ANNUAL WORK PROGRAMME 2018

FINAL VERSION AFTER ACER OPINION

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ANNUAL WORK PROGRAMME 2017 THROUGH DECEMBER 2018

About ENTSO-E

ENTSO-E, the European Network of Transmission System Operators, represents 43 electricity transmission system operators (TSOs) from 36 countries across Europe. ENTSO-E was established and given legal mandates by the EU's Third Legislative Package for the Internal Energy Market in 2009, which aims at further liberalising the gas and electricity markets in the EU. In addition to its legal mandates, ENTSO-E is Europe at work and aims to ensure the efficient cooperation of its members, supportive of the overall vision of a reliable, sustainable and competitive European power market.

1. EXECUTIVE SUMMARY

This Annual Work Programme covers the period from September 2017 through the end of 2018. It builds on the obligations under ENTSO-E's legal mandate and ENTSO-E's strategic objectives as defined by the Board on a yearly basis. Responding to our obligations under the Third Legislative Energy Package, this programme focuses largely on the implementation of those tasks listed in the package. ENTSO-E's expertise and resources however are sourced from its 43 member TSOs who constitute the association.

The work programme was submitted for stakeholders' views, in a public consultation that took place in August-September 2017. The comments received have been implemented and it is now submitted to ACER for two months, after which ACER will provide comments. The work programme will be updated based on the feedback received, and published in its final version by 31 December 2017. The accomplishment of this ambitious work programme will be assessed by ENTSO-E's Annual Report 2018, to be released in early 2019. It goes without saying that the successful implementation of this work programme depends on the support of stakeholders.

2018: TURNING A PAGE FOR ENTSO-E

Nine years after its inception, 2018 is a turning point for ENTSO-E as all of the network codes and guidelines that we have produced so far jointly with stakeholders, the European Commission and ACER are in force or awaiting their entry into force and our efforts focus on their implementation. Implementing the codes and guidelines will be a significant challenge for all involved parties, including ENTSO-E. The implementation of the first codes began several years ago and will be intensively pursued until 2025. This task comes with significant workload and investments in new tools, methodologies, and close cooperation with stakeholders and regulators. The first experience in this area with the network code stakeholder committees has been positive and effective, and cooperation should be further strengthened in 2018, but it also shows that we are still climbing an important learning curve along with all stakeholders.

Our 2018 work programme also reflects the needs of the transition towards active system management. As **the customer should move centre stage**, generation grows increasingly decentralised and variable, while new challenges and new opportunities arise. New technologies and players are entering the market, and new EU policies will guide Europe's energy transition. Power networks, including both DSOs and TSOs, occupy a key position, linking all energy market players to each other throughout Europe. The digitalisation of the power system is an important part of the answer to these challenges.

ENTSO-E and its members are committed to and already part of this digital transformation of the grid. The **digital revolution** – the fourth industrial revolution – is a powerful means to address the global challenges that the world is faced with: global warming, economic competitiveness, and security of energy supply. TSOs are already engaged on that path, and develop common tools like the Common Grid Model. The Common Grid Model will also more closely link the national, regional and pan-European, for example, allowing bi-directional data flows between national operators and regional service centres. We aim to develop a proposal on how to best build the IT architecture needed to sustain the future digital grid.

Going digital means that data handling competences need to be developed. Already today, data processing plays a significant role in ENTSO-E's work on things like adequacy forecasts, grid models, transparency platform, network code implementation, etc. At the same time, we recognise that this is a very dynamic and demanding environment. ENTSO-E will therefore invest further through 2018 in this area.

Adapting to change also means **transforming the way we create value for society**. Since its inception, ENTSO-E has been entrusted with a number of legal mandates and we have upheld them to the best of our abilities. With the experience gained over the past years and the feedback we have received, we aim to go further by **providing energy market players with the services they need to make the energy transition happen**, while observing strict neutrality. A first example of this new approach is our

Bente Hagem
CHAIR OF THE BOARD
Statnett, Norway

With the experience gained over the past years, we aim to provide energy market players with the services they need to make the energy transition happen.

plan to transform our Transparency Platform into a 'market-serving' tool: a single, intuitive and user-friendly platform centralising data on the entire internal electricity market. We realise that a lot needs to be done to achieve that goal, on user-friendliness and data quality, to name only two aspects. Nevertheless, we believe that adopting a more service-oriented approach, while continuing to fulfil the legal mandates entrusted upon us, will allow us to better deliver on our vision and values.

REPORT STRUCTURE AND MAJOR PROJECTS IN 2018

Transformation starts from the inside. With that in mind, we are reviewing our internal values and vision, as well as the overall structure and the ways our secretariat works. One such step will be the streamlining of our R&D and innovation activities, to prepare for the smarter grid and to ensure that innovation projects are implemented on such areas as the TSO-DSO interface. In the context of our new IT strategy to prepare for the future challenges, our internal IT organisation and governance will also be reviewed and streamlined.

Because of the importance of network codes for ENTSO-E's work and for the European electricity market and system, and because the codes constitute one overall project with many interrelationships between them, the work programme contains a separate 'Network code' chapter (Chapter 2). We focus on implementation, which is the most significant part of our work since the approval in comitology of the last code, the Electricity Balancing Guideline, in March 2017. 2018 will see an important milestone with the publication in March of the results of our bidding zones study and the go live of XBID, both part of the implementation of the CACM Regulation but initiated already several years ago. With regards to system operations, one significant element is the continued implementation of all regional security coordinators and their five initial services.

Chapter 3 addresses our activities dedicated to the future of the grid, namely grid development, innovation and the wholesale-retail interface. We will release the Ten-Year Network Development Plan (TYNDP) 2018, with a number of new initiatives, including a co-creation process with stakeholders on the scenarios considered, a report on pan-European system needs and enhanced modelling methodologies. With the TYNDP, TSOs plan decades ahead to guarantee a safe, affordable and clean electricity supply to customers across Europe. Our work programme on system adequacy (Chapter 4) should be seen as an early preparation for a potentially enhanced role of ENTSO-E's adequacy assessments, as foreseen in the proposed risk preparedness regulation.

For the first time, the work programme regroups our IT work in a 'Towards a digital future' chapter (Chapter 5), covering major IT deliverables (Transparency Platform, Common Grid Model), ENTSO-E's IT strategy and standardisation work as well as our work on cyber security.

The importance of data and modelling in ENTSO-E's work, e.g., for system adequacy analysis and grid planning, is tremendous. It is becoming even more so with the implementation of network codes, as some deliverables, such as the review of bidding zones, require significant work in data collection, analysis, and market modelling. Many aspects of our work require elaborate methodologies and software, with constant improvement and adjustment so as to remain state-of-the-art. This has significant implications in terms of resources (budget and staff).

Finally, stakeholders' input is decisive for the quality of our work and for its implementation. Consequently, ENTSO-E considers co-creation and engagement as a key element to fulfil its role. Chapter 6 presents activities aiming at the continuous enhancement of stakeholder engagement.

We understand the challenges faced by stakeholders when contributing to our numerous public consultation processes, which can require considerable time and efforts. ENTSO-E will consider elaborating a simpler methodology in 2018.

2. IMPLEMENTING THE NETWORK CODES

Building a secure, competitive and low-carbon European electricity sector and the internal energy market are ambitious targets, that need adequate rules to enable them to become a reality. These new rules are the network codes. The codes are a technical rulebook, that complement existing legislation by defining a common 'code of conduct' for all. Generators, grid operators, traders and all other players in the sector will adopt the same practices and business processes.

Between 2009 and March 2017 ENTSO-E has developed, jointly with ACER and stakeholders, eight network codes. The adoption of the Electricity Balancing Guideline by EU member states in March 2017 and passing through scrutiny by the Council and European Parliament, marked the end of that process. All codes have now either entered into force or are awaiting their entry into force, and ENTSO-E's resources are now mostly focused on their implementation, detailed hereafter.

The codes belong to one of three families:

- **Market codes move market integration forward, for more competition and resource optimisation. They set rules for capacity calculation, day-ahead and intraday markets, forward markets and balancing procurement.**
- **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 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 and demand facilities and high-voltage direct current (HVDC) connections.**

The eight existing codes need to remain up-to-date with market and technological developments. Their review is an ongoing process on which ENTSO-E will work jointly with ACER , the European Commission and all stakeholders over the years to come.

In addition, in its Communication 'Clean energy for all Europeans' of November 2016, the European Commission set up a Smart Grids Task Force overseeing three stakeholder working groups, to prepare the ground for possible new network codes if required on demand response, energy-specific cybersecurity and common consumer's data format. ENTSO-E is involved and will provide its expertise as necessary. It goes without saying that new network codes should be launched only when, firstly, a gap analysis has been thoroughly undertaken between what is provided by the existing codes and what is missing and justifying a new code, and secondly when it can be ruled out that the missing elements cannot be addressed through amendments of the existing codes or guidelines.

HOW ARE NETWORK CODES IMPLEMENTED?

Entry into force of the codes means they become binding EU law, to be applied by European and national players. Implementation often requires a combination of national decisions, regional agreements, and pan-European methodologies and tovols. All market participants, DSOs, TSOs, and regulators are involved in various ways. The related workload as well as the consultation processes are significant.

IMPLEMENTATION OFTEN REQUIRES A COMBINATION OF NATIONAL DECISIONS, REGIONAL AGREEMENTS, AND PAN-EUROPEAN METHODOLOGIES AND TOOLS. ALL MARKET PARTICIPANTS, DSOS, TSOS, AND REGULATORS ARE INVOLVED IN VARIOUS WAYS.

WHO IS IN CHARGE OF THE IMPLEMENTATION?

The codes define which entity is responsible for each implementation task.

- ENTSO-E oversees part of the implementation tasks.
- Additionally, ENTSO-E facilitates the tasks attributed to 'all TSOs'. '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'). The TSOs whose countries are not member of the EU are also involved in the development phase. Because TSOs have decided that ENTSO-E's structures are the most efficient vehicle to facilitate the delivery of pan-European tasks and of some regional tasks, ENTSO-E coordinates and supports the decision-making process. However, the validation of the deliverables to be submitted to NRAs is made by 'all TSOs', not by ENTSO-E.

Once submitted to all EU NRAs (or to those of the respective region), all NRAs must similarly reach a decision to formally adopt the deliverable and make it legally binding. In case they cannot reach a consensus, a safety net process involving ACER is foreseen.

The codes set deadlines for implementation, and these can be ambitious. Therefore, ENTSO-E and the TSO community started early implementation projects before the official entry into force of the codes.

TASK	RESPONSIBILITY	APPROVAL
ENTSO-E	ENTSO-E	ACER
Pan-European 'All TSOs'	All TSOs	All NRAs
Regional 'All TSOs'	TSOs of the regions	NRAs of the region
National	Depending on national legislation (TSO, DSO,...)	National NRAs

Stakeholders involvement from European and regional groups to national bodies

Monitoring by ACER, EC, ENTSO-E

The detailed implementation plan is presented in the next sections, which introduce the work ahead for each of the three families of codes:

- **Market codes:** the CACM Regulation entered the fourth year of its official implementation period in August 2018. The Forward Capacity Allocation Regulation entered into force in October 2016 and entered its second year of implementation in October 2017. Finally, the Electricity Balancing Guideline was approved in comitology in March 2017 and is expected to enter into force before the beginning of 2018. Several early implementation projects at the European and regional levels are already ongoing or planned.
- **Operational codes:** The System Operation Guideline entered into force in September 2017, the Network Code Emergency and Restoration was approved in comitology in October 2016 and is expected to enter into force in November 2017. Several implementation projects with deliverables on the pan-European and regional levels have already begun. The entry into force of both regulations will trigger the work on the remaining tasks.
- **Connection codes:** Although their implementation is the responsibility of each EU member state, ENTSO-E has monitoring duties and acts as a platform to share information and good practices through the publication of implementation guidelines, support of the Grid Connection European Stakeholder Committee, and maintenance of an implementation library on its website, providing information on all national implementation processes.

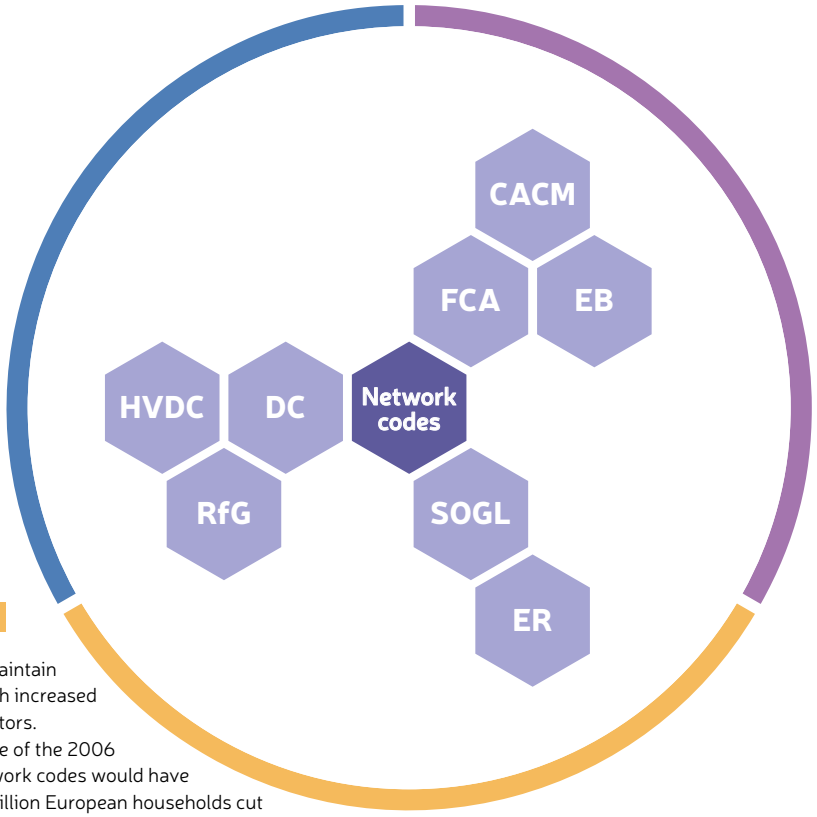
NETWORK CODES

SUSTAINABILITY

Network codes will ease the integration of 260 GW of PV & wind and more than 11 GW of demand-side response across Europe

SECURITY OF SUPPLY

The codes will allow to maintain security of supply through increased cooperation of grid operators.
If implemented at the time of the 2006 event (system split), network codes would have contributed to avoid 15 million European households cut off and M€ 300 - 500 of economic losses due to load shedding



COMPETITIVENESS & SOCIAL WELFARE

> 23 countries in day-ahead market coupling

> 1 billion € increase in social welfare with market coupling and 80% already achieved

> ±120 TWh of power are exchanged in intraday markets each years. With the market codes and continuous trading this will double by 2020

> 10 million of market data published each year on ENTSO-E website

A large part of ENTSO-E's work aims at ensuring, for all three families of codes, the delivery and consistency of legally-robust deliverables, communication, and stakeholder engagement. This includes:

> Participate in the design and drafting of ENTSO-E and pan-European 'all TSOs' deliverables and some regional 'all TSOs' deliverables;

> Organise consultations, working groups and public workshops for all European tasks and, when relevant, share information on regional and national task delivery;

> Support the NC European Stakeholder Committees, chaired by ACER, which allow a continuous involvement of stakeholders during the whole implementation programme;

> Facilitate the adoption of pan-European 'all TSOs' deliverables and some regional 'all TSOs' deliverables;

> Act as a platform to share information and good practices for regional and national tasks among TSOs and with stakeholders through its website;

> Advise TSOs on technical and legal issues and participate when needed in meetings or forums set up for the implementation of NCs;

> Elaborate on agreements, such as aligning the existing operational agreements with the requirements of the SO Guideline and NC Emergency and Restoration;

> Review the several major operational IT tools to provide a secure and smooth coordination among TSOs and RSCs with appropriate interoperability standards.

A COLLECTIVE EXERCISE

Stakeholder consultation and regulatory approval is of utmost importance in the implementation phase of the codes. Implementing the codes requires the involvement of the whole electricity community, at the EU, regional and national levels.

To involve stakeholders in the implementation of the codes, ACER and ENTSO-E have set up European Stakeholders Committees, with three main missions:

> contributing to a more informed decision-making process for the methodologies and rules still to be developed;

> monitoring progress in implementation;

> serving as a platform to share general views on implementation.

The Market Stakeholders Committee launched in 2015, the Grid Connection Stakeholders Committee in 2016, and the System Operations Stakeholders Committee in 2017. All three committees will continue holding regular meetings throughout 2018.

ENTSO-E supports these committees by taking charge with ACER of the preparation and development of meetings, providing secretariat services, informing stakeholders of progress, and making available every

minutes and documents of the meetings on its website.

Besides, ENTSO-E has developed throughout 2017 an Issue Logger tool, where the questions raised by members of the European Stakeholder Committees are centralised and answered to in a transparent manner. Developed with the support of ACER and in agreement with the members of the Stakeholder Committees and the European Commission, the tool has benefited from the constructive feedback of committees members, is currently being finalised and will be made publicly accessible by end of 2017. ENTSO-E hopes that, as the Tool compiles more and more answers related to specific aspects of network codes and their implementation, it will support a harmonised implementation of all codes throughout Europe.

In addition to the Market Stakeholder Committee, the Balancing Stakeholder Group also meets regularly to discuss the implementation of the Electricity Balancing Guideline. Market codes are also discussed in the yearly Florence Forum, where ENTSO-E participates.

Implementation tasks for all codes require extensive public consultations and the organization of workshops involving stakeholders. A pre-emptive planning of public workshops and consultations planned in 2018 is provided in the following sections when available.

MONITORING THE IMPLEMENTATION

ENTSO-E is entrusted with the tasks of 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.

Monitoring activities started in 2016 for CACM and continued over 2017, with the elaboration of monitoring plans (for the CACM and FCA regulations) and monitoring reports as well as the collection of data to support ENTSO-E and ACER in their monitoring activities (including the identification of data to be collected and the design and implementation of interfaces for data collection).

ENTSO-E initiates its monitoring activities for other codes as they enter into force, based on discussions with ACER on the most efficient approaches to collect data needed for ACER's and ENTSO-E's monitoring. Regarding connection codes, ENTSO-E has been paving the way for the monitoring of their implementation by creating the connection codes implementation library, which will gather all available European and national documents and timelines in all European countries and regions as they become available.

Specific monitoring activities in 2018 for each code are detailed in the sections below.

BETTER INFORMATION FOR BETTER STAKEHOLDER INVOLVEMENT: SPREADING KNOWLEDGE OF NETWORK CODES

In close cooperation with the Florence School of Regulation, ENTSO-E will launched in October 2017 the first edition of an online training course on network codes. Developed over the course of 2017, this first online training course benefited from the contributions of ACER and of the European Commission. This first course covers the market codes and the System Operation Guideline. In 2018 ENTSO-E aims to develop, still with the FSR, a second course to cover connection codes.

The objective of this initiative is to help improve understanding of the network codes and their implementation. The training is targeted to all energy market stakeholders, EU institutions officials, national regulators and TSOs.

In addition, ENTSO-E has commissioned a study to assess the impact of network codes in terms of value creation for European citizens.

Finally, ENTSO-E communicates on network codes via its website, publications and events.

MARKET CODES: COMPETITIVENESS & SOCIAL WELFARE

Market codes are moving market integration forward for more competition and resource optimisation. They define rules on forward or long-term capacity allocation allocation so that market players have more opportunities to trade electricity while hedging the risks associated with cross-border trading. They set how capacity on interconnections is calculated and how congestion is managed, aiming at increasing cross-border exchanges in the day-ahead (the day before real-time market) and intraday timeframes.
Finally, the codes address electricity balancing, that is, the actions and processes through which TSOs ensure, in a continuous way, the balance of the generation and load in order to maintain system frequency. The idea is to maximise the exchange of balancing resources as well as to integrate new providers, such as demand response.

THE CACM REGULATION

The rules set by the CACM Regulation provide the basis for the implementation of a single energy market across Europe. The CACM Regulation sets out the methods for allocating capacity in day-ahead and intraday timescales and outlines the way in which 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.
Because it was the first code to enter into force, in August 2015, the implementation of the CACM Regulation is well under way. The following implementation steps are ongoing:

DEFINITION OF THE CAPACITY CALCULATION REGIONS (CCRS)

'All TSOs' submitted a proposal on CCRs to all NRAs in November 2015. The NRAs did not reach a unanimous agreement on the proposal and the task was then referred to ACER. In November 2016, ACER approved the CCRs as proposed by 'all TSOs' with one amendment; it merged the Central-West Europe and the Central-East Europe regions in a 'Core CCR'.
In future, it may be necessary to make changes to the definition of CCRs, because

of the building of new interconnections and the possible definition of new bidding zone borders. In that case, ENTSO-E will work with the concerned TSOs to draft, consult and submit an amendment request to the definition of CCRs.

ENTSO-E will support CCRs in their work as needed, including preparations and public consultations on their capacity calculation methodology, re-dispatching methodology and cost-sharing methodology.

COMMON GRID MODEL AND GENERATION AND LOAD DATA PROVISION METHODOLOGIES

(see in Chapter 5 under 'Common Grid Model').

BIDDING ZONES STUDY

As part of the implementation of the CACM Regulation, a report on the efficiency of existing bidding zones, and possibly a review, are foreseen. Upon request from ACER, ENTSO-E and involved TSOs started, in 2012, as an early implementation project, on the bidding zone review of Central-West Europe, Denmark-West, Central-East Europe, Switzerland, and Italy.

A bidding zone is the largest geographical area in which market participants can exchange energy without capacity allocation. This implies that, within a bidding zone, energy exchanges are possible without constraint. However, exchanges may be constrained between zones where cross-zonal capacities are insufficient to facilitate them. This poses the question of where and how the geographical boundaries of bidding zones should be determined. An efficient configuration of bidding zones maximizes social welfare by optimising electricity exchanges across Europe.
In December 2016 ACER formalised the requirements for a review of the bidding zone configuration under CACM. This implies an obligation for the TSOs involved to finalise the results of the bidding zone study by 21 March 2018. ENTSO-E and the TSOs involved expect to obtain model results from the external consultant in charge in the fall of 2017, and to analyse the results, consult with stakeholders and develop final recommendations by March 2018.
Additionally, ENTSO-E, upon ACER's request and to fulfil CACM implementation obligations, will issue a technical report on bidding zones covering all of Europe by August 2018.

TSOS-NEMOS TASKS

Under the ENTSO-E framework, nominated electricity market operators (NEMOs) and TSOs have cooperated to develop a proposal for a common set of requirements for efficient capacity allocation to enable the development of the price coupling algorithm and of the continuous trading matching algorithm. The proposal was submitted to NRAs in February 2017. NRAs requested amendments and NEMOs, in cooperation with TSOs, will resubmit the proposal by end of October 2017.
ENTSO-E will keep supporting other implementation tasks attributed to NEMOs, including the backup methodology, maximum and minimum prices, the follow up of complementary regional auctions, and fall back procedures. We also cooperate with NEMOs on developing and reporting on cost sharing and organising the day-to-day management of the single day-ahead and intraday coupling.

METHODOLOGY FOR SCHEDULED EXCHANGES

TSOs will submit in 2017 updated proposals for the methodologies for calculating scheduled exchanges. Depending on the feedback received from NRAs, follow-up work may be needed in 2018.

INTRADAY CROSS-ZONAL GATE OPENING AND CLOSURE TIME

All TSOs submitted their proposal to all NRAs for approval in December 2016. The NRAs decided in June 2017 to request amendments, so all TSOs submited the amended proposal in late August 2017.

INTRADAY CAPACITY PRICING DEVELOPMENT

All TSOs submited a proposal to all NRAs in August 2017. NRAs' decision is expected in February 2018.

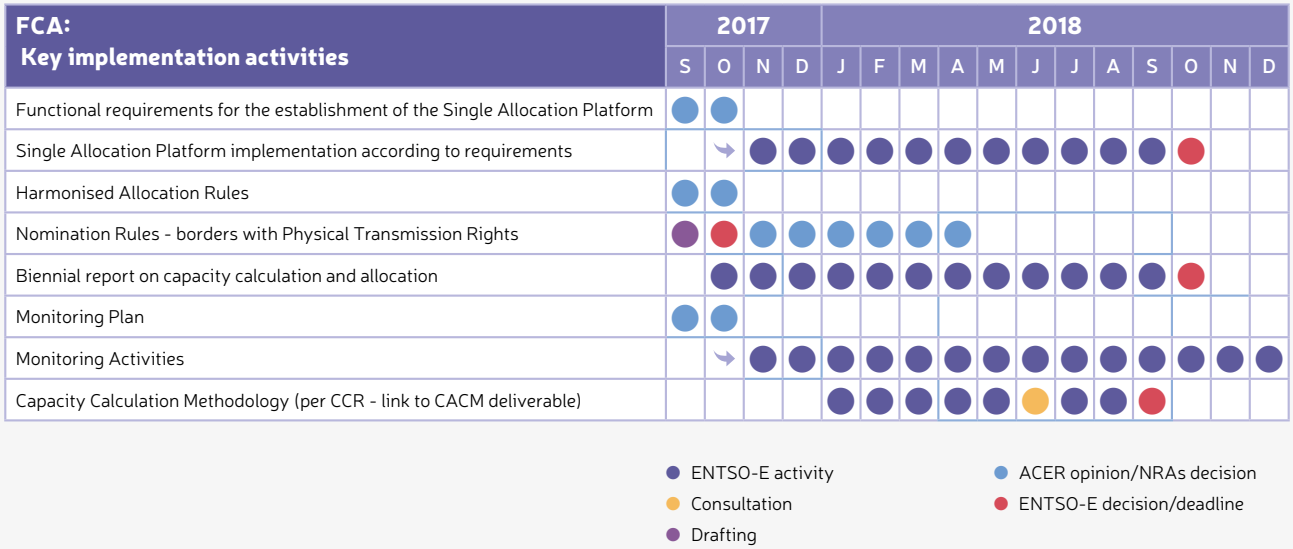
IMPLEMENTATION MONITORING ACTIVITIES

In 2016 ENTSO-E submitted to ACER its Monitoring Plan for CACM, explaining the scope, frequency, and method used for the monitoring of the implementation. Over 2016 and 2017, ENTSO-E has been discussing with ACER the establishment of the list of information that ENTSO-E, TSOs, and other market entities should submit to ACER for its own monitoring of the CACM implementation. Follow up of these discussions and delivery of the data will take place in 2018.
In addition, ENTSO-E will issue in 2018 the 4th and 5th edition of its biannual report on the progress and potential problems with the implementation of the single day-ahead and intraday coupling. This report takes stock of the progress achieved so far in the coupling of electricity markets through the day-ahead market coupling project (namely, the multi-regional coupling project or MRC) and the intraday market coupling project (namely, the cross-border intraday project or XBID).

Finally, ENTSO-E monitors the implementation of capacity calculation regions through its biennial report on capacity calculation and allocation constraints, the first edition of which was released in August 2017, and the second foreseen in August 2019.

CACM: Key implementation activities	2017				2018											
	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
Bidding zone study (formalised CACM deliverable)	●	●	●	●	●	●	●									
Technical report on bidding zones covering entire Europe (recurring CACM task)			●	●	●	●	●	●	●	●	●	●				
ENTSO-E reports on DA and ID progress (recurring task)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
TSOs-NEMOs joint tasks	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Capacity calculation methodology (per CCR)	●															
Redispatching and countertrading methodology (per CCR)	●	●	●	●	●	●	●									

● ENTSO-E activity
● Consultation
● ENTSO-E decision/deadline



THE FORWARD CAPACITY ALLOCATION REGULATION

The forward capacity allocation (FCA) Regulation aims at establishing and promoting forward markets in a coordinated way across Europe. Forward markets allow parties to trade in longer timeframes, secure transmission capacity before the day-ahead timeframe and hedge the risks.

The FCA Regulation entered the second year of its implementation in October 2017. Planned implementation activities include the following:

HARMONISED ALLOCATION RULES

Work on draft harmonized allocation rules (HAR) began with early implementation work launched in 2014, and draft HARs were submitted to all NRAs in 2016. Following the entry into force of the FCA Regulation in October 2016, all TSOs delivered the HAR as part of the official FCA implementation in April 2017. ACER approved the HAR proposal with amendments in early October 2017.

SINGLE ALLOCATION PLATFORM

All TSOs' proposal on the Single Allocation Platform - the European platform to be established by all TSOs for FCA - was submitted to NRAs in April 2017. All NRAs' approved the proposal in late September 2017. TSOs now have 12 months to establish the platform.

NOMINATION RULES FOR PHYSICAL TRANSMISSION RIGHTS

The proposals on physical transmission rights are due 12 months after the entry into force of the FCA, by October 2017. They will cover the technical requirements, nomination processes and timings, and the format of communication processes.

REGIONAL DESIGN OF LONG-TERM TRANSMISSION RIGHTS

TSOs have developed proposals for the design of long-term transmission rights, where each proposal covers one CCR. The proposals were delivered in April 2017 and NRAs' decision is expected by October 2017.

METHODOLOGY OF SPLITTING OF LONG TERM CROSS ZONAL CAPACITY

TSOs will develop in 2018 proposals for methodologies for the splitting of long term cross zonal capacities. Each proposal will cover one CCR. The proposals are expected to be delivered in Q4 2018.

CONGESTION INCOME DISTRIBUTION METHODOLOGY

ENTSO-E is working with all TSOs to prepare a proposal for a congestion income distribution methodology under FCA, to be delivered six months after the same methodology for CACM received NRAs' approval. Tentative timing for submission of the methodology for FCA is December 2017.

FIRMNESS AND REMUNERATION COST SHARING

Work on firmness and remuneration cost sharing is expected to be delivered six months after the delivery of the FCA congestion income distribution methodology and will start in 2018.

CGM METHODOLOGY AND GENERATION AND LOAD DATA PROVISION METHODOLOGY FOR FCA

(see in Chapter 5 under 'Common Grid Model').

MONITORING ACTIVITIES

ENTSO-E is discussing with ACER to detail the list of information that ENTSO-E, TSOs, and other market entities should submit to ACER for its own monitoring of the FCA implementation. Follow up of these discussions and delivery of the data will take place in 2018.

ENTSO-E and TSOs are working on the indicators to take into account in the monitoring of capacity calculation and expect to release them at the end of 2017 or early 2018. The first report on capacity calculation under FCA is due in October 2018.

Finally, ENTSO-E will release in 2018 its first report on the progress and potential problems with the implementation of forward capacity allocation, providing the FCA monitoring plan receives ACER's approval (expected in 2017).

THE ELECTRICITY BALANCING GUIDELINE

Electricity balancing is the process by which TSOs ensure sufficient energy to balance inevitable differences between supply and demand in real time. The Electricity Balancing Guideline aims to move Europe from the current situation, in which balancing energy is used mostly at a national level, to a situation in which larger markets allow the resources available in Europe to be activated in a more effective way.

The Electricity Balancing Guideline was approved by EU member states in comitology in March 2017; early implementation activities are already ongoing and will continue in 2018. ENTSO-E has created project teams to deliver the "all TSOs" deliverables for imbalance netting, frequency restoration reserves with automatic activation (aFRR), frequency restoration reserves with manual activation (mFRR), replacement reserves, cross-border capacity allocation, imbalance settlement, settlement of intended and unintended deviations, activation purposes, reporting and CBAs.

Furthermore, the International Grid Control Cooperation (IGCC) project has started implementing the targets for the European platform for imbalance netting, and the Trans European Replacement Reserves Exchange (TERRE) project has started implementing the targets for the European platform for replacement reserves. Implementation projects for European platforms for aFRR and mFRR will be identified, so that work can start at the latest in 2018.

Ben Voorhorst
PRESIDENT
TenneT, The Netherlands

Market codes are moving market integration forward for more competition and resource optimisation.

EB GUIDELINE: Key activities	2017				2018											
	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
ENTSO-E to update manual of procedures of Transparency Regulation	●	●	●	●	●	●	●	●	●	●						
Proposal for activation purposes	●	●	●	●	●	●	●	●	●	●	●	●	W	●	●	●
Each TSO to propose T&Cs for BSPs and BRPs	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Proposal for pricing method for all products	●	●	●	●	●	●	●	●	●	●	●	●	W	●	●	●
Proposal for TSO-TSO settlement of intended exchanges of energy	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Proposal for TSO-TSO settlement of settlement of ramps and FCR and unintended exchanges within and between SA	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Proposal for harmonisation of certain features of imbalance calculation & pricing	●	●	●	●	●	●	●	●	●	●	●	●	W	●	●	●
Cross Border Capacity Allocation	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
ENTSO-E monitoring plan	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Proposal for implementation framework for European platform for replacement reserves	●	●	●	●	●	●	W	●	●	●	●	●	●	●	●	●
Proposal for implementation framework for European platform for frequency restoration reserves with automatic activation	●	●	●	●	●	●	●	●	●	●	W	●	●	●	●	●
Proposal for implementation framework for European platform for imbalance netting	●	●	●	●	●	●	W	●	●	●	●	●	●	●	●	●

- ● Consultation
- ● Drafting
- ● ACER/NRAs opinion
- ● ENTSO-E decision
- ● TSO decision
- W Workshop

SYSTEM OPERATIONS CODES: REGIONAL COOPERATION & SECURITY OF SUPPLY

THE SYSTEM OPERATION GUIDELINE

The System Operation Guideline sets out harmonised rules on how to operate the grid to ensure the security of supply with increasing renewables. It also enshrines in EU law the regional security coordinators (RSCs) (more on RSCs below).

It entails several challenging implementation tasks for TSOs at pan-European, regional, and national levels. The implementation of the System Operation Guideline involves ENTSO-E and TSOs; ACER and NRAs are monitoring progress. From March 2017, the European Stakeholder Committee on Network Codes Implementation dealing with system operations ensures that all electricity stakeholders are involved in the process.
The SO Guideline entered into force on 14 September 2017. The following implementation activities are ongoing and/or will begin in 2018:

> ENTSO-E will facilitate the preparation of an 'all TSOs' proposal on key organizational requirements, roles and responsibilities in relation to data exchange. The proposal is expected to be submitted in early 2018, at the latest six months after the entry into force of the SO Guideline.

> ENTSO-E will facilitate the preparation of an 'all TSOs' proposal regarding a methodology for coordinating operational security analysis and for a methodology for assessing the relevance of assets for outage coordination.

> ENTSO-E will facilitate the establishment of an 'all TSOs' process to develop a common list of year-ahead scenarios, against which TSOs assess the operation of the interconnected transmission system for the following year.

SO GUIDELINE: Key implementation activities	2017				2018											
	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
PAN-EUROPEAN ACTIVITIES																
Implementation monitoring: development of list of relevant information to be communicated by ENTSO-E to ACER	●	●	●	●	●	●	●	●	●	●	●	●	●			
Implementation monitoring: comprehensive standardised format, digital data archive of the information required by ACER	●	●	●	●	●	●	●	●	●	●	●	●	●			
Key organisational requirements, roles and responsibilities in relation to data exchange	●	●	●	●	●	●	●	●	●	●	●	●	●			
Process for developing a common list of year-ahead scenarios	●	●	●	●	●	●	●	●	●	●	●					
Methodology for building the year-ahead common grid models from the individual models and for saving them	●	●	●	●	●	●	●	●	●	●	●	●	●			
Methodology for building the day-ahead and intraday common grid models from the individual models and for saving them	●	●	●	●	●	●	●	●	●	●	●	●	●			
Methodology for coordinating operational security analysis	W	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Methodology for assessing the relevance of assets for outage coordination	W	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Implementation and operation of OPDE	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Harmonised data format for data exchange which shall be integral part of OPDE	●	●	●	●	●	●	●									
Development of OPDE module for outage coordination	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Development of OPDE module for adequacy assessment	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Preparation for publishing the data on operational agreements, frequency quality, load-frequency control structure and reserves on Transparency Platform	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
REGIONAL ACTIVITIES ON SYNCHRONOUS AREA LEVEL																
Agreement with non-EU TSOs setting the basis for their cooperation concerning secure system operation and setting the arrangements for the compliance of the non-EU TSOs with the obligations in SOGL	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Coordination of dynamic stability assessments	●	●	●	●	●	●	●	●	●	●	●	●	●			
Study for identifying whether minimum required inertia needs to be established	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Methodology for the definition of minimum inertia required to maintain operational security and prevent violation of stability limits	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Methodologies, conditions and values included in synchronous area operational agreements	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Determination of LFC blocks	●	●	●	●	●	●	●	●	●	●	●					
Assumptions and methodology for a CBA to be conducted to assess the minimum activation time of FCR -in CE and Nordic synchronous areas	●	●	●	●	●	●	●	●	●	●	●	●	●			
Cost-benefit analysis suggesting the minimum of FCR activation period	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
REGIONAL ACTIVITIES ON CCR LEVEL																
Common provisions for regional operational security coordination	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

● ENTSO-E activity ● Drafting ● ENTSO-E decision
● Consultation ● ACER opinion W Workshop

- ENTSO-E launches at the end of 2017 the work to make available on its Transparency Platform information on operational agreements, frequency quality, load-frequency control structure and reserves. It is expected that work will be ongoing throughout 2018 and conclude in 2019.
- No later than six months after the entry into force of the SO Guideline, TSOs of the Continental Europe and Nordic synchronous areas must release the assumptions and methodology for a cost-benefit analysis to assess the time required for frequency containment reserves providing units or groups with limited energy reservoirs to remain available during alert state. The methodology will be submitted to all NRAs of the concerned region for approval in January 2018. Once the methodology is approved, TSOs will have 12 months to submit the results of the cost-benefit analysis.
- The SO Guideline requires that a synchronous area operational agreement be produced for all synchronous areas (except Baltic). The synchronous area operational agreements are developed on the basis of the existing agreements between TSOs, while respecting all relevant requirements specified in the SO Guideline. For the Continental Europe area, there already exists the well-established UCTE Multilateral agreement from 2005 and its operational annex, the Operation Handbook. The Operation Handbook is a comprehensive collection of technical standards for the operation of the interconnected grid of the Continental Europe synchronous area. Work started in 2017 and is expected to conclude by September 2018, one year after entry into force of the SO Guideline.
- The System Operation Guideline requires several tasks on dynamic stability at synchronous area level: TSOs must perform dynamic stability assessments coordinated within synchronous areas, and each synchronous area must conduct a common study to identify the need to establish minimum required inertia limits. ENTSO-E identified a need to coordinate these activities at the pan-European level, to ensure the consistency of the assessment, studies and methodologies between synchronous areas. We will develop a guideline for the monitoring and exchange of information on dynamic stability assessments between TSOs, and a set of rules for decision criteria for action once the assessment results are known. Finally, ENTSO-E will have the studies done at the synchronous area level evaluated by a neutral consultant.

Finally, activities in 2018 will include implementation monitoring. ENTSO-E is discussing with ACER the exact scope of these activities.

In addition, to be consistent with the final text of the SO Guideline (and of the Emergency and Restoration Code), ENTSO-E has reviewed its incident classification scale methodology and will implement the new methodology in 2018. The new methodology also includes updated definitions of several criteria, to harmonise the way the criteria are interpreted.
The methodology is sent to ACER for opinion on the format and contents of the annual reports based on the incident classification scale as required by Article 15(1) of the SO Guideline.

REGIONAL SECURITY COORDINATORS: ENABLERS OF TSO REGIONAL COOPERATION

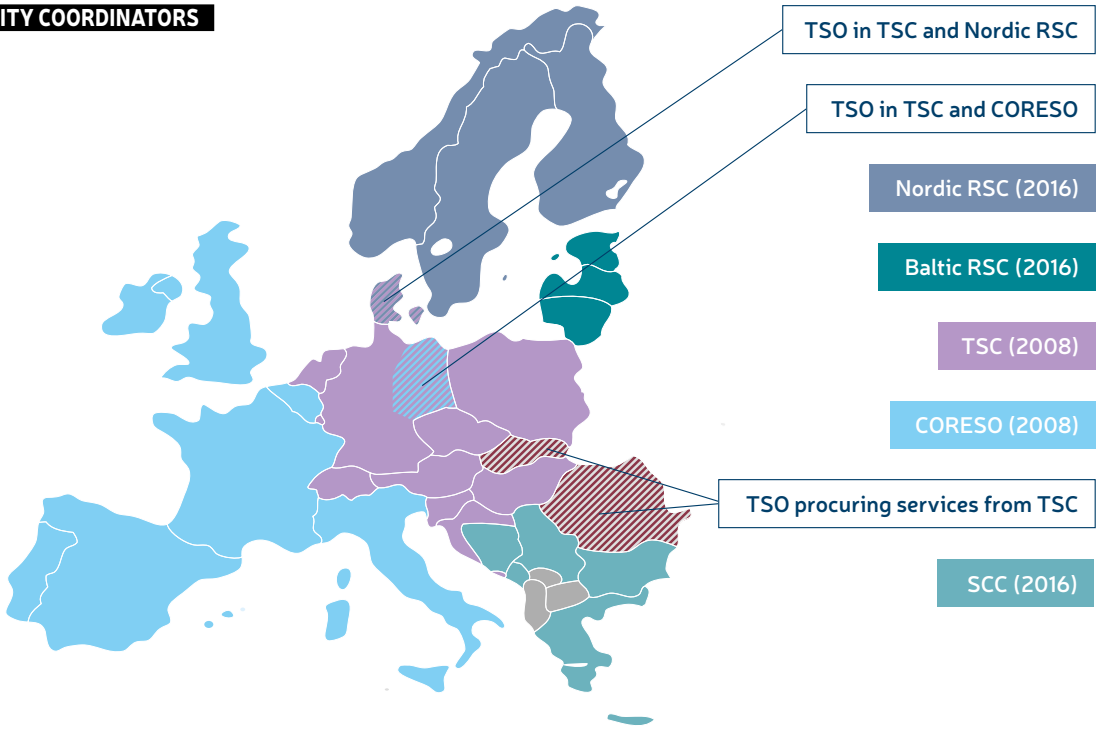
RSCs are appointed by TSOs to perform tasks required by SO Guideline and have been established in close collaboration and in an evolutionary way. Through their recommendations to TSOs, RSCs contribute to the operational security of the electricity system. A multilateral agreement signed in 2015 by ENTSO-E and TSOs made it mandatory for ENTSO-E members to participate in RSCs or to contract five services from them. The agreement also ensured that RSCs develop in a harmonized way under ENTSO-E's coordination, tools, standards and methodologies.

The System Operation Guideline formalises the name, existence, and role of the RSCs and makes it legally binding for all TSOs to take part. RSCs will cover the whole of Europe well before the legal deadline of 27 months after entry into force of the SO Guideline.

By 2019, all five RSCs' tasks must be implemented across Europe. ENTSO-E supports possible enhancement of the number of RSCs' tasks over time, once the five initial ones are successfully implemented.

FIVE TASKS	BENEFIT FOR TSOS & MARKET PARTICIPANTS
Regional operational security coordination	Identify risks of operational security in areas close to national borders. Identify the most efficient remedial actions in these areas and make recommendations to the concerned TSOs without being constrained by national borders.
Regional outage coordination	Single register for all planned outages of grid assets (overhead lines, generators, etc.). Enhanced governance of asset maintenance.
Coordinated capacity calculation from CACM	Calculate available electricity transfer capacity across borders (using flow-based or net transfer capacity methodologies). Maximise the capacity offered to the market.
Regional adequacy assessment	Provide market participants with consumption, production, and grid status forecasts up to several weeks ahead.
Building of Common Grid Model	Provide a regional dynamic view of all major grid assets (generation, consumption, and transmission), updated every hour.

REGIONAL SECURITY COORDINATORS



Overview of the RSCs which TSOs procure their services from[1].

According to the multilateral agreement signed in 2015, all TSOs will confirm which RSC(s) they intend to procure the five tasks from by the end of 2017[2].

In 2018, ENTSO-E will support the implementation of RSCs with the following activities:

- **Development of the OPDE module/ application for adequacy assessment.**
- **Development of the OPDE module/ application for outage planning coordination.**

Both tools will facilitate more detailed regional implementation in each RSC.

THE EMERGENCY AND RESTORATION CODE

The Emergency and Restoration Code (ER NC) sets out harmonised rules on how to deal with emergency situations and to restore the system as efficiently and as quickly as possible. It was approved by EU member states in comitology in October 2016 and is now awaiting its entry into force, expected before the end of 2017.

The ER NC is primarily subject to implementation at a national or TSO level. RSCs will also play a role in consistency assessments of each TSO's system defence plans. The implementation period is foreseen to extend until 2022 and the planning of implementation activities is in preparation.

THROUGH THEIR RECOMMENDATIONS TO TSOS, RSCS CONTRIBUTE TO THE OPERATIONAL SECURITY OF THE ELECTRICITY SYSTEM. THEY WILL COVER THE WHOLE OF EUROPE WELL BEFORE THE LEGAL DEADLINE OF 27 MONTHS AFTER ENTRY INTO FORCE OF THE SO GUIDELINE.

1. Provisional and simplified illustration.

2. Unless there is a redundancy between services provided by RSCs and services already secured by the TSO.

CONNECTION CODES: INTEGRATING RENEWABLES AND DEMAND RESPONSE

All three connection codes were approved and entered into force in 2016. The implementation of connection codes is the responsibility of each EU member state. ENTSO-E is tasked with delivering non-binding implementation guidance documents (IGDs).

ENTSO-E has drafted an initial set of 18 non-binding IGDs, highlighting the effect on specific technologies, the link with local network characteristics, and the need for coordination between network operators and grid users. Following a consultation process, final versions of the IGDs were released in March 2017.

ENTSO-E seeks to keep the documents continuously updated with the experience gained from the implementation at national level, and will publish updated versions of the IGDs for public consultation by end of 2018.

Additionally, ENTSO-E will work with ACER on monitoring the implementation of connection codes at national level. Work is already ongoing to pave the way for the monitoring, with the creation of the connection codes implementation library. It will contain all available European and national documents and timelines on the implementation of the connection codes in all European countries and regions and will be populated as documents become available. Available from ENTSO-E's website, it aims to make all documents on the implementation of connection codes available to stakeholders in an easy and practical way.

ENTSO-E also acts as a platform to exchange good practices and share information among EU member states, internally through its member TSOs and externally through supporting the European Stakeholder Committee on connection codes.

Finally, ENTSO-E will engage with ACER to define the possible amendments that may need to be made to each of the three connection codes.

CONNECTION NETWORK CODES: Key implementation activities	2017				2018											
	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
RFG - HVDC - DCC																
Coordinate implementation activities and work on CNC implementation Library	●	W	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Work on frequency stability requirements Implementation Guidance Documents (IGDs)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Work on HVDC related IGDs	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Work on cost Cost Benefit Analysis (CBA) related IGD	●	●	●	●	●	●	●									
Engage with stakeholders/ACER/EC, e.g., through the European Stakeholder Committee on connection codes	W	●	●	W	●	●	●	●	●	●	●	●	●	●	●	●
Collect needs for CNC amendments	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Engage with standardisation bodies to achieve consistency between connection codes and standards	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Report on inter-TSO coordination activities	●	●	●	●	●	●	●	●	●							

● ENTSO-E activity
● Consultation
● Drafting
● Publication
W Workshop

3. GRID OF THE FUTURE

By 2030 at least 45% of the electricity we consume will be generated from renewable energy sources (RES)[3]. This represents a significant challenge for ENTSO-E and TSOs in terms of infrastructure planning, innovation efforts and allowing customers to participate in all markets. Connecting Europe's electricity systems would allow the EU to boost its security of electricity supply and to integrate more renewable energy.

GRID DEVELOPMENT AND PLANNING: THE TYNDP

ENTSO-E's Ten-Year Network Development Plan (TYNDP) is the most extensive pan-European network development plan, providing a long-term vision of the power system. A legally mandated deliverable published by ENTSO-E every two years, it is the foundation of European grid planning and the sole basis for transmission projects that are eligible to be labelled as 'projects of common interest' (PCI).

The TYNDP aims to provide a benchmark for transmission network development (scenarios, system needs, development solutions, and project assessment). Pan-European system development is coordinated and linked with national needs, finding synergies when relevant between European, regional, and national studies, and making use of the significant expertise of the regional and local conditions of TSOs.

The TYNDP 2018 has evolved substantially in its methodology and carries important messages closely related to the EU's energy policy goals. The infrastructure projects depicted in the TYNDP are a key enabler of the EU's climate and energy policy objectives of decarbonisation, competitiveness and security of supply. These objectives drive the need for reinforcing and extending the European transmission infrastructure.

WHAT'S NEW IN THE TYNDP 2018?

The TYNDP 2018 will feature a new set of scenarios, which, for the first time, are co-constructed with stakeholders, member states and NRAs, and developed jointly with the European Network of TSOs for gas ENTSOG. Co-construction implies a change in methodology: for previous editions, we had proposed already defined 'visions' on which stakeholders were invited to comment. Instead, for the TYNDP 2018 ENTSO-E and ENTSOG have involved interested parties from the very beginning of the process, starting from a blank page and asking stakeholders to 'Build your own 2030 and 2040 scenarios'. This approach resulted in three clear storylines, all above the emissions targets, which we named 'sustainable transition', 'distributed generation' and 'global climate action'.

Additionally, for the first time, ENTSO-E will prepare a pan-European System Needs Report. This report will complement the Regional Investment Plans, to have an enhanced overview of the system needs. The system needs analysis of previous TYNDPs considered only economic indicators to identify the key boundaries, or main barriers for power exchanges, to be addressed. The TYNDP 2018 will consider other factors, such as RES curtailment and security of supply. The geographic scope of the system needs analysis will also be extended beyond the ten key boundaries considered in the 2016 edition. The TYNDP 2018 package will also include a new analysis aiming at better understanding future operational challenges in an electricity system with a very large amount of RES (frequency stability, voltage). Regarding the modelling, methodologies have been enhanced with a focus on demand and RES. A more detailed approach to determining demand profiles for each zone will be used, and the modelling approach of demand-side response and electric vehicles has been refined. Additionally, the TYNDP 2018 will be the first to consider several climate conditions. This is crucial when planning a system where most of the

3. EC Communication (COM (2014) 15) 'A policy framework for climate and energy in the period from 2020 to 2030'.

production is dependent on an increasingly un-predictable climate.

The assessment of projects will be conducted using the new cost-benefit analysis methodology 2.0. The new methodology was drafted by ENTSO-E, with ACER's input, because the feedback received from stakeholders on previous TYNDPs, and ENTSO-E's own experience with the previous methodology, showed a need for improvement.

WHAT ARE THE NEXT STEPS?

Winter 2017-2018: Publication for public consultation of the regional investment plans and of the European system needs report.

Q3 2018: release of the TYNDP 2018 for public consultation.

STAKEHOLDERS SHAPING THE FUTURE GRID

ENTSO-E is continuously striving to increase stakeholder's involvement in the TYNDP process.

In addition to the aforementioned enhanced role of stakeholders in the building of the scenarios, stakeholders are also involved via the Network Development Stakeholder Group. The Group involves representatives of various actors, including electricity generators, distribution system operators, traders, consumers, and NGOs. In activity since 2013, the role of that group has been reinforced and it is now a key contributor in building the TYNDP: while keeping a consultative role, it will work as an oversight committee for the selection of projects and will be involved in the selection of the content to be included in the various deliverables. The Network Development Stakeholder Group will also be expected to provide analysis on specific issues, e.g., on the consistency of the scenarios with the targets specified in the 2015 Paris Agreement, and on technologies.

Public consultations and workshops will be organised throughout 2018 to engage all interested stakeholders in the process. Additionally, issues particular to specific regions will be discussed in six regional workshops, to involve local stakeholders in the discussion.

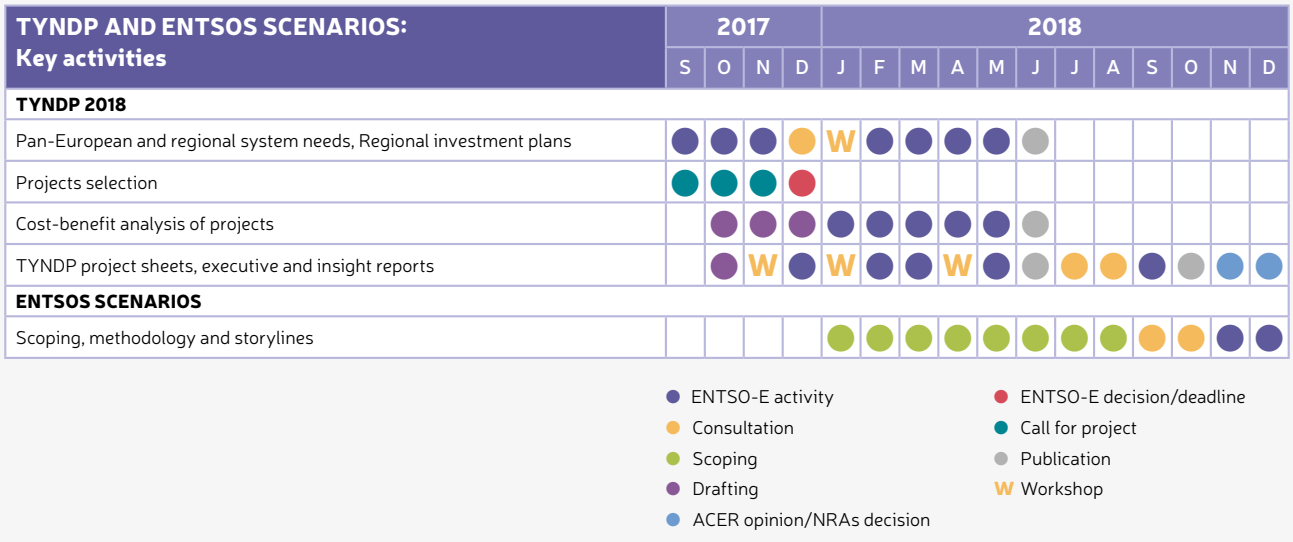
THE NEXT COST-BENEFIT ANALYSIS METHODOLOGY

The assessment of infrastructure and storage projects performed in the TYNDP uses a Cost Benefit Analysis (CBA) methodology drafted by ENTSO-E, in consultation with stakeholders, and published by the European Commission. In 2018, ENTSO-E will be working with stakeholders and its institutional partners to develop and publish the third version of the CBA methodology. Discussions with stakeholders held in 2017 identified three key areas for improvement of the methodology: security of supply, socio-economic welfare and storage. If adopted by the European Commission, the CBA 3.0 should be used in the TYNDP 2020.

STUDIES ON INTERLINKAGE OF GAS AND ELECTRICITY SECTORS

The future of the electricity system cannot be fully apprehended without considering the overall energy landscape. Interlinkages between gas and electricity in particular cover from household energy use to electricity production and storage, as well as infrastructure. ENTSO-E has been working with ENTSOG since 2015 at developing a common set of scenarios, with the gas sector providing input to the electricity sector and vice-versa. Following ACER's opinion received in 2017[4] and requiring to go far beyond in terms of interlinkage of the models, ENTSO-E and ENTSOG will perform with external providers new studies aimed at better understanding how the gas and electricity sectors influence each other, and in fine how more efficient cross-sectoral decisions on infrastructure investments can be made. These studies will look at the way the value of gas and electricity transmission infrastructure can be compared against each other; at the interlinks between electricity and gas market prices and at technologies making new interlinks possible, in particular power to gas technologies.

INTERCONNECTION



4. https://www.acer.europa.eu/Official_documents/Acts_of_the_Agency/Opinions/Opinions/ACER%20Opinion%2007-2017.pdf

Hervé Laffaye
VICE-PRESIDENT
RTE, France

For the TYNDP 2018 ENTSO-E and ENTSOG have involved interested parties from the very beginning of the process, starting from a blank page and asking stakeholders to 'Build your own 2030 and 2040 scenarios'.

STUDIES WITH UKRAINE AND MOLDOVA

In 2006 the Ukrainian TSO, Ukrenergo, asked UCTE, one of the predecessor organisations of ENTSO-E, to start the investigations and work on synchronous interconnection of the Ukrainian power system with the power system of Continental Europe. Due to geographical circumstances, this interconnection includes the power system of Moldova. A feasibility study was envisaged which, however, did not start until the government of Moldova ensured its financing via EU funds in 2013. The study was eventually completed in early 2016, concluding that a synchronous interconnection of Ukraine and Moldova is, in principle, possible under the condition that the system can ensure dynamic stability.

Under these assumptions, ENTSO-E's Regional Group Continental Europe (RGCE) prepared, separately for Ukrenergo and the Moldavian TSO, Moldelectrica, catalogues of measures and project requests for additional studies which represent the main technical part of the "Agreement on the conditions of the future interconnection of the power system of Ukraine (or Moldova) with the power system of Continental Europe" signed in June/July 2017.

These agreements represent the legal basis for the cooperation of Continental European TSOs with Ukrenergo and Moldelectrica for a period of six years with a possibility to extend the cooperation by two years. During this time, (i) it will need to be clarified whether a pure synchronous interconnection is feasible or a turn towards a hybrid AC/DC or pure DC interconnection will have to be undertaken, (ii) Ukrenergo and Moldelectrica will have to become compliant with the standards of the Operation Handbook of the RGCE and the EU Guidelines on System Operation and Emergency & Restoration, and (iii) when synchronous interconnection is considered feasible, Ukrenergo and Moldelectrica will have to perform a successful island and trial synchronous operation.

SYNCHRONISATION OF THE BALTIC TSOS WITH THE CONTINENTAL EUROPEAN SYSTEM

Baltic TSOs have on their agenda the prospect of disconnecting from the IPS/UPS power system to which they are at present synchronously connected by having tie lines with Russia and Belarus. This aim is formulated in the so called BEMIP - Baltic Energy Market Interconnection Plan. Within this scope, the Joint Research Centre (JRC) of the European Commission produced the report "Integration of the Baltic States into the EU electricity system: a cost-benefit and geo-political security analysis" in which possible disconnection scenarios are analysed: synchronous interconnection with ENTSO-E's Regional Group Nordic, synchronous interconnection with ENTSO-E's RGCE, and island operation with DC links to neighbouring countries. Among these scenarios, the synchronous interconnection with RGCE is considered the most favourable option. The Polish TSO, PSE, and the Baltic TSOs envisage to further investigate this option by the end of 2017/Q1 2018, especially in terms of dynamic stability of the interconnection.

BETTER IMPLEMENTATION OF INFRASTRUCTURE

TSOs' infrastructure projects need to be implemented to achieve Europe's energy and climate policy objectives in a timely and efficient manner. However, in many cases TSOs face opposition when building transmission infrastructure. They are confronted with increased public reluctance to accept power lines locally, as projects are perceived by local populations as nuisance without any directly perceptible benefits. Many TSOs have developed proactive and innovative approaches to gain public buy-in. The best practices put in place include e.g., the development of new tower line designs and technologies, the reduction of environmental effects and the early involvement of local citizens, e.g., in the determination of potential route options for the new line.

Financing and public acceptance issues are the topic of discussions between ENTSO-E, TSOs, the European Commission, regulators and stakeholders at the yearly Infrastructure Forum in Copenhagen. ENTSO-E is an active contributor to the forum, presenting best practices on public acceptance and proposing solutions.

To dig deeper into the issue of public acceptance, ENTSO-E has commissioned a study on the economic value of timely grid extension. To be realised by the Florence School of Regulation and released in late 2017/early 2018, the study will consider innovative practices put in place by

BY 2030 AT LEAST

45%

OF THE ELECTRICITY WE CONSUME WILL BE GENERATED FROM RENEWABLE ENERGY SOURCES

RESEARCH AND INNOVATION: Key activities	2017				2018											
	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
Implementation Plan 2017-2019	●															
R&I Monitoring Report 2017			●	●	●	●	●	●	●	●	●					
Vision of Energy System ETIP SNET	●	●	●	●	●	●	●	●	●	●	●	●	●			
Preparation of EC calls	●	●	●	●	●	●	●	●						●	●	●
Support for SET Plan structure/ETIP SNET	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Exchanges with ACER on regulatory framework	●	●	●	●	●	●	●	●	●	●						
Events/InnoGrid2020+ conference										W						
Intensys4EU EC funded project	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
ENTSO-E IEC 61850 Profile Development	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Standardisation cooperation			●						●	●						

● ENTSO-E activity
● Scoping
● Drafting
● ACER opinion
● Proposal submission (tentative)
● Publication
W Workshop

infrastructure projects in the electricity sector and in other sectors. It will evaluate the impact on investment costs of these innovative approaches aimed at increasing public acceptance (which are more expensive that traditional ones) versus the benefits resulting from reduced delays in building new infrastructure (e.g., in terms of reduced CO_2 emission or increased security of supply).

As this ENTSO-E-led initiative is pursued throughout the rest of 2017 and into 2018, the European Commission is presently assessing the effectiveness of its TEN-E Guidelines. Depending on the EC's conclusions, ENTSO-E may be required to contribute towards better implementation of the regulation. ENTSO-E has proactively already developed internally a set of ideas, which could be taken further in 2018 in the context of the aforementioned studies.

TOWARDS SMARTER GRIDS - RESEARCH, DEVELOPMENT & INNOVATION

In the coming years, the European grid will face game-changing environments.
New business models will need to be developed involving new actors such as storage, ICT, prosumers, and active customers. The active customer – consumer and prosumer – will need smart grids and systems, integrating smart meters, highly developed home automation systems and appliances, enabling demand response, portfolio management, and load optimisation. Big data management, the Internet of things, and the post-processing and security of data are required for inter-TSO cooperation and for the empowerment of consumers.

On the system operations side, innovative solutions will be needed for substation automation in conjunction with standard fault analysis and location, dynamic line rating, and the use of optical or nano-technologies.

In addition, electricity grids must create synergies with other energy networks (gas and heat) and allow the transition towards sustainable transport through the deployment of electric vehicles, which requires the evolution of the battery sector and the creation of efficient charging station networks.

Our objective is to transform the European energy system into an integrated one, with emphasis on flexibility (including demand-side response, storage, etc.) and end - to - end digitisation to integrate different technologies and market services. ENTSO-E coordinates TSOs' innovation activities to ensure the future transmission grid is up to the challenge.

RESEARCH, DEVELOPMENT AND INNOVATION (RD&I) ACTIVITIES IN 2018

In accordance with its legal mandate to promote and coordinate the RD&I activities of TSOs, and in line with the deliverables requested by its participation in European research and innovation projects, in 2018, ENTSO-E will focus on the following activities.

ENTSO-E will support the Strategic Energy Technology (SET) Plan activities, through participation in the European Technology and Innovation Platform on Smart Networks for Energy Transition (ETIP SNET) and Horizon 2020. This includes:

- Continue our participation in the ETIP SNET, both at EXCO meeting level (chair) and in the working groups. The objective is to share with stakeholders from the whole energy sector at EU level the results achieved by TSOs' R&I activities, but also their R&D needs, and to work together towards an integrated R&I vision;
- Participate in the EC-funded project Intensys4EU, in cooperation with other stakeholders including DSOs, storage, and the research community;
- Foster the participation of TSOs in Horizon 2020 projects: ENTSO-E will prepare and/or facilitate proposals to answer the calls of the Horizon 2020 Work Programme 2018-2020, with the aim of maximising synergies in between TSOs' activities and potentially identifying proposals requiring ENTSO-E's involvement.

We will also continue our exchanges with ACER regarding options for a regulatory framework for innovation for TSOs.

In addition, ENTSO-E will develop a R&I Monitoring/Application Report 2017, providing an overview of the state of the art of technologies and potential advancements. The R&I Monitoring/Application Report develops and updates the data base of TSOs' R&I projects at EU, regional and national level. It summarizes the projects' progresses and results, and monitors the achievement of the overall objectives set in the R&I Roadmap and R&I Implementation Plan. In addition, it highlights areas for improvement and makes proposals to overcome the barriers blocking the deployment of R&I results.

To ensure the dissemination of R&I activities, knowledge-sharing and exchange of best practices between TSOs and with energy stakeholders, ENTSO-E will organise the yearly InnoGrid2020+ conference jointly with EDSO for Smart Grids. Inter-TSOs workshops on various topics will also take place, and the work within the Intensys4EU projects will include regional workshops.

ENTSO-E will develop, jointly with the ETIP SNET and the Intensys4EU project, a report on extreme scenarios for the energy system for 2030. The outcome of the report will serve to inform future TYNDPs (though not the TYNDP 2018, for which scenarios were presented in July 2017). We will also prepare an assessment of various flexibility solutions to fulfil the electricity power system needs (existing and future ones).

Finally, ENTSO-E will look at the potential impact of current and future IT developments on the power system, and investigate their potential for the future business models of TSOs, looking in particular at blockchain.

CUSTOMERS AS ACTIVE MARKET PARTICIPANTS: THE TSO-DSO PLATFORM

The importance of the TSO-DSO interface and wholesale-retail integration are rising in parallel with the deployment of distributed generation and the advent of new technological and market opportunities, such as demand side response, aggregators, and smart grids. The EC's Clean Energy for all Europeans package of proposals of November 2016 addresses this issue, with proposals such as, for customers, an easy switching of supplier, a better access to and protection of consumption data, and the definition of a legal framework for demand-side response.

To meet the challenges mentioned above, TSOs and DSOs cooperate closely while involving stakeholders, in particular market participants. The first objective of the joint TSO-DSO work is to build a common understanding of the challenges and needs from the perspectives of a system operator and neutral market facilitator and then to extend the discussion to include market parties, regulators, and the European Commission.

The four European associations representing electricity DSOs (CEDEC, EDSO for Smart Grids, EURELECTRIC, and GEODE) and ENTSO-E exchange regularly in a systematic and structured framework, including joint workshops. Ongoing work includes the preparation of a joint paper on active system management, and will continue in 2018.

Internally, ENTSO-E organises its work via a project on TSO-DSO/wholesale-retail issues, due to run at least until September 2018. The project identified gaps in the current regulatory framework to build a proper market design ensuring efficient and fair use of distributed flexibilities (definition of products, interaction between balancing, congestion management and intraday market, consideration of grid constraints etc.). Based on our discussions with DSOs on these topics, and the work to be done within the EC Expert Group on demand side response, ENTSO-E will elaborate a proposal to address potential regulatory needs. Additionally, the project will focus its work in 2018 on innovation aspects of the TSO-DSO interface, regarding both the demonstration and market uptake of innovative solutions.

THE IMPORTANCE OF THE TSO-DSO INTERFACE AND WHOLESALE-RETAIL INTEGRATION ARE RISING IN PARALLEL TO THE DEPLOYMENT OF DISTRIBUTED GENERATION AND THE ADVENT OF NEW TECHNOLOGICAL AND MARKET OPPORTUNITIES.

4. SYSTEM ADEQUACY - ENSURING SECURITY OF SUPPLY

TSOs are in charge of assessing system adequacy. System adequacy is defined as the ability of a power system to cover demand in all conditions.

THE MID-TERM ADEQUACY FORECAST

To account for a growing number of disruption 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 a regular assessment of the adequacy situation, at time horizons of up to ten years ahead. After several years of publishing the predecessor reports 'Scenario Outlook and Adequacy Forecast', based on a simpler methodology, the 'Mid-term Adequacy Forecast' (MAF), published for the first time in 2016, aims at providing a pan-European adequacy assessment of the risks to security of supply and the need for flexibility for the coming decade.

The methodology used by the MAF is the first pan-European assessment of system adequacy using market-based probabilistic modelling techniques. It includes an advanced temperature-sensitive load model, harmonised probabilistic hydrological analysis with datasets for extended dry and wet hydro conditions, and forced outage rates for thermal units as well as HVDC links.

2018 will be the third year of the MAF. The methodology introduced in 2016 has been considerably improved upon and can be considered as mature. The focus in 2018 will be on improvements to the data and to the modelling (e.g., hydro modelling, information on mothballing of generation units, implementation of flow-based modelling). Specific additional refinements to the methodology may be needed, and ENTSO-E also relies on feedback received from stakeholders to identify the needs for amelioration.

To better represent the full complexity of adequacy in power systems, further data will have to be provided by TSOs. The greatest potential for further improvement is in hydro power, in the flexibility of generation assets, as well as in the economic parameters of the system (e.g., the country-specific values of lost load).

Additionally, the different modelling tools will need to be further developed. For future editions of the MAF, we aim at a more detailed representation and analysis of interdependencies within the system, e.g., the impact of demand and supply-side measures, increasing shares of e-mobility, storage and heat pumps on power networks. To deliver the above, and with a view to potentially insource external studies, ENTSO-E is staffing up the team in charge of modelling, including with seconded experts from TSOs.

SPECIFIC ADDITIONAL REFINEMENTS TO THE METHODOLOGY MAY BE NEEDED, AND ENTSO-E ALSO RELIES ON FEEDBACK RECEIVED FROM STAKEHOLDERS TO IDENTIFY THE NEEDS FOR AMELIORATION.

THE SEASONAL OUTLOOKS

ENTSO-E is also mandated to issue short-term 'Seasonal Outlook' reports twice a year, covering the coming summer and winter periods, before 1 June and 1 December, respectively.

Lessons learnt from the January 2017 cold spell have shown that further improvements of the seasonal outlooks are needed. From 2018, ENTSO-E will seek to improve the methodology used in the seasonal outlooks to make it more similar to the one used for the MAF. This implies a switch from the current mostly deterministic approach to an hourly probabilistic approach. The change will be done following a step-by-step process in future seasonal outlooks, as it requires the implementation of new tools, methodologies and models.

Seasonal outlooks are bridges between the MAF and week-ahead adequacy, which is one of the tasks of the RSCs. The coordination between seasonal outlooks and week-ahead adequacy will be further increased. For this purpose, ENTSO-E is strengthening the cooperation with RSCs, optimising cross-functional synergies. In addition, in December 2017, a qualitative overview of identified critical risks by country will be appended to the winter outlook, based on a survey of TSOs.

Fintan Slye
VICE-CHAIR OF THE BOARD
Eirgrid, Ireland

Lessons learnt from the January 2017 cold spell have shown that further improvements of the seasonal outlooks are needed. From 2018, ENTSO-E will seek to improve the methodology used in the seasonal outlooks.

ADEQUACY REPORTS: Key activities	2017				2018											
	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
MID-TERM ADEQUACY FORECAST (MAF)																
MAF 2018	●	●	●	●	●	●	●	●	●	●	●	●	●	●		
SEASONAL OUTLOOK REPORTS																
Winter Outlook 2017/2018	●	●	●	●	●											
Summer Outlook 2018						●	●	●	●	●						
Winter Outlook 2018/2019													●	●	●	●

● ENTSO-E activity
● Drafting
● ACER opinion
● ENTSO-E decision
● Project start
● Publication

5. TOWARDS A DIGITAL FUTURE

TSOs and ENTSO-E work in an increasingly interlinked and digital environment. The implementation of the network codes, for example, requires closer collaboration between TSOs and other actors of the energy sector.

WHAT IT ARCHITECTURE FOR THE FUTURE DIGITAL GRID? - ENTSO-E'S IT STRATEGY

Digital innovation is a factor of transformation of existing practices in the electricity sector. For example, we expect that, by 2020, there will be more than 50 billion devices connecting prosumers to each other across the world. This development will allow prosumers to play a direct and active role in the power markets. Overall, the transactions will increase in complexity and can be facilitated by blockchain technology. As the number of players in the system rises fast and steeply, the importance of automation and digitalisation grows, thus contributing to the 'digital grid'[5].

The IT architecture must be adapted to allow TSOs and market players to take advantage of innovation for designing more efficient processes and methods. ENTSO-E and TSOs are already engaged in this digital transformation, with the Common Grid Model described hereafter. Our aim is to serve as a facilitator, to accelerate the deployment of the digital grid through adequate IT infrastructure.

The first step is the finalisation of an IT strategy, spanning the period from 2017 to 2020[6].

The strategy would comprise the following:

- **The strategy aims to address, in a first step and internally within ENTSO-E, the interdependent IT needs of ENTSO-E's four committees, interoperability, solutions to optimise IT within ENTSO-E, and governance.**
- **The strategy would also consider the increasingly interlinked IT needs of TSOs and other players, including regional security coordinators, the Joint Allocation Office, capacity calculation regions, power exchanges. The specific requirements of IT in critical infrastructure, in particular when it comes to real-time data, will be considered. In addition, the IT strategy builds shared criteria, standards and best practices to cope with the increasing needs for information exchanges between TSOs and DSOs.**

ENERGY-SPECIFIC CYBERSECURITY

The IT strategy will of course cover issues related to cybersecurity. This is of paramount importance for TSOs, whose systems' security is fundamental to electricity supply. ENTSO-E supports TSOs by acting as a platform to share best practices, and organises a yearly 'red team blue team' training event attended by TSOs' operational staff. The potential development of a network code on energy-specific cybersecurity is currently discussed in the European Commission's task force on smart grids. ENTSO-E is involved in the discussion, and will release, in early 2018, a policy paper on cybersecurity issues.

5. The notion of 'digital grid' refers to the future development of grid control technologies including substation automation, power electronics control as well as all operational IT for grid control rooms and real-time market operation (used across national, regional as well as pan-European levels). These technologies primarily aim at achieving improved grid reliability and optimised grid usage in the context of pan-European deregulated markets, enabling high penetrations of renewables and demand responsive prosumers through further flexibility and transparency in grid operation.

6. The draft ENTSO-E IT strategy has benefited from input from TSOs, TSCNET, CORESO and the Joint Allocation Office.

WHERE THE DIGITAL GRID STARTS: THE COMMON GRID MODEL

TSOs plan the operation of the grid from one year ahead to one hour before real time; this is the last timeframe in which market parties can adjust their positioning in cross-border intraday markets. Decisions relevant for ensuring the dispatching feasibility are taken by TSOs hours before, taking into account the best forecast of the situation after that last intraday trading. To make this operational planning, TSOs use computer models of the power system to simulate its behaviour depending on the different flows and the different elements of infrastructure. In addition, grid models are also instrumental for security analysis, capacity calculation, and adequacy assessment.

Networks become more interconnected and European electricity markets are becoming increasingly integrated. In addition, Europe is moving away from the use of fossil fuels notably for generating electricity; generation from wind and solar is growing year on year leading to increased variability and unpredictability of flows. TSOs are adapting to this reality with more cross-border coordination and greater use of data in operating the power system. One of the first illustrations of this adaptation is the Common Grid Model (CGM).

Developed by ENTSO-E, the CGM compiles the individual grid model of each TSO, covering timeframes going from one year before real time to one hour before real time. TSOs' individual (in most cases, national) grid models are picked up by RSCs, who merge them, after a quality assessment and regional alignment process and feed them back into the system so that TSOs can reconsider their assumptions. The CGM thus allows TSOs to better cooperate, increases the quality of operational planning and will result in more secure and cost-efficient European operational planning.

THE COMMON GRID MODEL AND NETWORK CODES

The CGM finds its legal basis in three of the network codes: the System Operation Guideline, the CACM Regulation and the FCA Regulation. The CGM is indeed a prerequisite for several processes harmonised in the network codes, such as capacity calculation and security analysis. Implementation of the CGM needs to be consistent throughout the various processes set in the three codes, and this is why ENTSO-E has been tasked with the preparation of two methodologies: the CGM methodology, and the generation and load data provision methodology.

Both methodologies were first prepared and submitted considering the CACM Regulation, as it was the first to enter into force. The CACM generation and load data provision methodology was approved by all NRAs in early 2017, while the CACM CGM methodology was submitted in 2016, and following a request for amendment, resubmitted in March 2017. Following the entry into force of the FCA Regulation in October 2016, both methodologies are being updated and were submitted to all NRAs in July 2017. NRAs' decision is expected six months later, in early 2018, and ENTSO-E will follow up with TSOs in the event that NRAs express a request for amendment.

The SO Guideline entered into force in September 2017. Consequently, all TSOs will review the methodologies in order to meet the requirements stipulated from the SO Guideline perspective. The drafting started in 2017 and will continue into 2018.

THE OPERATIONAL PLANNING DATA ENVIRONMENT

The Operational Planning Data Environment (OPDE) is the information platform that will support the CGM, allowing TSOs and RSCs to communicate. It is also the software basis for running the five core services of RSCs (see in Chapter 2 'Implementing the network codes').

The first version of the main software components of the OPDE will be delivered at the end of 2017 (protocols EDX/ECP, Operational Planning Data Management). ENTSO-E is currently testing these software components in an offline hosting test environment. The effective roll out of the minimal set up of OPDE (minimum viable solution (MVS) set-up) started in 2017 and must be completed in 2018. Once stable operation of the OPDE MVS set-up is achieved, the full target implementation of the OPDE will be executed in 2018 as well.

In addition, ENTSO-E will develop multiple business applications – apps, or services to which TSOs can subscribe to support their operational planning. They include the Quality Assessment Service, the pan-European Verification Function, and the Common Grid Model Alignment. These apps support the CGM operational business processes and are connected through the OPDE set up. Once the OPDE roll out is completed, they will run over the OPDE installation.

ALL TSOS' NETWORKS FOR NON-REAL-TIME OPERATIONAL AND MARKET-RELATED DATA COMMUNICATION NETWORK (ATOM)

The CGM will run on a dedicated communication network called ATOM. This IT network will support the performance of long- and short-term capacity calculation, operational security analysis, outage planning, and grid planning and adequacy forecast.

By the end of 2017, the fully meshed core of ATOM will be established and will be operational. The core interlinks four TSOs: RTE (France), Swissgrid (Switzerland), Amprion (Germany) and APG (Austria). Other TSOs will then be linked to one of these four TSOs, with a maximum of two degrees of separation from the core. Some TSOs, such as the Nordics, are part of a regional private network – meaning that they are connected to one-another via a meshed network. The connection of these regional private networks to the ATOM backbone core began in 2017 and will be completed into 2018.

The full backbone roll-out planning, that will connect each TSO to the backbone configuration, is currently ongoing with the design of the ATOM backbone target topology. It is anticipated that the ATOM backbone target topology will be finalised by the end of 2017. The resulting ATOM target roll-out of pan-European dimension will begin in 2018. The aim is to complete the full ATOM backbone set up by the end of 2018/beginning of 2019. When completed, this will effectively implement one of the most important among the five planned RSC services.

DATA FOR MARKET PARTICIPANTS: THE TRANSPARENCY PLATFORM

Launched in 2015 to comply with the Transparency Regulation, ENTSO-E's Transparency Platform centralises data on energy generation, transmission, and consumption, collected from data providers including TSOs, power exchanges, and other third parties. By making information available freely to all, it allows for a level-playing field where market participants can make better analyses and decisions. It is also instrumental for the monitoring and regulation of power markets.

However, based on the feedback received from users, the quality of the platform, its user-friendliness but also the quality of the data need improvement. Additionally, new obligations such as reporting provisions in network codes show the need to extend the scope of the Transparency Platform, as an alternative to the creation of additional online platforms.

Consequently, we will enhance the Transparency Platform from its present form to a 'market-serving tool'. The objective is for it to become the single, intuitive and user-friendly platform centralising data related to the entire internal electricity market, in addition to the data required by the Transparency Regulation. Work in 2018 will include the drafting of business requirements for each of the planned activities.

Regarding business-as-usual operation of the Transparency Platform, ENTSO-E will continue ensuring the smooth operation of the platform and data population. Reports will be developed that feed back to the data providers, highlighting the missing data. All TSOs will work in parallel to increase data quality as much as possible.

STANDARDISATION ACTIVITIES

ENTSO-E engages in various standardisation activities in support of reliable and stable system operation and processes for the smart grid environment. Standards facilitate cross-border exchanges and allow efficient and reliable identification of different objects and parties relating to the internal energy market and its operations, as well as supporting network code implementation in various ways.

In addition, several of ENTSO-E's IT tools and data environment, such as the operational planning data environment, 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.

In 2018, standardisation activities will include the following:

- ENTSO-E will coordinate the standardisation work of TSOs and monitor standardisation activities relevant for TSOs via the established network of CENELEC and of the IEC.
- ENTSO-E will continue its collaboration with the European standardisation organisation CENELEC, especially in relation to the implementation of network codes. Collaboration includes the participation in and contribution to the Smart Energy Grid Coordination Group and other high-level groups focusing on network code implementation chaired by CENELEC, and the organisation of joint workshops with CENELEC.
- ENTSO-E will continue to support the maintenance and development of ENTSO-E profiles under the Common Information Model, in support of several of ENTSO-E's IT tools, e.g., the Common Grid Model Exchange Standard and the Operational Planning Data Environment.
- Support the implementation of network codes: ENTSO-E will release an impact assessment on data exchanges of the Balancing Guideline, CACM Regulation, FCA Regulation and of the Common Grid Model, and will develop by the end of 2018 the CIM model needed to support these exchanges and standards. In addition, ENTSO-E will develop implementation guides for the Electricity Balancing Guideline to support the implementation of non-real time processes of the replacement reserves, automatic frequency restoration reserves (aFRR) and frequency restoration reserves with manual activation (mFRR) and imbalance netting platforms.
- ENTSO-E will define a European electricity market role model based on the network codes and guidelines. A role model is to be understood as the technical, illustrative, means of identifying roles, services and associations.
- Development of implementation guides to support future data exchange requirements between TSOs and DSOs.

6. CO-CREATION & ENGAGEMENT

Each of our work products detailed in the previous chapters benefits from the input and ideas of market participants, regulators, European institutions, and NGOs. ENTSO-E does not work in isolation but strives to co-create and engage with a wide range of European stakeholders and, beyond, to foster relationships with international actors.

Experience has shown that stakeholder contribution is decisive for the success of our various mandates. As a consequence, ENTSO-E has gradually enhanced its stakeholder engagement far beyond the legal requirements as set out by the Third Package. Besides formal, web-based, public consultations and stakeholder workshops, we engage frequently through bilateral meetings, have set up an Advisory Council, organise and participate in events and assess our work through feedback surveys.

We keep stakeholders informed of our activities via our events, social media and weekly newsletter (the 'Friday Roundup') as well as through our website entsoe.eu. The website is currently being revamped, to increase its user-friendliness and the readability of the content. We welcome all feedback and ideas on how to better communicate on our activities (contact: info@entsoe.eu).

ENTSO-E'S ADVISORY COUNCIL

In 2016 ENTSO-E has set up, on its own initiative, an Advisory Council that delivers its views to ENTSO-E's Board and Assembly on ENTSO-E's work programme and achievements, and gives opinions on whether our key products actually contribute to fulfilling our mandates, to the energy transition and the innovation push linked to it. It is composed of nine members representing DSOs, electricity generators, consumers, traders, wind and solar energy producers, NGOs, and the European Commission (with observer status). The Advisory Council will meet two to three times in 2018.

PUBLIC CONSULTATIONS

ENTSO-E collects stakeholders' feedback via public consultations, the large majority of which are regarding our legal mandates and are part of a mandatory consultation process. All consultations are centralised on our Consultation hub, an interactive, web-based platform allowing stakeholders to easily access and comment on consulted documents. They include consultations on ENTSO-E's own deliverables, but also consultations run by our members as part of network code implementation. As an example, more than half of the 34 consultations[7] already opened in 2017 were launched by TSOs of a specific capacity calculation regions, and a few others were part of an 'all TSOs' decision process. ENTSO-E thus fulfils its role of supporting the stakeholder engagement commitment of its members.

ENTSO-E'S CONSULTATION HUB IS AN INTERACTIVE, WEB-BASED PLATFORM ALLOWING STAKEHOLDERS TO EASILY ACCESS AND COMMENT ON CONSULTED DOCUMENTS.

7. As of mid July; this number will increase by end of year.

The length of a consultation varies depending on the deliverable, but in principle it is not less than four weeks. Consultations on ENTSO-E's deliverables are generally accompanied by at least one public workshop, organised at the beginning or during the consultation, to answer potential questions from respondents.

Our Consultation hub was launched in 2015. Our stakeholder survey for 2016 shows improvement in stakeholders' satisfaction with the way consultations are run, with the average rating increasing from 3,30 for 2015 to 3,75 out of a maximum 5 score.
There is still room for improvement however, and we understand the challenges faced by stakeholders when providing input to our public consultations, which can require considerable time and efforts. ENTSO-E will work on the elaboration of a simpler methodology in 2018.

REGIONAL AND EUROPEAN CONFERENCES

ENTSO-E engages with a wide audience of stakeholders through its conferences, addressing pan-European issues (our annual conference, the joint InnoGrid2020+ conference) and local issues via regional conferences. In 2018, two regional conferences will take place, including one in Switzerland in April to discuss issues specific to the Alpine region (the location of the second regional conference is still to be confirmed). We will also continue the initiative started this year and organise our second joint conference with an RSC, after the ElSeC conference organised with TSCNET in October 2017. Beyond our own conferences, ENTSO-E frequently partners up and contributes to other conference organisers or speaks at third-party events and conferences.

EU INSTITUTIONS AND ACER

For ENTSO-E, strong and constructive relationships between policymakers, regulators and TSOs, at the European, regional and national levels, are key to successfully address common challenges. What is more, many of ENTSO-E's deliverables, including this annual work programme, benefit from ACER's input and are subject to a formal opinion process. We also engage in joint initiatives, such as the European Stakeholder Committees for network code implementation created with ACER, and the co-organisation with the EC and ACER (and ENTSOG) of a joint conference on network codes in 2017.

CONNECTING WITH NEIGHBOURING REGIONS & INTERNATIONAL COOPERATION

The Energy Community is a key partner for ENTSO-E. This is because the Energy Community covers many of the countries where TSOs are ENTSO-E members. In addition, for countries of South-East Europe who are not member of the EU, the Energy Community ensures that the EU internal energy market, including network codes and guidelines, is extended to these countries.

ENTSO-E supports the TSOs of South-East Europe in aligning their legal and regulatory framework with that of the EU. This will ensure the consistent development of their national and regional electricity markets in line with the requirements of the internal electricity market.

In 2018 ENTSO-E will organise an event dedicated to South-East Europe, which may take place back-to-back with the Athens Forum and be organised on a yearly basis in following years. This event is a follow-up on the regional conference organised in Thessaloniki in November 2016, which showed a real need to engage with local stakeholders and discuss issues specific to the region. These include the steps needed to overcome market fragmentation in South-East Europe, ways to foster liquid cross-border markets through strengthened regional cooperation and synergies with solutions and models, and the need to co-operate further with the Energy Community to support the Western Balkan 6 initiative.

ENTSO-E also exchanges regularly with MedTSO, and with TSOs, regulators and power exchanges of the US, Japan, Korea, the Middle-East, and South-Africa.

FOR ENTSO-E, STRONG AND CONSTRUCTIVE RELATIONSHIPS BETWEEN POLICYMAKERS, REGULATORS AND TSOS, AT THE EUROPEAN, REGIONAL AND NATIONAL LEVELS, ARE KEY TO SUCCESSFULLY ADDRESS COMMON CHALLENGES.

7. GLOSSARY

ACRONYM	DEFINITION
aFRR	Automatic Frequency Restoration Reserves
ATOM Network	All TSO network for non-real time Operational and Market-related data
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
EB	Electricity Balancing
EDSO	European Distribution System Operators' Association
ENTSOG	European Network of Transmission System Operators for Gas
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
MAF	Mid-term Adequacy Forecast
mFRR	Manual Frequency Restoration Reserves
MRC	Multi Regional Coupling
MVS	Minimum Viable Solution
NEMO	Nominated Electricity Market Operator
NRA	National Regulatory Authority
OPDE	Operational Planning Data Environment
PCI	Project of Common Interest
Prosumers	Neologism to designate 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
TSC	TSO Security Cooperation
TSO	Transmission System Operator
TYNDP	Ten-Year Network Development Plan
XBID	Cross-Border Intraday

ANNEX 1. INTERNAL ORGANISATION OF WORK WITHIN ENTSO-E

ENTSO-E's work is steered by the Board and by the Assembly. An independent Advisory Council gives opinions on ENTSO-E's work programme and achievements.

ENTSO-E is organised into four committees, which have responsibility for delivering the work programme through projects, mandated work products, policy suggestions, and ongoing work. ENTSO-E's committee structure reflects our contribution to the four main EU energy policy goals.

They are:

1) 'SYSTEM DEVELOPMENT' – DEVELOPING A STRONG AND ADEQUATE GRID.

The System Development Committee coordinates network development at European and regional level and prepares the Ten-Year Network Development Plans, the regional investment plans and adequacy forecasts. It also drafted the connection network codes and supports their implementation.

2) 'SYSTEM OPERATIONS' – GUARANTEEING SECURE AND RELIABLE POWER SYSTEM OPERATIONS.

The System Operations Committee is in charge of technical and operational standards, including operational network codes, as well as of power system quality. It ensures compliance monitoring and develops tools for data exchange, network models and forecasts, and oversees the grid security from physical, organisational and cyber security points of view.

3) 'MARKET' – PROMOTING A FULLY DEVELOPED INTERNAL ELECTRICITY MARKET.

The Market Committee works towards an integrated and seamless European electricity market and is in charge of methods for cross-border congestion management, integration of balancing markets, ancillary services and the inter-TSO compensation mechanism, including market network codes.

4) 'RESEARCH, DEVELOPMENT, AND INNOVATION' – ENSURING THE AMBITIOUS USE OF INNOVATION.

The Research, Development and Innovation Committee ensures the effective implementation of ENTSO-E's mandate in the area of innovation and R&D, largely focusing on strong and smart grids and the empowerment of consumers.

THE LEGAL AND REGULATORY GROUP

is tasked to ensure that ENTSO-E fulfils its legal mandate in accordance with the applicable requirements, and does so by; (i) providing advice to all ENTSO-E bodies, including on strategic issues with legal dimensions; (ii) ensuring legal coherence, compliance, and robustness of ENTSO-E deliverables; (iii) facilitating, advising on, and providing legal support to each step of the network code process (from their development and adoption to their implementation); (iv) drafting the necessary contractual framework for certain ENTSO-E activities; and (v) ensuring the compliance of the ENTSO-E bodies with the rules of the Association.

Pursuant to the strategic objective of implementing a project management approach in ENTSO-E's work, a central project management office has been developed together with a customised project management framework. The project management office is following up and monitoring the implementation of the approach in order to ensure optimisation of resources and timely delivery of our work.

ANNEX 2. RESOURCES

In assessing our resources requirements, we analysed the workload of the tasks required by our legal mandates. Additionally, resources are needed for policy work, communication activities, general management and support of the tasks performed by our main bodies and working groups. We emphasise project management practices and resources optimisation to ensure faster and better delivery.

On 13 December 2017, ENTSO-E Assembly approved the budget of M€ 28.7 to fulfil ENTSO-E legal mandate and strategy. This represents a 40% increase from the 2017 budget and is mainly driven by the CGM programme developing the ATOM Network (secure private All-TSO network) and Operational Planning and Data Environment required for the implementation of Regional Security Cooperation as per CACM, FCA and SOGL Network Codes and the increase of efforts and resources required for the implementation of the 8 Network Codes / guidelines which have come into force in 2017 and are under critical delivery time-scales.

European Network of
Transmission System Operators
for Electricity

ENTSO-E AISBL
Avenue de Cortenbergh 100
B-1000 Brussels | Belgium

Tel +32 2 741 09 50
Fax +32 2 741 09 51
info@ensoe.eu
www.entsoe.eu

Design: The Crew Communication