a regional electricity summit in Europe. On 16 October 2018, Coreso and ENTSO-E organised the #PowerCoordinationEurope conference, exploring the concept of regional coordination and discussing the way-ahead towards the next decade. Focus areas were the advancement of regional power coordination and network code implementation, the interoperability of RSCs and solutions for tomorrow, electricity security and cyber-security.

ANNEX 1 – RESOURCES

Key figures

ENTSO-E AISBL[5] is a not-for-profit organisation governed by Belgian law. Its 2018 financial statements are reviewed by BDO statutory auditors who will issue an opinion at the 27 June 2019 General Assembly. The following figures are non-audited but give a fair overview of the activities performed during the year.

2018				
€ 28.6 M	€ +4 M	€ 3.6 M	€ 7.6 M	96
Total Membership fees	Net result	Capital expendotures	Net cash posotion	Total average FTE

The total budget of € 28.6 M represents a 42 % increase compared to 2017 (€ 20.2 M).

In 2018, the operational expenditures of the Association reached € 24.9 M for the following activities:

- 34 % Association member's services: association governance support, Secretariat administration, strategy and communication;
- 35 % Legal mandates' services: network code implementation, TYNDP, R&D activities;
- 31 % IT legal mandates' services: data and IT infrastructure (Common Grid Model under the network code implementation, Transparency Platform, ENTSO-E Awareness System).

The net result of € +4 M is mainly driven by the delay in rollout of the Common Grid Model.

The € 3.6 M in capital expenditures are mainly related to the Common Grid Model (€ 1.2 M) and Transparency platform (€ 0.7 M).

In 2018, the total yearly average full-time equivalent (FTE) reached 96, which corresponds to an increase of 17.5 FTEs when compared to 2017 and is mainly driven by the CGM programme and adequacy and network code implementation activities. It includes permanent staff, TSOs secondments and outsourced "on site" services (such as the IT support services). This is in addition to the numerous TSO staff members who bring their expertise to the Association via the Assembly, Board, Committees and their subgroups.

5 Association Internationale Sans But Lucratif

ANNEX 2 – PUBLICATIONS IN 2018

Legally mandated publications (final publications only)

Jan Report on Inter-TSO coordination in connection network codes implementation

Feb European power System 2014 Completing the map & regional investment plans

Mar Connection codes implementation guidance document on frequency related parameters

Mar Connection codes implementation guidance document: Cost benefit analysis

Mar TYNDP 2018 Scenario Report (and datasets) (with ENTSOG)

Apr First edition of the bidding zone review

Apr Annual Report 2017

May Overview of Transmission Tariffs 2018

May Summer Outlook Report 2018 and Winter Review (and datasets)

June HVDC NC Implementation guidance document: Embedded HVDC systems – frequency schemes in case of system split

June HVDC NC Implementation guidance document: Interactions between HVDC systems and other connections

June HVDC NC Implementation guidance document: HVDC systems default parameters

Aug First joint report on the progress and potential problems with the implementation of intra-day and day-ahead coupling as well as forward capacity allocation

Sept 2017 Incident Classification Scale Annual Report

Sept ITC Transit Losses Data Report 2017

Oct Mid-term Adequacy Forecast 2018

Oct 2nd ENTSO-E Guideline For Cost Benefit Analysis of Grid Development Projects

Oct Bidding zone configuration technical report 2018

Nov TYNDP 2018 Executive report, insight reports & Project sheets

Nov Winter Outlook 2018/2019 and Summer Review 2018 (and datasets)

Jan 19 Annual Work Programme 2019

Other publications

Mar Report on the oscillation event of 3 December 2017

May Adapting regulatory frameworks for enhanced stakeholder engagement and environmental protection

May Ten innovation actions to deliver the Energy Union (with E.DSO)

Oct Power to Gas – A Sector Coupling Perspective (with ENTSOG)

Nov Electricity in Europe 2017

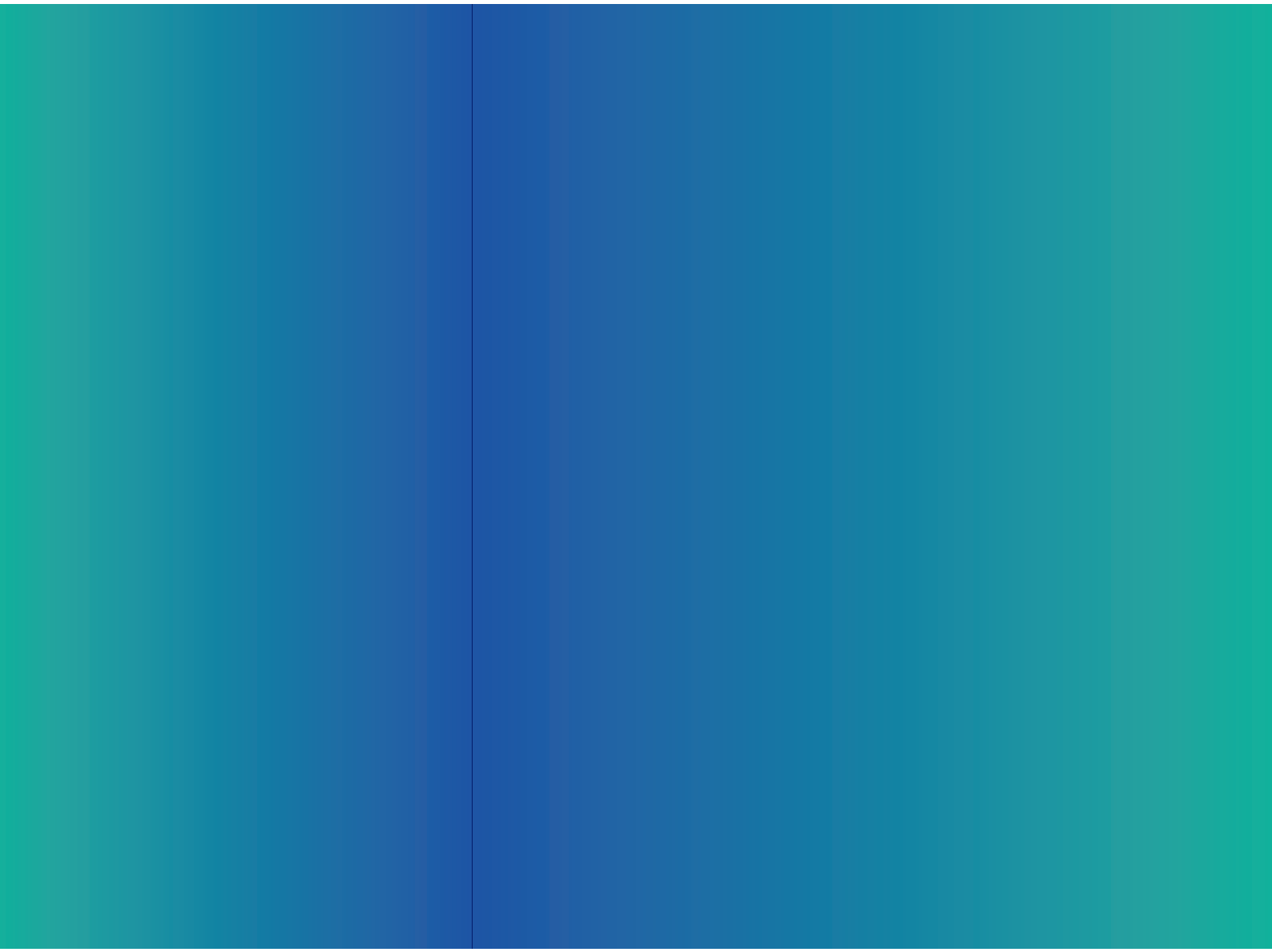
Dec Electricity Balancing in Europe – An overview of the European balancing market and Electricity Balancing Guideline

Dec Improving HVDC system reliability

GLOSSARY

Acronym	Definition
aFRR	Automatic Frequency Restoration Reserves
BRP	Balancing Responsible Parties
BSP	Balancing Service Provider
CACM	Capacity Allocation and Congestion Management
CBA	Cost-Benefit Analysis
CCR	Capacity Calculation Region
CENELEC	European Committee for Electrotechnical Standardisation
CGM	Common Grid Model
CGMES	Common Grid Model Exchange Standard
DCC	Demand Connection Code
DSO	Distribution System Operator
EBGL	Electricity Balancing Guideline
ECAN	ENTSO-E Capacity Allocation and Nomination System
ENTSOG	European Network of Transmission System Operators for Gas
ETIP SNET	European Technology and Innovation Platform Smart Networks for Energy Transition
FCA	Forward Capacity Allocation
HVDC	High-Voltage Direct-Current
IEC	International Electrotechnical Commission
IEM	Internal Electricity Market
ICS	Incident Classification Scale
JAO	Joint Allocation Office

Acronym	Definition
MADES	Market Data Exchange Standard
MAF	Mid-term Adequacy Forecast
mFRR	Manual Frequency Restoration Reserves
MRC	Multi Regional Coupling
MoU	Memorandum of Understanding
NEMO	Nominated Electricity Market Operator
NRA	National Regulatory Authority
OPDE	Operational Planning Data Environment
PCI	Project of Common Interest
Prosumers	Neologism that designates producers and consumers
RES	Renewable Energy Sources
RfG	Requirements for Generators
RGCE	Regional Group Continental Europe
RR	Replacement Reserves
RSC	Regional Security Coordinator
SAP	Single Allocation Platform
SET Plan	Strategic Energy Technology Plan
SOGL	System Operation Guideline
TSO	Transmission System Operator
TYNDP	Ten-Year Network Development Plan
XBID	Cross-Border Intraday



European Network of
Transmission System Operators
for Electricity

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