ANNUAL REPORT
2013

TSO COOPERATION AND THE INTERNAL ENERGY MARKET

BENEFITTING CONSUMERS ACROSS EUROPE

European Network of
Transmission System Operators
for Electricity

entsoe

CONTENTS

ABOUT ENTSO-E

ENTSO-E represents 41 national electricity transmission system operators (TSOs) from 34 countries across Europe and fulfils mandates under European Union Regulation (EC) 714/2009 on cross-border exchanges of electricity.

ENTSO-E's mission is to promote important aspects of EU energy policy in the face of significant challenges to the European transmission system:

- **Security** - pursuing the coordinated, reliable and secure operation of the European network.
- **Adequacy** - promoting development of the interconnected network and investments for a sustainable European power system.
- **Market** - offering a platform for the Internal Energy Market (IEM) by creating standardised market integration and transparency frameworks that facilitate competitive wholesale and retail markets across Europe.
- **Sustainability** - facilitating the secure integration of new sources of generation, particularly renewable energy, to achieve EU goals for decarbonising the European energy system.

ENTSO-E's vision is to be the focal point for all technical, market and policy issues relating to TSOs and the European network, interfacing with power system users, EU institutions, regulators and national governments.

ACTIVITIES

Main ENTSO-E products include pan-European networok codes, a Ten-Year Network Development Plan (TYNDP), recommendations for the coordination of technical cooperation between TSOs, and summer and winter outlooks for electricity generation.

Network codes

The ENTSO-E network codes set out the rules for the operation and development of the European network, as well as for market integration. They follow framework guidelines defined by ACER, the Agency for the Cooperation of Energy Regulators, and are subject to transparent public consultation. The network codes are subsequently adopted into EU law via the Comitology procedure and become binding for all market participants.

Network development plan

ENTSO-E's Europe-wide TYNDP is prepared every two years. It covers models of the European network, scenario development, a European generation adequacy outlook and an assessment of the resilience of the integrated network. Regional investment plans (RIPs) complement the TYNDP.

Operational tools

ENTSO-E's development and promotion of common operating tools for TSOs ensures coordination of the European network under both normal and emergency conditions.

Adequacy forecasts

ENTSO-E publishes annual summer and winter generation outlooks, as well as a long-term system adequacy forecast that looks 15 years into the future.

EXECUTIVE SUMMARY

NICK WINSER, ENTSO-E PRESIDENT, PIERRE BORNARD, CHAIRMAN OF THE BOARD, AND KONSTANTIN STASCHUS, SECRETARY GENERAL, DISCUSS ENTSO-E'S MAIN ACTIVITIES AND ACCOMPLISHMENTS DURING 2013.

NICK WINSER

> “The creation of the Internal Energy Market (IEM) is central to meeting the European Union’s energy policy objectives of affordability, sustainability and security of supply.”

Nick Winser: The single market will allow greater volumes of low-carbon electricity to be safely integrated into the European network and encourage investment in cross-border transmission capacity. Combined, these two will deliver significant benefits to consumers, year on year.

The benefits of creating the world’s largest electricity market will not only be felt by all those in the energy sector but also by Europe’s overall economy, today and into the future. Although the target for completing the IEM by the end of 2014 is ambitious, the industry is working hard to ensure that momentum is maintained from the significant progress made during 2013.

Pierre Bornard: ENTSO-E’s member TSOs - the owners, operators and developers of Europe’s transmission system - are central to making the IEM a reality.

> “TSOs have always worked closely together but the huge shift in the nature of electricity generation, with the challenge of integrating ever increasing amounts of fluctuating RES, has led to unprecedented levels of TSO cooperation under the umbrella of ENTSO-E.”

Over the year, ENTSO-E has continued to build on its expertise and experience amassed since its formal establishment. This is reflected in the progress we have made so far, particularly in the areas of the network codes and European grid planning through our Ten Year Network Development Plan (TYNDP).

We continue to improve and refine our activities, based on feedback from our members and all stakeholders, to ensure that we meet the requirements of Europe’s energy consumers.

So far, progress on the IEM has been underpinned by the policy framework provided by the EU's 2020 energy and climate change objectives. The EU institutions are now considering a clear energy policy framework for 2030.

For TSOs, where system planning takes place at least a decade in advance, rapid agreement on the 2030 targets will be welcome. Key issues, such as binding RES targets for Europe versus individual Member States, will have a considerable effect on the future European grid.

Konstantin Staschus: Nowhere has TSO cooperation been more evident than in the development of the network codes. ENTSO-E submitted six codes for ACER's opinion in 2013, meaning that a total of eight out of the ten codes have now been developed.

"Written in consultation with a wide range of stakeholders, the network codes are the foundations on which the IEM is being built. They harmonise national rules in the areas of network connection, electricity markets and network operation."

PIERRE BORNARD

As the adoption of the network codes into EU law has been slower than originally anticipated, we have already begun planning for their implementation across the European network during 2014 and beyond. This will require even greater practical cooperation among TSOs, as well as market participants and regulators. Given ENTSO-E's role in drafting the codes, we will also monitor and support their implementation together with ACER.

Nick Winser: We are keenly aware of the far reaching and long-term significance of our activities and the need to engage effectively with all stakeholders. We have taken important steps during 2013 to ensure that the frequency and quality of our interaction with them continue to improve.

For example, there are clear synergies between ENTSO-E and ENTSOG, the ENTSO for gas. During 2013, we increased our collaboration with ENTSOG and we are currently exploring further opportunities to work as partners on the preparation of key industry documents such as the TYNDP and winter and summer outlooks.

Cooperation between TSOs and DSOs is also critical. ENTSO-E clearly recognises that DSOs are facing many of the same challenges we are. We will continue to cooperate closely with our DSO colleagues to ensure that networks remain reliable, sustainable and connected.

Pierre Bornard: Speaking of ensuring the stability of the European grid, 2013 was also a significant year for network development as work on the preparation of the ENTSO-E TYNDP 2014 intensified.

"Regulation (EU) 347/2013 entered into force in May 2013 and has established the ENTSO-E TYNDP as the sole basis for the 2015 selection of European Projects of Common Interest (PCIs)."

In addition to making the TYNDP the focus for the future selection of European PCIs, the new regulation requires ENTSO-E to publish a harmonised Europe-wide cost-benefit analysis (CBA) methodology to fairly assess all projects, including third-party and large storage projects, to support cost allocation, investment incentives and grant decisions.

After broad consultation, ENTSO-E submitted its CBA methodology to ACER, the EC and Member States in November and this is currently being used in the assessment of projects for the TYNDP 2014. Further development of the methodology is in progress in order to deliver a very open and transparent planning process, despite its extreme technical and economic complexity.

Konstantin Staschus: Although creation of the IEM will undoubtedly benefit energy consumers across Europe, gaining public acceptance of the infrastructure necessary to make it a reality is a challenge.

"Gaining acceptance of infrastructure projects requires a coordinated effort by TSOs, policymakers, regulators, generators, and also customers and non-governmental, environmental organisations (NGOs)."

ENTSO-E continues to work closely with the European Commission on a pilot project to develop an engagement strategy for communicating the benefits of new transmission infrastructure. This strategy is expected to be completed in mid-2014.

Nick Winser: Electricity markets are steadily improving across Europe in terms of integration, competition, liquidity and transparency. Despite this, it is becoming increasingly evident that the benefits of more efficient markets are being limited by the time scales required to transform networks to accommodate RES generation. The speed of deploying RES varies by country and is closely linked to national positions on policy.

ENTSO-E's work on long-term market design has focused on the identification of key recommendations for concrete pan-European solutions. There have also been several major TSO initiatives at regional level.

"The inherent intermittency of RES makes market integration particularly important, especially for the day-ahead and intraday markets."

The North West Europe (NWE) price coupling project, the pilot for day-ahead (DA) market coupling throughout Europe, went live in February 2014, thanks to the close cooperation between TSOs and power exchanges. Other DA market coupling projects, such as the Iberian peninsula's preparation to join NWE, the 4M and 5M projects involving the Czech Republic, Slovakia, Hungary, Romania and Poland, and the Italian Borders Working Table, have progressed throughout the year.

Pierre Bornard: In addition to the projects outlined by Nick, flow-based price coupling is advocated as the market model for highly meshed networks, such as Central West Europe, as preliminary studies show higher price convergence than with existing market coupling measures.

The "go live" decision on flow-based price coupling will be taken in 2014. The Central East Europe region is also working on the implementation of a flow-based model.

Within the intraday (ID) time frame, ENTSO-E's Capacity Allocation and Congestion Management network code (NC CACM) defines the rules for a continuous market where trades can be made up to an hour before real time. The NWE+ ID project, including TSOs and power exchanges from North West Europe with Switzerland and Austria, is working to create the platform towards the end of 2014.

Following respective reviews of the pilot study on bidding zones (within which trades can be made without capacity allocation over all time frames), ENTSO-E published the TSOs' technical report (Activity 1 of the bidding zones review) in January 2014. This was followed by ACER's publication of the NRAs' market report (Activity 2 of the bidding zones review) in March.

"As systems and markets get more and more complex, market transparency and the trust and confidence of all stakeholders are crucial."

The new European Regulation (EU) 543/2013 mandates ENTSO-E to develop and operate a central information transparency platform publishing fundamental information on the European electricity market. Development of the platform and manual of procedures advanced significantly over the year and it was launched in January 2014 with data previously available on *www.entsoe.net*. The addition of new data required by the regulation is scheduled for the end of 2014.

Approval of the Common Grid Model Exchange Standard was another ENTSO-E achievement during 2013. The data exchange standard will allow TSOs to efficiently combine individual network data, a prerequisite for routine security and capacity calculations on a regional scale, as defined by various network codes.

Konstantin Staschus: The activities of regional security coordination groups such as Coreso and TSC also continue to improve the reliability of the network, maximising the transmission capacity available to market participants and ultimately benefitting the consumer.

KONSTANTIN STASCHUS

"One of the TSOs' most important tasks is to ensure that the transmission system is secure and reliable. Without a secure network, the single market simply cannot function."

Work has continued on enhancing TSO cooperation in operations, for example between synchronous areas with the creation of an ENTSO-E working group to share best practice across Europe.

Pilots are currently in progress on HVDC links between the Nordic and Continental European synchronous areas, with a further pilot between the Nordic and Baltic areas expected in 2014.

Nick Winser: While delivering on our immediate tasks such as the network codes and the TYNDP, we are always looking to the future.

System extensions connect third-party networks to one of ENTSO-E's synchronous areas and can bring increased trading possibilities and efficiencies in transmission, reserve power and system balancing. Over the past three years, the Turkish system has successfully overcome a number of operational challenges and the decision on its permanent synchronous operation with the Continental Europe area is due be taken in 2014.

The Albanian network has also made steady progress in implementing a variety of organisational and infrastructure projects, as well as liberalising its electricity market. It is expected that the decision on its permanent synchronous operation will also be made in 2014.

Pierre Bornard: R&D continues to play a crucial role in Europe's ability to meet its low carbon objectives and the ENTSO-E R&D Roadmap 2013-2022 provides our vision of the projects that need to be carried out by TSOs to meet these. The roadmap is supported by our annual R&D Implementation Plan.

> "Significant TSO R&D achievements during 2013 include the funding and start-up of three major new projects and the successful completion of four others."

Over the year, ENTSO-E has worked on the R&D Implementation Plan 2015-2017. The plan's top-down and bottom-up approaches answer the requirements of the roadmap and reflect the upcoming R&D needs of TSOs and other stakeholders. We have also developed a special set of key performance indicators (KPIs) to monitor the progress of both European and national research and innovation projects in achieving the roadmap's goals.

Capturing and sharing the knowledge acquired within the R&D framework is vital in achieving the goals. Sharing of lessons learnt and best practice stimulates active participation in TSO R&D activities and their application also helps shape future R&D projects for TSOs, as they adapt to the changing energy landscape.

Finally, to bridge gaps between the technical requirements of initiatives such as the network codes and smart grid development and existing industry standards, ENTSO-E has set up a Standardisation working group so member TSOs can mutually benefit from closer participation in the activities of organisations such as CEN/CENELEC and the IEC.

Nick Winser: As the above summary shows, ENTSO-E's work covers a very large number of activities, which have recently been further increased through new legislation.

Without the significant input of our member TSOs, this work would simply not be possible. During 2014, we look forward to continued TSO and stakeholder cooperation as we work towards delivering a secure and competitive European electricity market.

REVIEW OF ACTIVITIES

OVERVIEW

The nature of European power systems is changing dramatically. The huge shift towards renewable energy, particularly wind and solar power, prompted by the EU's 2001 Directive on the promotion of electricity from Renewable Energy Sources (2001/77/EC), its 2009 Renewable Energy Directive (2009/28/EC) and subsequent 20/20/20 targets have far-reaching consequences. RES has increased the variability of energy generation, resulted in more dispersed sources of generation, and multiplied power flows across Europe.

Europe's internal energy market (IEM) is fundamental to meet its low-carbon objectives and to deal with these new conditions. It will also bring numerous benefits for consumers, including greater energy choice, system reliability and market transparency.

Since the liberalisation introduced by the First Energy Package in 1996, electricity markets have progressively developed and integrated. Although full integration is on track, the creation of what will be the world's largest electricity market presents unique challenges that require TSOs to work ever more closely together.

In addition to adapting their own systems and operating approaches to cope with national and European energy and climate change objectives, they must now ensure that the rules and infrastructure required for pan-European operation are in place.

Although TSOs have always worked closely together, the huge shift in the nature of electricity generation, with the challenge of integrating ever increasing amounts of intermittent renewable energy (RES), has led to unprecedented levels of cooperation between them. TSOs are fostering the process through ENTSO-E.

EVER-INCREASING HARMONISATION

More interconnections, the expansion of RES generation, the changing role of distribution networks and the creation of the single market all require harmonised operational rules and tools to ensure a continuous, secure electricity supply. TSOs' system operations rules, developed and coordinated through ENTSO-E as the European network codes, coupled with R&D innovations and regional security initiatives will enhance the quality of supply, while also mitigating the cost of grid development.

For the IEM to function effectively, the rules governing its operation and the required network infrastructure need to be in place. Establishing harmonised cross-border markets across all time frames will result in a more flexible and more efficient use of available resources.

TSOs have worked closely with stakeholders to establish the guidelines to allow market participants to trade seamlessly across Europe. They have also cooperated with each other to plan a transmission network that will meet Europe's needs, today and for the future. ENTSO-E's forthcoming TYNDP 2014 will continue to play a significant role in this process.

STAKEHOLDER ENGAGEMENT

Over the past year, ENTSO-E has taken important strides forward in engaging stakeholders and in ensuring that a close working relationship with its partners and stakeholders is embedded in its working culture. The aim is to ensure that the broadest range of views is taken on board at the early stages of ENTSO-E projects so that they can be reflected in its final products or positions.

Improvements in ENTSO-E's approach to building closer links with partners such as the EC and ACER and to working with stakeholders has been particularly apparent during 2013 in relation to its main legally-mandated deliverables. Most obviously, these include the ENTSO-E network codes and the Ten-Year Network Development Plan (TYNDP).

NETWORK CODES

Close relationships with stakeholders remain a key focus in the development and forthcoming implementation of the network codes. Input from many expert groups, supplemented by open workshops and bilateral discussions, have allowed ENTSO-E to obtain views from across the industry and provide suitable responses where necessary. Feedback over the past year has demonstrated an increase in stakeholder satisfaction in this area.

Conscious of the complexity of the network codes and how they interact with each other, ENTSO-E has created the network codes mini-website (*http://networkcodes.entsoe.eu*) as a specific channel to communicate and further explain its activities in this area. The adoption and implementation of the network codes represents a significant future challenge for which a close working relationship with stakeholders is vital.

TYNDP 2014

ENTSO-E's second official TYNDP is due for release at the end of 2014 and its increased relevance to the realisation of the IEM means that stakeholders' suggestions and the need to improve public acceptance and appreciation of both existing and new transmission infrastructure are increasingly important.

ENTSO-E has worked hard on the frequency and quality of its interaction with stakeholders via various channels. These include public web-based consultations, like those for its network "visions" and investment project cost benefit analysis (CBA) methodology, and open workshops at regional and European level, such as its pan-European TYNDP stakeholder workshop held in Brussels in November.

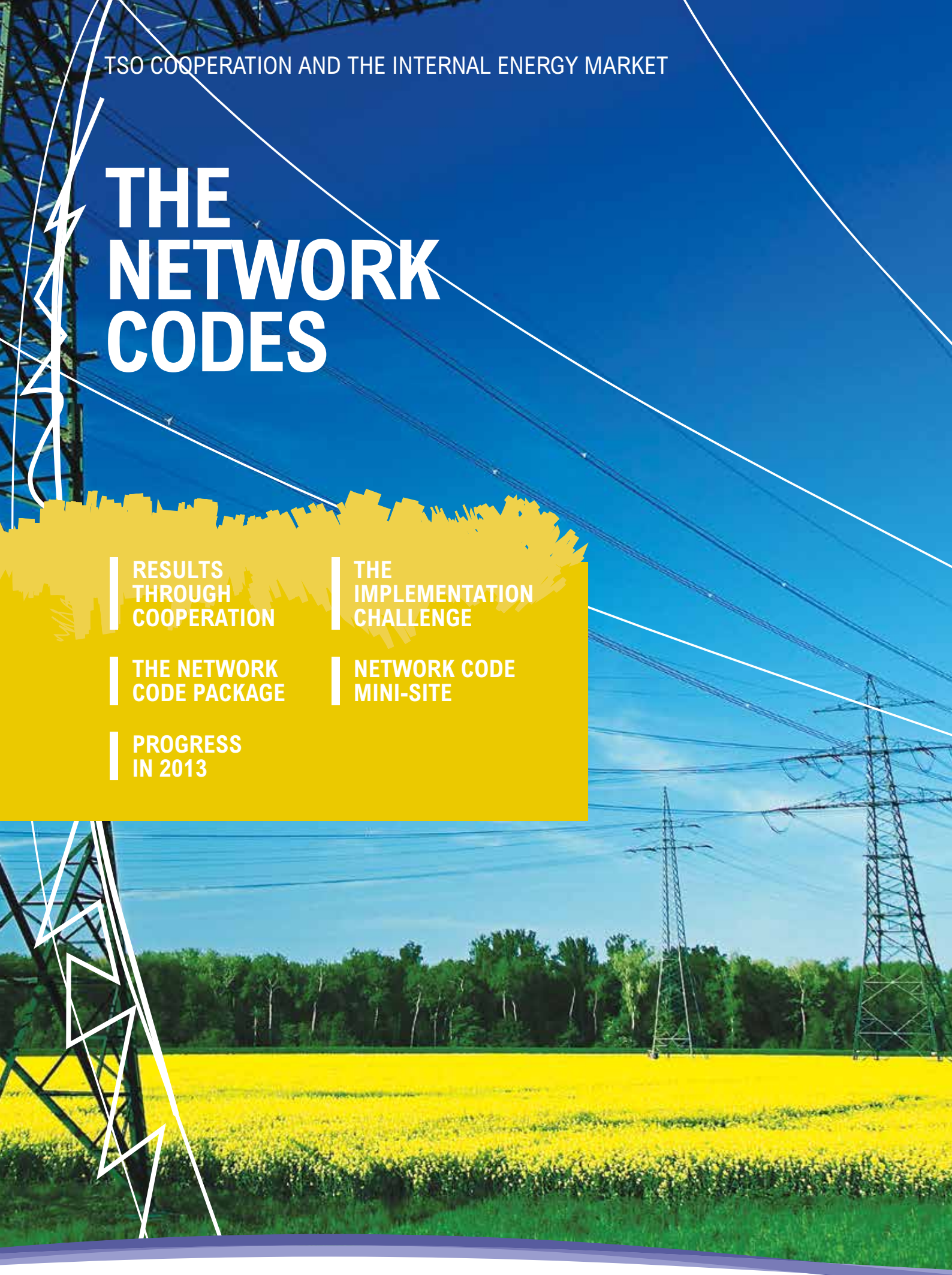
LONG TERM NETWORK DEVELOPMENT

A key element of ENTSO-E's programme for stakeholder management has been the creation of the Long-Term Network Development stakeholder group. By incorporating major stakeholders such as generators, energy traders, renewable energy associations and NGOs, this group provides an opportunity to share a variety of views on system development in general, and on TYNDP methodologies and data assumptions.

The role of Europe's distribution system operators (DSOs) is undergoing a similarly fundamental shift as that of the TSOs. ENTSO-E will particularly focus, therefore, on working more closely with its DSO colleagues to ensure that networks remain reliable, sustainable and connected.

The EC and ACER continue to be ENTSO-E's most important partners and will remain closely involved in all aspects of its work.

THE NETWORK CODES



- RESULTS THROUGH COOPERATION
- THE IMPLEMENTATION CHALLENGE
- THE NETWORK CODE PACKAGE
- NETWORK CODE MINI-SITE
- PROGRESS IN 2013

RESULTS THROUGH COOPERATION

One of the most impressive examples of cooperation among European Transmission System Operators (TSOs) is the work they have undertaken within ENTSO-E to produce the network codes. These will be the legally binding instruments that set out the detailed rules, obligations and rights for all users of the pan-European network.

Successful development of the network codes has involved a major joint effort by the European Commission, ACER, ENTSO-E and individual TSOs. It has been backed by extensive consultation of stakeholders from across Europe. These include generators, power exchanges, energy supply and trading companies, equipment suppliers, distribution system operators (DSOs), large industrial users and national regulatory authorities (NRAs).

The Third Energy Package introduced the concept of the network codes in order to ensure greater collaboration among all participants to create a secure, competitive and low-carbon energy sector in Europe.

The fundamental changes in generation patterns, including the increasing adoption of renewable energy sources (RES), a more active energy demand-side through the development of smart grid technology, and increasingly interconnected transmission networks throughout Europe underlined the need for new harmonised rules to manage the rapidly evolving energy system.

COHERENT PACKAGE

ENTSO-E's goal in the network code development process has been to produce a set of codes that meet the variety of stakeholder needs. Different stakeholder views have been fully analysed and considered to create a robust, coherent and consensus-based package of codes that have the ability to be amended and grow, as future technical or market needs require.

Within the 12 month period which the European Commission gives ENTSO-E to produce a particular network code, it has not only managed to ensure consensus among its member TSOs, but has also worked closely with other stakeholders from across the sector to ensure that their priorities are considered.

THE NETWORK CODES FALL INTO THREE CATEGORIES - NETWORK CONNECTION, SYSTEM OPERATIONS AND ELECTRICITY MARKETS.

Network Connection

- Requirements for Grid Connection applicable to all Generators (NC RfG)
- Demand Connection (NC DCC)
- High Voltage Direct Current (NC HVDC)

System Operations

- Operational Security (NC OS)
- Operational Planning and Scheduling (NC OPS)
- Load Frequency Control & Reserves (NC LFCR)
- Emergency and Restoration (NC ER)

Electricity Markets

- Capacity Allocation and Congestion Management (NC CACM)
- Forward Capacity Allocation (NC FCA)
- Electricity Balancing (NC EB)

THE NETWORK CODE PACKAGE

The network code development process separates codes drafted by TSOs and endorsed independently by ACER (which only provides an opinion) and the European Commission. Each code is then adopted into EU law via Comitology, the adoption process where the code is refined by the European Commission and then scrutinised by representatives from EU Member States before being recommended to the European Parliament and Council.

Following each network code's completion of the Comitology process, it will become an annex to Regulation (EC) 714/2009 on cross-border exchanges of electricity.

NETWORK CONNECTION

Three network connection codes define the technical requirements for all parties wishing to connect to the European network, such as generators, TSOs, DSOs and large industrial customers, and the capabilities they must have to contribute to secure network operation. A more secure system provides for more reliable services to the benefit of Europe's consumers.

Because of the very long time frames guiding grid investment - a transmission line has a life of more than 40 years - it is important that investment decisions are based on a full understanding of the contributions required from both generators and network customers. ENTSO-E's connection-related network codes collectively provide these.

The individual codes are Requirements for Grid Connection applicable to all Generators (NC RfG), Demand Connection (NC DCC), aimed at DSOs and industrial customers and facilitating demand-side response, and High Voltage Direct Current connection (NC HVDC), primarily covering large inter-country cables and connections to offshore wind farms.

SYSTEM OPERATIONS

The purpose of the three system operations codes is to define pan-European operating standards and procedures to ensure the operational quality (frequency, voltage, security) of the interconnected network and to promote coordination among TSO operations.

Thus TSOs will follow a common set of operational rules not only for their national transmission systems, but also for the European network. This is particularly important to meet the challenge posed by more frequent large continental-scale power transfers necessitated by the rapid growth of intermittent RES generation, such as large offshore wind farms or solar parks, located at greater distances from main consumption centres.

Although Europe's TSOs have worked together for well over 50 years on a voluntary and contractual basis, the system operations network codes will for the first time formalise their cooperation on a legal basis.

The codes cover Operational Security (NC OS), Operational Planning and Scheduling (NC OPS), and Load Frequency Control and Reserves (NC LFCR). A new code on Emergency and Restoration (NC ER) completes the picture.

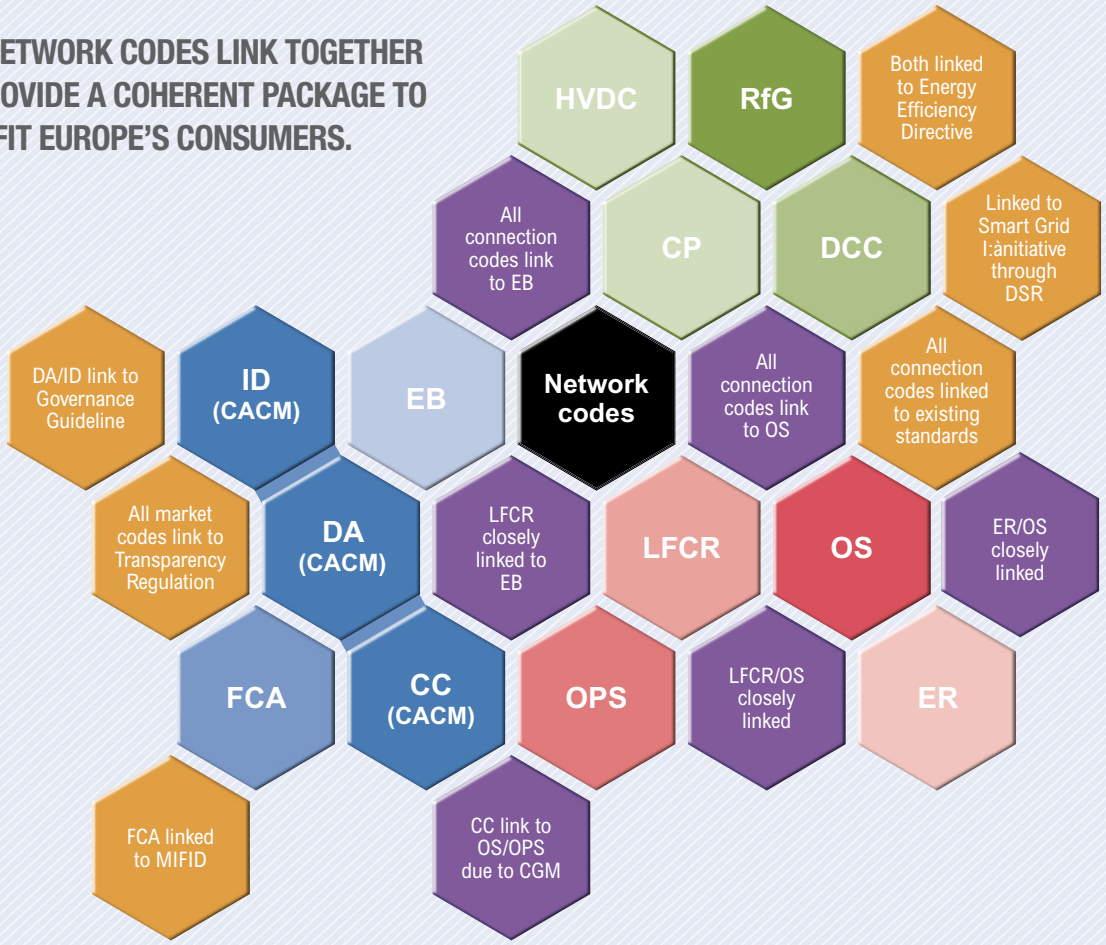
ELECTRICITY MARKETS

The electricity market codes cover the rules for unified market operation (in the forward, day-ahead, intraday, and balancing time frames), as well as for calculating cross-border capacity and defining bidding zones where participants can exchange energy without the need for capacity allocation.

They introduce a standard set of market practices across Europe to promote implementation of the IEM - the world's largest and most competitive electricity market providing far greater consumer choice.

The three market codes are Capacity Allocation and Congestion Management (NC CACM), which includes the Intraday (ID), Day-ahead (DA) and the Coordinated Calculation of Network Capacity (CC)

THE NETWORK CODES LINK TOGETHER TO PROVIDE A COHERENT PACKAGE TO BENEFIT EUROPE'S CONSUMERS.



subsections, Forward Capacity Allocation (NC FCA) and Electricity Balancing (NC EB).

The NC EB can be regarded as the market and procurement-oriented sister of the NC LFCR, in that it covers the process by which TSOs ensure that they can access sufficient back-up reserves to balance differences in supply and demand.

Its objective is to move Europe from the current situation, where most balancing is carried out at a national level, to a situation where coordinated cross-border balancing cooperations foster a reduction in total balancing costs and balancing energy activations.

LINKS BETWEEN CODES

Developing the network codes individually means that there are inevitably links and dependencies between them that need to be explained and managed.

Each code interacts, to a greater or lesser extent, with every other code. Like the European transmission system, they are best viewed as a meshed structure where the whole is greater than the sum of the parts.

It is the impact of the entire package of network codes, as opposed to one specific item, that will benefit Europe's consumers. ENTSO-E recognises this fact and has constantly sought to highlight it in its work on communications and consistency.

The main links between the codes are captured in the diagram above. It should be noted, however, that it does not cover areas such as investment incentives, where there is a prospect of additional codes to be developed.

PROGRESS IN 2013

Over the past year, ENTSO-E has made significant progress on the development of each of the network codes. Eight codes have been delivered to ACER, with six of these recommended by ACER to the EC. The final version of the NC HVDC is due for submission to ACER in April 2014.

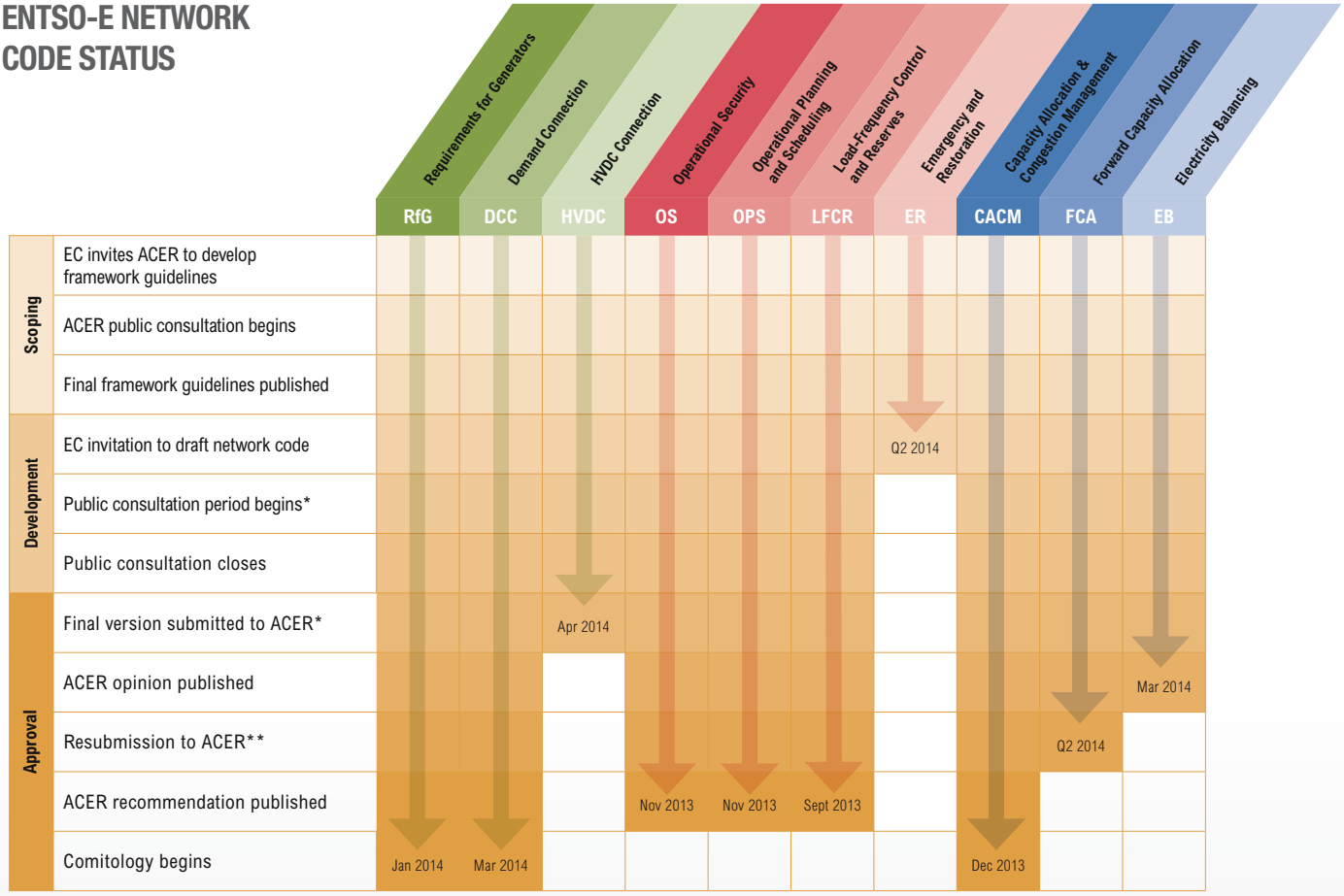
For the connection codes, ACER recommended that the EC should adopt the NC RfG and NC DCC in March 2013 and the former is currently in the early stages of Comitology. The HVDC code underwent a two-month public consultation until January 2014 before it is to be submitted to ACER.

After issuing a positive opinion and recommendation to adopt the system operations LFCR network code in September 2013, ACER recommended that the EC should adopt the NC OS and NC OPS in November.

Of the market-related codes, ENTSO-E delivered the NC CACM to ACER in September 2013 and the work required by the code to put the vital pillars of the IEM in place has already begun. ENTSO-E submitted the NC FCA to ACER in October, which provided its reasoned opinion in December. The code will be resubmitted in Q2 2014.

Finally, ENTSO-E submitted the NC EB to ACER in December. Its synergies with the NC LFCR mean that the two may progress through Comitology together.

ENTSO-E NETWORK CODE STATUS



The purpose of this chart is to provide overall transparency in ENTSO-E's network code development. All forward-looking dates are provisional until confirmed. Stakeholders will be informed and invited to all confirmed events by means of official communication.

* In accordance with ENTSO-E's Network Code Development Process, internal re/drafting and approval is carried out before public consultation and submission of the code to ACER.
** In cases where ACER does not attach a recommendation to its opinion, ENTSO-E has the opportunity to resubmit the code.

ENTSO-E is now working on the final pieces of the network code package. These are the NC HVDC, which is crucial to defining the way the European (super) grid will develop, and a new additional code on Emergency and Restoration (NC ER).

In some ways, development of the NC ER will answer many stakeholder questions on the linkages between the capabilities required by connecting parties in the connection-related codes and those required in the system operations codes covering normal network operation.

The NC ER will be a major focus of ENTSO-E's work during 2014 and with the other nine network codes will form the base on which a secure, competitive and low-carbon energy market can be built.

THE IMPLEMENTATION CHALLENGE

Development of the network codes is in many ways just the beginning of the process - implementing them is the next challenge. While discussions with Member States under Comitology have begun, momentum is lacking and no code has yet become law.

The lack of momentum in the Comitology process delays realisation of the benefits delivered by the network codes. Their impact will not be fully captured until they are implemented across Europe. A concerted effort by TSOs, regulators and stakeholders is needed to make this implementation happen in a timely and coherent way.

While the codes contain a significant level of detail, the nature of the electricity system makes this detail necessary for procedures to truly converge and the IEM to flourish. TSOs must build on their constructive cooperation so far, to work on the critical cornerstones of the IEM and put in place the specific tools to allow seamless system operation.

ENTSO-E does not underestimate the challenge involved and is already looking into two of the leading topics: the definition of bidding zones (areas in which there will be a single electricity price) and capacity calculation regions. Much more work will be needed to ensure that the many pieces of the puzzle are put in place.

ENSURING THE CODES CAN ADAPT

Current efforts are inevitably focused on getting the network codes adopted into law but it is important to not lose sight of the bigger picture. For the codes to be considered a success, they will need to be in place in 5, 10 and 20 years' time. This means that they must be capable of keeping pace with the inevitable changes within the electricity sector and that the updating and amendment process is critical.

In the short term, individual codes will need to be updated to include specific developments over the next few years. This will require a robust but proportionate process that allows changes to be proposed and discussed and, in due course, become legally binding (again through Comitology).

ACER has provided an outline for this process, which will be the subject of greater ENTSO-E attention in 2014 including consideration of how to work with stakeholders in assessing proposals.

NETWORK CODE MINI-SITE

The network codes are by necessity complex, as they set rules for the largest integrated electricity network in the world, cover markets in which millions of euros flow between counterparties every hour, and guide investment decisions that have an impact of 40 years or longer.

The inherent complexity of the codes is one of the reasons why ENTSO-E was tasked with the challenge of producing them. It quickly realised that this complexity could also make it difficult for stakeholders and other interested parties to understand their specific rights and obligations under the codes.

To aid understanding of the network codes and their interactions and obligations, ENTSO-E has invested considerable resources during 2013 to construct its dedicated network codes mini-website (*http://networkcodes.entsoe.eu*), which went live in the latter part of the year.

The website seeks to make the codes more accessible through a combination of video material, frequently asked questions and content tailored to a less technically focused audience. It also provides another vehicle through which stakeholder questions can be asked and answered. It complements the efforts made by ENTSO-E and individual TSOs at national level and will be a significant focus of attention during the coming year.

2014 will continue to be an important year for the network codes. The first codes will become law and ENTSO-E will work hard to facilitate the adoption of their provisions across Europe. Working closely with stakeholders, ENTSO-E will ensure that a reliable, sustainable and connected Europe takes another step closer to reality for the benefit of Europe's consumers.

INFRASTRUCTURE DEVELOPMENT

- NETWORK FOR THE FUTURE
- ENERGY INFRASTRUCTURE REGULATION
- TYNDP 2012 FOLLOW-UP
- 2030 SCENARIOS
- TYNDP 2014
- ACCEPTANCE OF INFRASTRUCTURE PROJECTS
- COLLABORATION WITH ENTSOG

NETWORK FOR THE FUTURE

The timely development of new network infrastructure is vital to meet the requirements of the internal energy market (IEM) and the integration of different types of generation, including ever increasing amounts of renewable energy sources (RES). More dispersed sources of generation, both onshore and offshore, must be connected to the major demand centres where most Europeans live and work.

The Third Energy Package mandates ENTSO-E to prepare its biennial Ten-Year Network Development Plan (TYNDP), which builds on national and regional investment plans to identify gaps in infrastructure from a European perspective and inform individual Member States and other stakeholders about projects that have a network-wide impact.

The TYNDP package, together with ENTSO-E's Scenario Outlook and Adequacy Forecast (SOAF) and Regional Investment Plans (RIPs), gives the most comprehensive view of pan-European system development. The SOAF forecasts and assesses long-term generating adequacy and provides the base scenarios for market and network studies within the TYNDP framework.

ENERGY INFRASTRUCTURE REGULATION

In order to better support decision-making at regional and European levels, the EU's trans-European Energy Infrastructure Regulation (EU) 347/2013, which entered into force in May 2013, mandates the ENTSO-E TYNDP to provide greater transparency into the entire European transmission network. The TYNDP now becomes the sole basis for the selection of European Projects of Common Interest (PCIs).

The EC will publish a biennial list of EU-wide transmission and storage PCIs, which must be included in the preceding ENTSO-E TYNDP in order to gain PCI status. Such projects can potentially be eligible for faster permitting, special regulatory treatment and EC financial support. The EC published its first Union PCI list on 14 October 2013, which included projects from the TYNDP 2012.

THIRD-PARTY PROJECTS

The majority of projects included in the TYNDP are proposed by ENTSO-E member TSOs. However, there are an increasing number of projects from third-party promoters. These are either projects proposed by TSOs outside the European network that have an impact on the network, or projects proposed within the European network by organisations that are not members of ENTSO-E. In the future, for third-party projects to gain PCI status, they must also be included in the ENTSO-E TYNDP.

ENTSO-E ran two rounds of assessment during 2013 to determine if projects submitted for inclusion in the TYNDP 2014 were compliant with the legal and technical criteria set out in its "Procedure for the Inclusion of Third-Party Projects". The first assessment was conducted in January for third-party transmission projects, with ENTSO-E notifying candidates whether or not they were successful in May.

Based on stakeholder feedback and Regulation (EU) 347/2013 coming into force, it was decided that a second call for third-party storage projects should be held. ENTSO-E therefore ran a second assessment for these projects in October, as well as for additional transmission projects that were not submitted in January or that were submitted but not accepted.

TYNDP 2012 FOLLOW-UP

ENTSO-E's TYNDP 2012 identified the need for a €104 billion investment in transmission infrastructure (excluding national or regional investments) to meet the EU energy policy goals of reducing carbon emissions, enhancing energy security and ensuring the transition to the IEM.

More than 100 projects of pan-European significance involve the construction of 52,300 km of new high voltage infrastructure by 2020. This will save some 170 million tons of CO_2 (150 Mt through RES connections and 20 Mt through market integration).

Building this infrastructure is a huge challenge, considering public acceptance, regulatory and financial issues. An increase in the transparency of project progress will enable all stakeholders, and particularly national and European regulatory and political bodies, to better understand their impact.

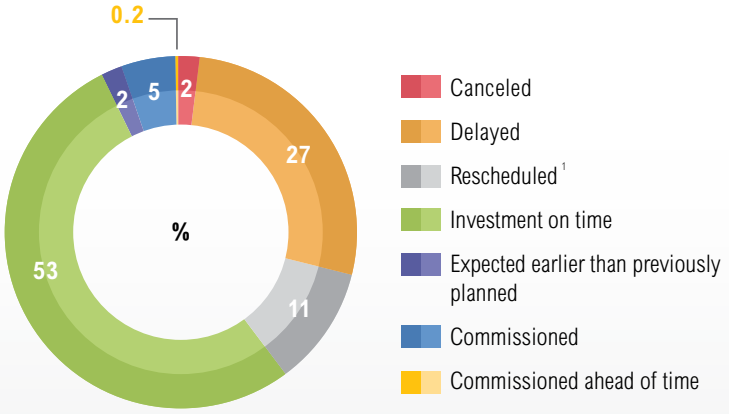
MONITORING REPORT

In the development of the TYNDP 2014 package, ENTSO-E has therefore worked in collaboration with stakeholders to track the progress of investment projects identified in the TYNDP 2012, publishing a Monitoring Update Report in June 2013.

As an interim communication before the TYNDP 2014, the report presents an overview of the evolution of the projects, including statistics on their progress and an updated table focusing on project status, date of commissioning and additional monitoring information.

The analysis shows that, although 53% of projects are on time to meet their planned commissioning dates, 27% are delayed, mostly by one or two years. Major reasons for the delays are the difficulties in gaining public consent and permits for building the new infrastructure.

TYNDP 2012 PROJECT EVOLUTION



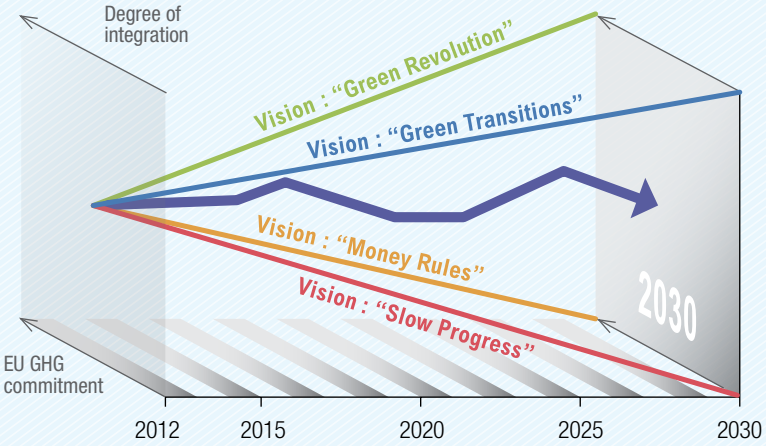
[1] In statistics covering modification of commissioning dates, long-term investments at an early stage of the planning process have been separated into a new category "Rescheduled". Investments postponed due to their external driver being delayed (e.g. the connection of postponed RES generation) are also included in this category.

ENTSO-E 2030 SCENARIOS

ENTSO-E's TYNDP 2014 will include market and network studies up to 2030 in order to bridge the gap between its 10-year time horizon and the EC's 2050 Energy Roadmap and the e-Highways2050 project. Since predicting this far into the future is difficult, ENTSO-E has constructed four distinct visions of the electricity system and created a realistic range of scenarios that show the different requirements for grid development up to this date.

Regulation (EU) 714/2009 mandates the TYNDP to include a "scenario development, a European generation adequacy outlook and an assessment of the resilience of the system." Four ENTSO-E visions provide the basis for the scenarios used in ENTSO-E's Scenario Outlook and Adequacy Forecast (SOAF) as the background assumptions for the market and network studies to be included in the TYNDP 2014 package.

ENTSO-E 2030 VISIONS



The scenario development is the first step in the process to identify future infrastructure needs, defining the parameters under which forecasts of generation and demand will develop. Based on this data, ENTSO-E prepares pan-European and regional market studies to estimate the expected electricity flows within the system.

By applying these flows to the grid model, it then identifies the future infrastructure necessary to ensure efficient and economic transmission.

The scenarios derived from the contrasting visions capture a realistic range of outcomes that result in different challenges for the grid and help to identify the most resilient and flexible infrastructure to cope with them.

The pathways to 2030 are designed along two axes: reaching the EU's commitment to reduce greenhouse gas (GHG) emissions set out in the 2050 Energy Roadmap and the degree of European integration required to achieve the EU objectives.

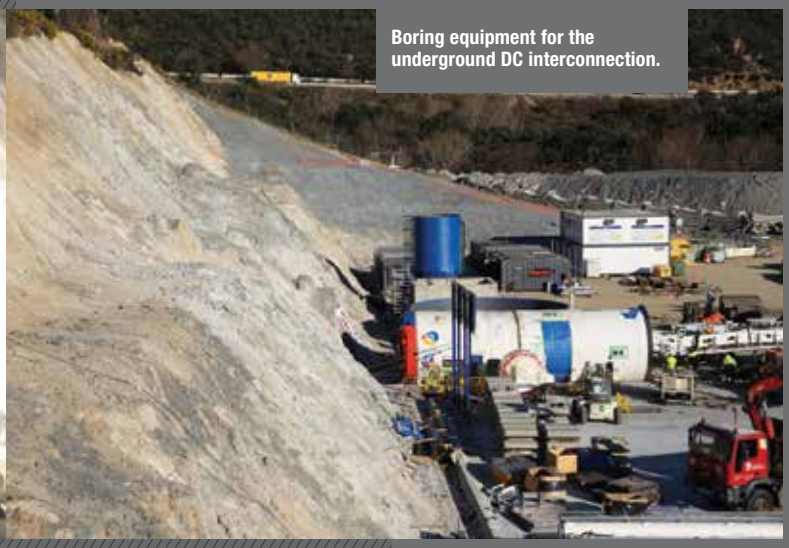
Vision 1 ("Slow Progress") and Vision 3 ("Green Transition") are bottom-up scenarios that are jointly derived from the input data provided by individual TSOs. Vision 2 ("Money Rules") and Vision 4 ("Green Revolution") are top-down scenarios constructed so that the EU energy policy goals are achieved. The scenarios cover four possible outcomes under the chosen assumptions in relation to the 2030 horizon.

EXTENSIVE CONSULTATION

The scenarios based on the four visions that will be included in the TYNDP 2014 are being developed with extensive stakeholder interaction and consultation. A two-month public web consultation was held between mid-July and mid-September 2013, where stakeholders had the opportunity to influence the scenario building process.

The consultation supplemented previous open workshops, discussions within the Long-Term Network Development Stakeholder Group and bilateral meetings, each of which contributed to the development process.

TSO COOPERATION
RTE (FRANCE), REE (SPAIN)



Boring equipment for the underground DC interconnection.

NEW FRANCE-SPAIN INTERCONNECTION

A € 700 million underground DC interconnection, linking the southern French town of Baixas near Perpignan with Santa Llogaia near Figueras in northern Spain, is set to double cross-border capacity in the region to 2800 MW and also increase the quality and security of supply of both the French and Spanish networks.

The 320 kV interconnection, due to be completed in mid-2015, will also better integrate the Iberian grid with the rest of Europe and facilitate the transmission of renewable energy, saving 2.3 million tonnes of CO_2 each year. The interconnection is 64.5 km long, with VSC (voltage source converter) stations at each end,and crosses the Pyrenees in an 8.5 km tunnel. Construction of the link is being managed by Inelfe (Interconnexion électrique France Espagne) a joint company specially set up for the purpose by the Spanish and French TSOs.

The project is the first to be carried out by a specially created joint TSO company (other companies have since followed the example) and also has a number of exceptional characteristics:

- it is the first based on a 320 kV DC cross-linked polyethylene (XLPE) cable
- it is the first to use two 1000 MW VSC converter stations
- it is the first time that such a powerful line is being built fully underground
- it will require the management of a DC interconnector within an AC grid.

After more than 30 years of discussions between both countries, the French and Spanish governments asked the European Commission to nominate a coordinator to help them solve the issue and the agreement with Inelfe was signed in 2008. The EC's Energy Program, the European Investment bank, and the TSOs are financing the project.

Work on the interconnector continued during 2013, with the line due to be tested at the end of 2014 until mid-2015. Both RTE and REE recognise that operation of the DC link in parallel with the AC grid will require new levels of coordination. They state that construction of the link has already greatly enriched collaboration at each TSO.

ENTSO-E TYNDP 2014

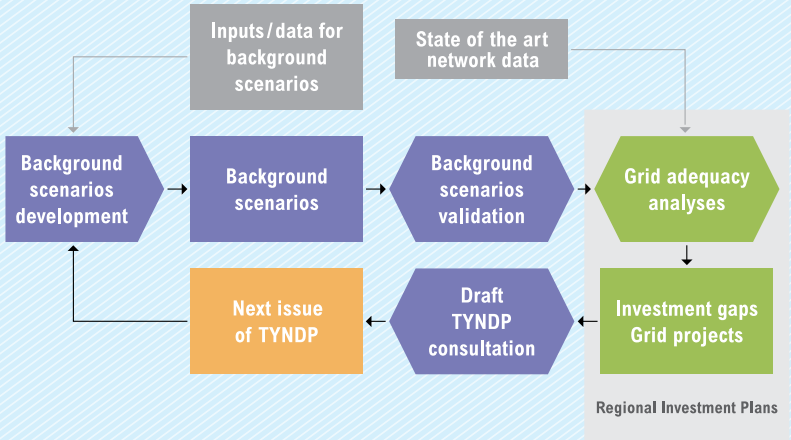
The ENTSO-E TYNDP 2014 is due to be published in December 2014 and the task of the collaborative development of the increasingly important package of regional and pan-European documents is ongoing through the System Development Committee's (SDC) TYNDP Working and Regional Groups.

Based on the data and assumptions of each of the four ENTSO-E visions, the System Adequacy and Market Modelling working group is preparing pan-European market studies before drafting the TYNDP documents.

The SDC Regional Groups have already performed regional assessments of relevant projects using the assumptions set out in the Vision 1 (Slow Progress) scenario. Next steps include assessment of projects against the Vision 4 (Green Revolution) scenario, followed by their assessment against the Vision 2 and Vision 3 scenarios.

Stakeholders are being involved throughout the assessment process via open workshops, the Long-Term Network Development Stakeholder Group, bilateral meetings and web consultations.

TYNDP BUILD-UP PROCESS



COST-BENEFIT ANALYSIS

In order to determine the benefits and investment cost of projects of pan-European significance, the respective ENTSO-E SDC Regional Groups currently undertake a consistent, multi-criteria analysis of each project in the TYNDP.

Regulation (EU) 347/2013 now requires ENTSO-E to publish, and submit to the EC and ACER and other relevant institutions, a harmonised European-wide cost-benefit analysis (CBA) methodology for network and market modelling that assesses PCIs and other TYNDP projects in order to support cost allocation, investment incentives and grant decisions, as well as to increase the transparency of the PCI selection process.

Continuous input from stakeholders has guided the development of ENTSO-E's CBA methodology over the past two years. It has sought extensive consultation through bilateral meetings and public workshops, and through direct interaction with the EC, ACER and Member States, as well as with the ENTSO-E Long-Term Network Development Stakeholder Group, which focuses on the TYNDP process.

From July to mid-September 2013, ENTSO-E ran a public consultation on the CBA methodology, which was subsequently improved based on the feedback received from stakeholders.

ENTSO-E submitted the CBA methodology to Member States, and the EC and ACER for their reasoned opinion in mid-November 2013. Following EC approval of this document, ENTSO-E will apply the methodology in the preparation of future TYNDP releases. Assessment of projects for the TYNDP 2014 is already being based on the new methodology.

ACCEPTANCE OF INFRASTRUCTURE PROJECTS

The development of grid infrastructure is a key component in successfully achieving the single market. But in 2013, the TYNDP Monitoring Update Report confirmed that lack of public acceptance of projects was one of the main obstacles to TSOs delivering the necessary electricity transmission infrastructure. The report identified that almost one in three key electricity infrastructure projects are experiencing delays.

While public opposition to infrastructure projects is not confined to the energy sector, communicating the need for large-scale electricity infrastructure presents a number of unique challenges.

The high reliability of European transmission systems means that consumers often take the electricity supply for granted. The challenge for TSOs is to effectively communicate the need to develop and invest in network infrastructure, not only for today's consumers but also for future generations.

In 2013, the European Parliament adopted the Energy Infrastructure Regulation, which contains proposals for streamlining and reducing permitting times for key infrastructure. ENTSO-E welcomes this but its view is that all energy stakeholders, including policymakers, generators and regulators, must play a part in fostering greater public understanding of why these projects are required.

RAISING CONSUMER AWARENESS

During 2013, ENTSO-E continued its discussions with the European Commission on the subject, playing a leading role in the EC's pilot project to create a communication strategy for raising public acceptance of grid infrastructure and the need for future development. The ultimate goal is to speed up the implementation of the new infrastructure necessary to meet Europe's low-carbon objectives and maintain the network's security of supply.

Following calls for expressions of interest from ENTSO-E, a steering group made up of TSOs, NGOs, academics, the EC and ENTSO-E was established to guide the pilot project.

In April, the European Commission released a tender for the development of a strategy for communicating the benefits of grid infrastructure. The contract was awarded to the successful applicant in October.

The project is now well advanced, with contributions from TSOs in a guidance role and as active participants in the trialling and testing of proposals developed by the contractor. The outcome is expected to complement individual TSO communications on the acceptance of grid development. Project tools will be tested in Member States in 2014 backed up by a database of examples of best practice. These will be stored on an accessible public web platform.

In addition to the EC pilot, individual ENTSO-E members are engaged in a number of other initiatives aimed at improving and enhancing stakeholder participation in the reinforcement of electricity grids.

COLLABORATION WITH ENTSOG

In a similar fashion to ENTSO-E, ENTSOG, the ENTSO for gas, is mandated by Regulation (EU) 715/2009 to publish a biennial TYNDP, as well as winter and summer supply outlooks for the European gas market. The new Energy Infrastructure Regulation also requires ENTSOG to adhere to the CBA methodology for evaluating network development projects of pan-European significance.

As the future of the European electricity and gas networks is interdependent, there are clearly areas of synergy on which both organisations can build.

In particular, the TYNDPs and seasonal outlook reports can benefit from improving the consistency of the scenarios on which they are based. Both ENTSOs have increasingly collaborated during 2013, with ENTSO-E currently exploring further opportunities to work as partners with ENTSOG on the preparation of its TYNDP 2014 as well as its winter and summer outlook reports.

Regulation (EU) 347/2013 also requires both ENTSO-E and ENTSOG to submit their CBA methodologies for evaluating projects of pan-European PCIs to ACER, the EC and Member States.

In preparation for the submission of these methodologies to ACER and the EC in mid-November, ENTSO-E and ENTSOG held a joint workshop in Brussels to present them to Member State government representatives, who were invited to discuss the approaches and raise any issues they might have.

MARKET INTEGRATION

- LONG-TERM MARKET DESIGN
- STANDARDISATION OF INFORMATION EXCHANGE
- REGIONAL MARKET DEVELOPMENT
- MARKET TRANSPARENCY

LONG-TERM MARKET DESIGN

European energy and climate change policies are changing the nature of the power system. In particular, the focus on renewable energy sources (RES) has introduced significant uncertainty into the day-to-day operation of the European network. The requirement for at least 45% RES energy by 2030[1] requires major changes in the fundamental operating principles on which transmission systems have been based. Many of the technical challenges are yet to be identified and there is no universally agreed approach on how best to address them.

Electricity wholesale markets throughout Europe are steadily improving in terms of integration, competition, liquidity and transparency. The transmission network, while growing in operational complexity and degree of interconnection, is also proving to be robust and reliable and cross-border congestion management is becoming more efficient and better coordinated.

Despite this, the rapid transformation of wholesale markets required by EU policy risks limiting some of the benefits from better functioning, more integrated markets. This is becoming increasingly evident each year.

The shortcomings of current markets in managing this transition phase are visible in many parts of Europe. Wholesale price signals are becoming less predictable and therefore less effective in supporting existing generation development or in stimulating new investments. As a consequence, there is a perception of a growing gap between the characteristics of Europe's existing generation assets and the needs of the future market based on an ever-increasing amount of variable generation.

At the same time, significant funding will be required to invest in a suitable combination of RES resources, transmission networks (including cross-border interconnection) and the necessary back-up generation plants to meet EU targets. This is clearly a matter of growing concern for all stakeholders and policymakers, including ENTSO-E and its member TSOs.

SUITABLE FRAMEWORKS

There has been significant discussion in many countries on the need for suitable frameworks to address system adequacy concerns.

Any future market design needs at least to reflect the physical challenges of power system operation, allow the emergence of correct price signals to encourage the necessary investment, and incentivise behaviour that effectively meets the challenges. It must also allow for fine-tuning of energy policy objectives.

During 2013, ENTSO-E's work on long-term market design has focused on the identification of key policy recommendations for specific solutions.

[1] A policy framework for climate and energy in the period from 2020 to 2030" [EU Comm (2014) 15]

These are summarised as follows:

- The European Target Model, as outlined in the framework guidelines and presently being translated into EU legislation via the network codes, should be maintained and implemented as planned. However, it should be augmented with additional elements in order to address future market challenges.

- The market design should be Europe-wide and so reduce the need for local intervention. Undue market distortion should be avoided, in particular when complementing the European Target Model. Policies or interventions at national and European level need to be consistent and regulatory and/or support mechanisms should be coordinated between Member States to the highest possible degree.

- Markets should contribute more to network management in all time frames. In particular, this requires strong TSO/power exchange cooperation in the day-ahead (DA) and intraday (ID) time frames. The interface between TSOs and DSOs should also be further clarified.

  TSOs' responsibilities for network security have to move hand-in-hand with possibilities for effective physical system management, including that of generation units and distribution networks. Balancing responsibility for RES energy as well as for full integration of demand-side management (DSM) into the market design will be necessary.

- Ancillary services need to be further developed regarding market orientation (e.g. cross-border markets) and technical needs (e.g. products). Cross-border participation must be addressed, where and as long as local capacity mechanisms exist. Market design should deliver investment signals for adequacy, flexibility and for generation localisation over the long term. Finally, all market design elements need to follow a consistent, holistic approach.

REGIONAL MARKET DEVELOPMENT

In combination with the network codes, regional market developments are essential to achieving an internal energy market that allows the integration of a range of energy sources. Regional projects, developing in a co-ordinated way, complement the top-down approach provided by the network codes and streamline bottom-up cooperation, bringing regional and national approaches into the European context.

Throughout 2013, ENTSO-E has encouraged regional coordination, working in close cooperation with all the TSOs involved in different implementation projects. Its approach is aimed at achieving pan-European solutions, facilitating exchange of information and expertise among TSOs from different regions, and assuring consistency between regional implementation projects and the corresponding network codes.

DAY-AHEAD MARKETS: PRICE COUPLING

NWE price coupling project

Supported by the Florence Forum, in 2010 ENTSO-E and the TSOs and power exchanges involved chose the North-Western Europe (NWE) price coupling project as the pilot for implementing day-ahead market coupling throughout Europe.

The project's aim is to implement a full price coupling market in cooperation with the relevant power exchanges across the whole NWE region. This covers the Central-West Europe (CWE) region (Belgium, France, Germany, Luxembourg and The Netherlands), the Nordic-Baltic region (Denmark, Sweden, Finland, Norway, Latvia, Lithuania and Estonia) and Great Britain, as well as the Swepol link between Sweden and Poland.

The project went live in February 2014. It is the first to implement the price coupling of regions (PCR) solution developed by the European power exchanges and runs in a common synchronised mode with South-Western Europe (SWE). The launch is a significant step towards an integrated European power market, and thus more competitive prices for European consumers..

This cooperation among TSOs aims to increase the efficient allocation of the interconnection capacities of the countries involved and so reduce market costs. A single algorithm will be used to simultaneously calculate market prices, net positions and interconnector flows between market areas based on implicit auctions, facilitated by the PCR solution.

The 17 project partners are APX, Belpex, EPEX SPOT and Nord Pool Spot from the power exchange side and the TSOs 50Hertz, Amprion, Creos, Elia, Energinet.dk, Fingrid, National Grid, RTE, Statnett, Svenska Kraftnät, TenneT TSO GmbH, TenneT TSO B.V. and TransnetBW.

All pre- and post-coupling arrangements, as well as the necessary IT processes, were developed and tested during 2013 and contractual agreements between parties finalised in anticipation of the go-live date.

SWE price coupling project

This is a joint project between the French, Spanish and Portuguese TSOs, RTE, REE, REN, and the OMIE power exchanges in Spain and Portugal and EPEX SPOT in the French market. During 2013, it has defined the pre-coupling, post coupling and exceptional situations processes required to allow implementation of market coupling between the NWE region and the Iberian markets.

The SWE project has been running in common synchronised mode with the NWE project since the latter's go-live date. The Czech Republic, Slovakia and Hungary have already been coupled using the CWE algorithm since September 2012 and Romania and Poland's willingness to couple their markets (the 5M market coupling project) resulted in a memorandum of understanding in July 2013.

Due to transitional market incompatibilities, only Romania will now join the 4M Market Coupling Project extending Czech, Slovak and Hungarian market coupling to Romania. During 2013, the project finalised the high-level system architecture and approved the design phase. The 4M countries wish to introduce the benefits of market integration to market participants as soon as possible, as well as to prepare for European price coupling, implementing market coupling based on the PCR solution.

The Italian Borders Working Table

This project encompasses TSOs and power exchanges from countries bordering Italy (and includes France, Switzerland, Austria, Slovenia and Greece). It brings the various organisations together to develop a regional approach to designing pre- and post-coupling processes. During 2013, the project has covered cross-border capacity assessment and publication, information exchange, settlement management, and the distribution of congestion charges.

TSO COOPERATION
FINGRID (FINLAND), ELERING (ESTONIA)

EstLink 2 submarine cable.


Anttila converter station, Finland.

ESTLINK 2 - LINKING THE NORDIC AND BALTIC MARKETS

Successful cooperation between northern TSOs Fingrid and Elering - construction of the EstLink 2 interconnection between Finland and Estonia - has paved the way for a joint Nordic-Baltic electricity market. The link was commissioned in February 2014.

The 450 kV HVDC interconnection has a transmission capacity of 650 MW. Together with the EstLink 1 interconnection, operational since 2006, it increases the total transmission capacity between Finland and Estonia to 1000 MW. This significantly improves the functionality of the Baltic electricity markets and their security of supply.

The link is approximately 170 km long, some 14 km of which is an overhead line in Finland, 145 km a submarine cable across the Gulf of Finland, and 11 km an underground cable in Estonia. Converter substations are located at each end of the link at Anttila in Finland and Püssi in Estonia.

After successful performance tests between the converter stations during 2013, trial operation making EstLink 2's capacity available for use by the Baltic markets took place from December 2013 to February 2014.

The total project budget was approximately €320 million shared between the two countries, including an EU subsidy of €100 million as part of a more extensive economy recovery package. Close cooperation between Fingrid and Elering meant that the link was implemented and commissioned according to the initial time schedule which is exceptional for such a large project.

Fingrid and Elering also completed the purchase of the EstLink 1 interconnection from Nordic Energy Link in autumn 2013. EstLink 1 began as a commercial project between market participants and between 2006-2013 was rented by the Finnish and Estonian TSOs.

DAY-AHEAD MARKETS: FLOW-BASED MODEL

Flow-based price coupling is being advocated as the target market model for highly meshed grids, such as that of the CWE region. It allocates capacity by optimising the overall order book surplus from the different spot markets, while ensuring that the physical limits of the grid are respected. The consequence, when sufficient capacity is available, is price harmonisation across the region.

By using a more detailed grid description, the flow-based method increases price convergence while ensuring that security of supply is maintained. The model takes flows over critical electrical paths into account, rather than just the contract paths, and maximises the use of inter-regional transmission capacity and market efficiency through implicit auctions.

CWE flow-based project

Nine organisations are involved in the CWE project including seven TSOs (Amprion, Creos, Elia, RTE, TenneT TSO GmbH, TenneT TSO B.V. and TransnetBW) and two power exchanges (APX Belpex and EPEX SPOT). After two years of development and experimentation, the TSOs and power exchanges have delivered a flow-based design in line with preliminary studies that shows higher price convergence in the CWE region compared to the current market coupling based on available cross-border transmission capacities (ATCs).

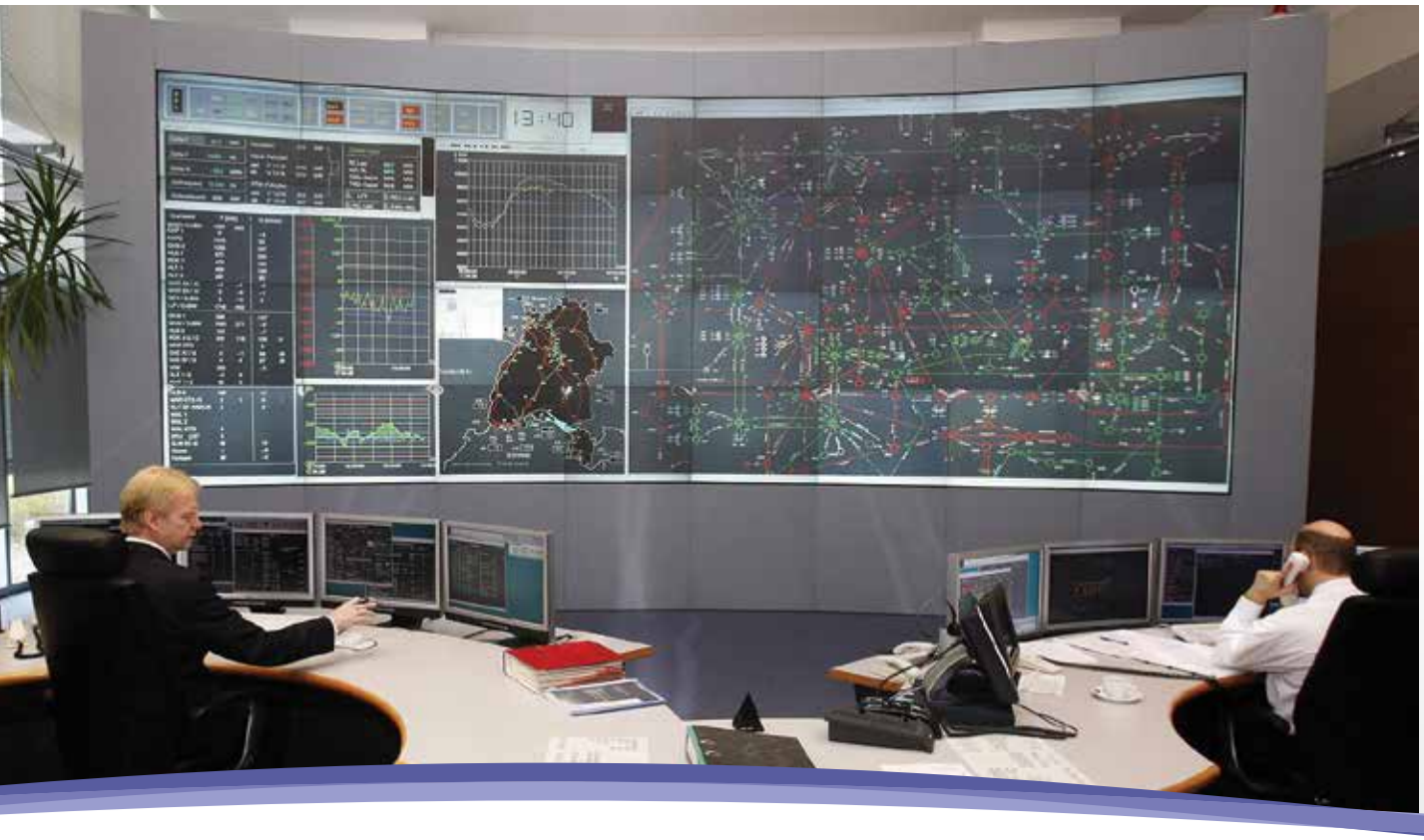
An external parallel trial started in February 2013, with ex-post publication of the results from January 2013, and ran throughout the year. This learning period enabled market participants to experience the flow-based market mechanism. The go-live decision will be taken in 2014 after the successful launch of NWE price coupling and the necessary joint testing activities.

CEE flow-based project

The CEE region (Germany, Poland, Czech Republic, Slovak Republic, Austria) is currently also working on implementation of the flow-based price coupling target model. The aim of the project is to couple the CEE region with the NWE region and introduce flow-based price coupling in a single step. Advancement on this project in 2013 has been limited, although the memorandum of understanding that will facilitate further steps was agreed at the end of the year.

ENTSO-E coordination

In September 2012, ENTSO-E created a new taskforce for the Coordination of EU Market Coupling (CEMC). This taskforce involves all ENTSO-E TSOs in order to achieve efficient coordination of individual and regional projects and ensure that they are consistent, as well as to facilitate the coherent evolution of European-wide price coupling in line with the Capacity Allocation and Congestion Management network code (NC CACM).



During 2013, the CEMC taskforce assisted with the integration of the regions into the single European market coupling solution, coordinating the exchange of information, activities and expertise between TSOs from each region. It has also reported to the Florence Forum and provided a complete overview of the regional developments of DA projects throughout Europe.

REGIONAL IMPLEMENTATION PROJECTS: INTRADAY MARKETS

Coupling national intraday (ID) markets will increase intraday liquidity for the benefit of all market players, as well as make the network more secure, especially with regards to RES integration. The NC CACM defines the rules for a continuous intraday market allowing market participants to trade up to one hour before real time.

The market will be composed of a shared order book function that will pool the bids of all the European bidding zones together and a capacity management module that will contain all the cross-zonal capacities to be allocated. Although cross-zonal ID markets already exist in a number of European areas, such as in the Nordic countries and between France and Germany, the goal is to eventually create a pan-European intraday market.

NWE+ project

The initial NWE ID project has involved two more countries during 2013, Switzerland and Austria, and has been renamed the NWE+ project. The project team has worked on the selection of a vendor to create the pan-European platform, drafted the TSO requirements, and been involved in evaluating bids, as well as in validating the power exchanges selected, in order to ensure that TSOs' requirements have been met.

After the November 2013 Florence Forum, ENTSO-E increased its involvement in the project in order to facilitate the delivery of the intraday solution within the required timeframe.

Pilot study on bidding zones

The target model for the IEM is based on a zonal approach with several bidding zones - the largest geographical area within which market participants can exchange energy without the need for capacity allocation.

This implies that within a particular bidding zone unconstrained energy exchanges are possible. 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. The NC CACM describes the review process, which is divided into four activities: the TSOs' technical report, the NRAs' market evaluation, the NRAs decision on the launch of the bidding zone review, and the review itself.

In October 2012, ENTSO-E decided to pilot the bidding zone review process in several regions (CWE, Denmark-West, CEE, Switzerland and Italy) and presented the terms of reference of the study at the November 2012 Florence Forum. During 2013, ENTSO-E and ACER have worked on the reviews of the technical and market evaluation reports, which were published in the first quarter of 2014.

ENTSO-E coordination

The regional implementation initiatives described above are essential to achieve the IEM. ENTSO-E is working to enhance the coordination of the different projects so that the solutions can be eventually implemented on a pan-European basis.

Follow-up initiatives, such as cross-regional roadmaps, the convergence of regional implementation projects with ACER framework guidelines and the ENTSO-E network codes, and adequate transparency for stakeholders, are priorities. ENTSO-E has created different working groups to progress them.

TSO COOPERATION

STATNETT (NORWAY), SVENSKA KRAFTNÄT (SWEDEN), FINGRID (FINLAND), ENERGINET.DK (DENMARK), ELERING (ESTONIA), LITGRID (LITHUANIA), AUGSTSPRIEGUMA TĪKLS (LATVIA)

Litgrid control room, Lithuania.

NORD POOL INTRADAY MARKET FOR LITHUANIA AND LATVIA

In December, Nord Pool Spot, the Nordic and Baltic electricity exchange, opened up its Elbas intraday market to the Lithuanian and Latvian bidding areas. The initiative marks an important step towards implementation of the Baltic Energy Market Interconnection Plan (BEMIP) and the adoption of the Nord Pool Spot exchange model in all the Baltic States.

The intraday market provides an additional tool for market players to trade electricity, with trading possible up to one hour before delivery. It complements the Nord Pool's Elspot day-ahead market, which covers trades for delivery the following day on an hour-by-hour basis.

Elbas will allow market players in Lithuania and Latvia, as in Estonia and now in the entire Baltic region, to manage their trading risk more efficiently, as well as to balance their trades of electricity generated from renewable sources. On windy days, wind parks in Lithuania generate up to 220 MW of electricity an hour, all of which is sold on the exchange. In the winter season, wind power accounts for up to a fifth of all the electricity consumed there. The intraday market's shorter timescale offers the possibility of planning wind generation more precisely, allowing traders to optimise their trades in wind power.

Nord Pool Spot's Elbas intraday market was set up in 1999 and operates in the Nordic countries, Estonia and Germany. The market accounts for 1-2% of all wholesale electricity transactions on Nord Pool Spot. Intraday markets are also operated by electricity exchanges in Belgium and the Netherlands.

STANDARDISATION OF INFORMATION EXCHANGE

Standardisation of information exchange between TSOs is essential for their enhanced cooperation, as well as to an increasing number of parties including DSOs, generators, suppliers and consumers. Taking account of operational constraints, market rules and EU policy targets, cost-efficient information exchanges need to be based on common business process descriptions and a harmonised information model.

ENTSO-E's Electronic Data Interchange (EDI) working group collaborates with external harmonisation and standardisation organisations, such as the European Federation of Energy Traders (EFET), the European Forum for Energy Business Information Exchange (ebIX) and the International Electrotechnical Commission (IEC), and other ENTSO-E groups to develop detailed business process descriptions and standards in formats that can be easily understood and implemented by the software industry.

Common process descriptions include those of fundamental TSO business practices such as scheduling, settlement, capacity allocation and nomination, acknowledgement, status request and reserve resources' planning.

Alongside the core components, code lists and identification coding schemes for the European internal energy market (IEM), the descriptions have been developed over many years and form the basis of a standardised platform for electricity market data exchange and a harmonised information model. They constitute ENTSO-E's standards for information exchange at European level.

COMMON INFORMATION MODEL

The EDI group also actively contributes to standardisation activities within the common information model (CIM) as part of the IEC's Power System Management and Associated Information Exchange technical committee and its Deregulated Energy Markets working group.

The objective of these activities is twofold: to bring the requirements of ENTSO-E member TSOs into the IEC's CIM 62325 series of standards covering the exchange of data in deregulated energy markets such as the IEM; and to conduct the necessary interoperability (IOP) tests to ensure conformity of the standards with TSO business requirements.

The European style market profile (ESMP) defined in the IEC's CIM series provides the core components for use in standards covering specific business processes within the IEM.

Currently, the 'Profile and context modelling rules', 'CIM European market model exchange profile' and 'Acknowledgement business process and contextual model for CIM European market' have been adopted as international standards. The 'Market data exchanges guidelines' for the IEC 62325-351 profile has been approved as a technical specification. A number of other final drafts are close to IEC submission.

Since July 2012, ENTSO-E has conducted three interoperability tests on the IEC CIM series of standards in which TSOs, transmission capacity allocators (TCAs), transmission capacity auction

offices and market management system (MMS) software providers were invited to participate.

The tests aimed to demonstrate that each of the standards - 'CIM extensions for market', 'CIM European market model exchange profile', 'Acknowledgement business process and contextual model for CIM European market', 'Scheduling business process and contextual model for the European market' and the 'Transmission capacity allocation business process (explicit or implicit auction) and contextual models for the European market' - satisfy the information requirements for the corresponding business processes of the ESMP and that the IEC's CIM and ESMP are consistent.

The results of the tests have shown that work on the standards is in line with TSOs' business requirements, that they contain no major deficiencies and that they include all the capabilities needed to support information exchanges already implemented within ENTSO-E.

A fourth test took place in December 2013 to assess the compliance of work on the relevant IEC standards with the requirements defined by ENTSO-E's settlement (ESP), status request (ESR) and problem statement (EPS) business processes. Its main objective was to determine whether current ENTSO-E compliant XML documentation supporting the ESP, ESR and EPS procedures can be processed using the XML schema definitions generated by the CIM.

The results of the fourth test will be summarised in a final IOP report planned for release in February 2014.

MARKET TRANSPARENCY

Following publication of EU Regulation 543/2013 in June 2013 on the submission and publication of data in electricity markets, ENTSO-E has been formally mandated to develop and operate a new central Information Transparency Platform as well as a Manual of Procedures providing the necessary technical information to primary data owners, data providers, TSOs and end users.

Throughout the year, a special ENTSO-E advisory group, consisting of generators, power exchanges, information providers and major wholesale consumers, engaged with stakeholders to develop the new information platform and held several public workshops to highlight the steps up to its launch.

The first draft manual of procedures was submitted to ACER in October, with a final version due to be published in early 2014. ENTSO-E's Electronic Data Interchange (EDI) and Market Information and Transparency (MIT) working groups and a dedicated project manager have contributed significantly to the project.

The manual of procedures provides further details of data required by the regulation and includes the format of standardised data submission and the procedure and format for data communication and exchange. Due to the significant increase in data required by the regulation, ENTSO-E's existing transparency platform, *www.entsoe.net*, in operation since 2006, is to be replaced.

Using the criteria set out in the manual, ENTSO-E has finalised specification of the first release of the new information platform. The first steps were realised at the end of 2013 to allow an initial 'cut over' to the new technology and web interface in January 2014. Testing of the additional data required from stakeholders will begin around mid-2014 with the aim of launching this on the platform by the end of the year.

The ENTSO-E activities will enable provision of the required market information for the future and further facilitate the development of efficient and competitive energy markets across Europe.

TSO COOPERATION

- CHANGING OPERATIONS
- THIRD PARTY INTERCONNECTIONS
- THE ELECTRONIC HIGHWAY
- ENTSO-E AWARENESS SYSTEM
- SYSTEM FREQUENCY CONTROL
- THE ENTSO-E ACADEMY

CHANGING OPERATIONS

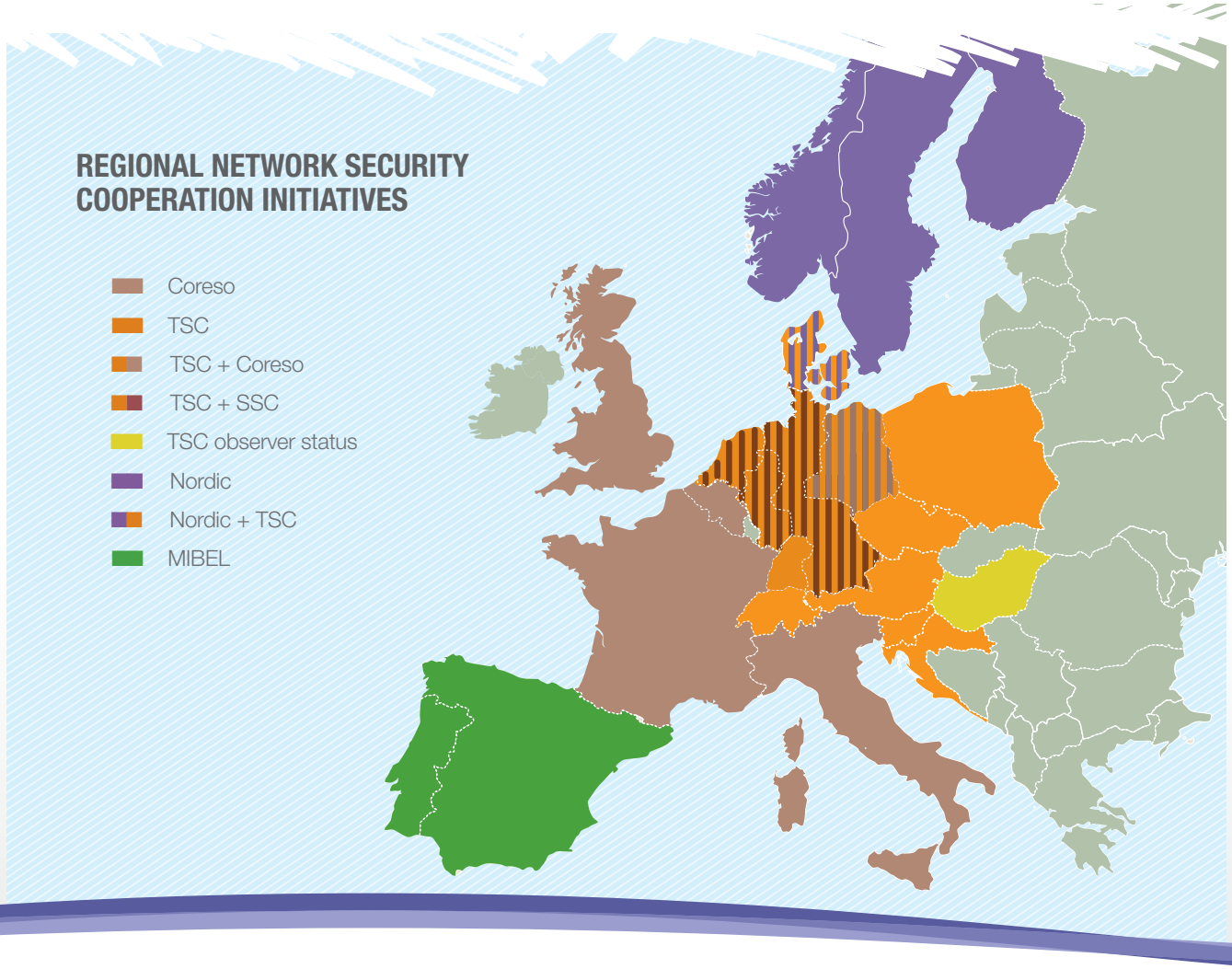
As consumers increasingly move to more sustainable energy use, changes in both the generation mix and technical energy demand are requiring significant modifications to established network operating practices. Greater cooperation among TSOs is helping them to meet these challenges and maintain the security and quality of supply that consumers currently enjoy and continue to expect.

TSO cooperation has been a reality for many years and forms the basis of most ENTSO-E activities. One of ENTSO-E's mandated tasks is to encourage its member TSOs to coordinate their efforts more effectively and to develop information networks and procedures that can help them achieve Europe's energy policy goals.

Nowhere is TSO cooperation more important than in ensuring the reliability of the European network and a number of important joint initiatives have been progressed in 2013 through various regional and synchronous area groups. The work of regional security coordination groups such as Coreso (Coordination of Electricity System Operators), SSC (Security Service Centre) and TSC (Transmission System Operator Security Cooperation), as well as initiatives through MIBEL (Mercado Ibérico de Energia Eléctrica) and Nordic organisations continue to improve the security of the overall network and maximise the transmission capacity available to market participants.

SYNCHRONOUS AREAS

Work has also continued on enhancing TSO cooperation across different synchronous areas. In addition to the creation of an ENTSO-E working group to share best practice across Europe, several projects have been set up to improve both the quality and security of the network supply.

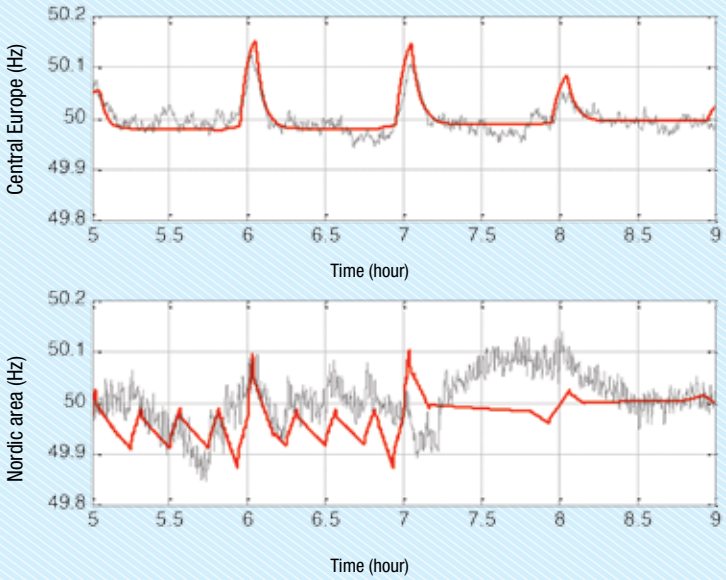


Pilot projects are currently in progress on HVDC links between the Nordic and Continental European areas and a further pilot between the Nordic and Baltic areas is expected in 2014.

A joint project by the Nordic and Continental European synchronous areas on system frequency is simulating the effect of different ramp rates (rate of change of interconnector power flows) when generating units are connected to the network. It is investigating whether ramping over a longer period of time provides a more stable frequency than that resulting from the very fast rates currently used.

It is believed that the fast rates cause increasing frequency deviations across synchronous areas, an important indicator of the operational quality and security of the network. The project will continue into 2014 when the effects of possible implementation will be analysed.

FREQUENCY DEVIATIONS WITH DIFFERENT RAMP RATES



Key: Actual frequency (black line); Simulation modelling (red line).

THIRD-PARTY INTERCONNECTIONS

System extensions involve the connection of external transmission networks to one of ENTSO-E's synchronous areas. The extensions are designed to bring benefits in terms of increased trading possibilities and lower costs for energy consumers through efficiencies in transmission, reserve power and system balancing.

As a synchronous area becomes larger, which can only be approved under the technical aspects of system stability and reliable synchronous operation, more reserve power is available to it and the safety of the overall system can be maintained at lower cost.

In this context, ENTSO-E's work on the inter-connections with the Turkish and Albanian power systems deserves comment.

TURKEY

After rigorous stand-alone operational tests, the Turkish system, operated by the TSO TEIAS, was synchronously connected to the Continental European area in September 2010. The date marked the beginning of a trial of parallel synchronous interconnection originally foreseen for a one-year period. However, due to technical problems within the Turkish network, the trial operation needed to be extended to achieve TEIAS' satisfactory compliance with Continental European operational rules.

By June 2011, limited commercial exchanges were successfully performed on the interconnection. Since then, the capacity available for trade on the interconnection has been gradually increased several times, always with the pre-condition of fulfilling some relevant technical requirements. The current values are 550 MW for imports to Turkey and 412 MW for exports from the Turkish system.

The next step will be 650 MW for imports and 500 MW for exports, again under the assumption that the technical requirements are met. It is anticipated that the decision on the permanent synchronous connection of the Turkish system to Continental Europe will be taken in 2014.

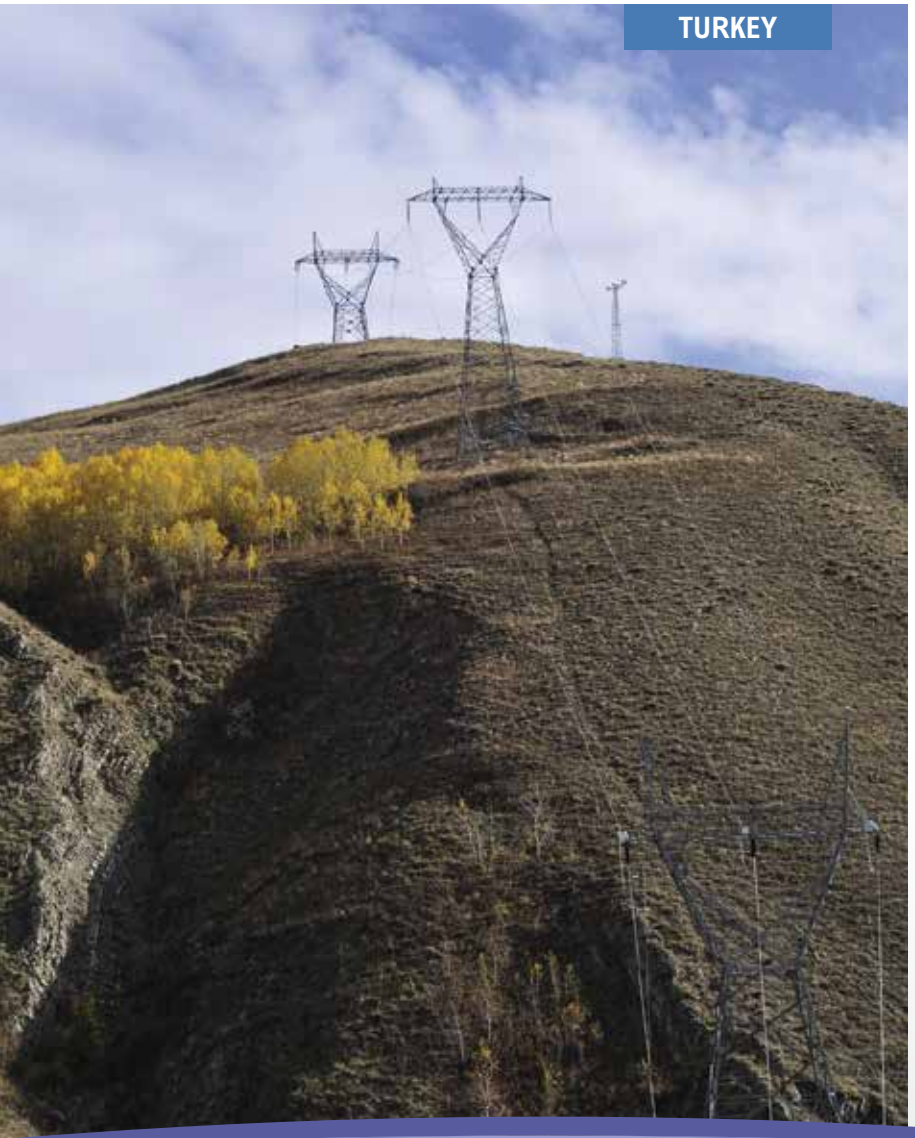
Low-frequency oscillations

In the early stages of the trial interconnection, the issue of low-frequency oscillations was a major concern. However the implementation of measures related to the damping of these (~0.15Hz frequency) was fully adequate to suppress them during normal operating conditions, as well as during disturbances.

Automatic generator control

Over the last three years, the TEIAS network's automatic generator control (AGC) performance has greatly improved. Several factors contributed to this: the AGC software was stabilised and fine-tuned; specific regulations provided incentives to generators to participate in secondary control; and a significant number of new units were placed under secondary control participation.

It should be noted that, during summer months of 2013 (a period characterised by high loads during which AGC performance deteriorated in 2012), area control error (ACE) statistics were maintained at excellent levels, well within set limits.



Major disturbances

The number of major disturbances that can lead to the separation of the Turkish system from Continental Europe has been reduced since the first stages of the trial operation. This is as a result of implementing improvements in overall system protection and strength.

There remain two critical areas within the Turkish system where, due to delays in transmission line construction, certain conditions can lead to the interruption of large amounts of generation and/or load. Since system enhancement may be delayed, the imminent solution has been the installation of local Special Protection Schemes (SPSs) to deal with the problem by local shedding of generation or load. TEIAS reported that these SPSs had been contracted and were operational by December 2013.

Irrigation in southeast Turkey

The irrigation load in the south east of Turkey is very high (more than 1500 MW) and this, compounded by limited coordination in the installation of distribution pumps, has resulted in significant voltage control problems.

In order to keep the voltage within technical limits, load is currently reduced by disconnecting pumps through their under-voltage protection controls. However, after a period of disconnection, the pumps then reconnect and the load increases again. Such load fluctuations cause instantaneous area control errors in the Turkish system and power flow deviations on cross-border lines to neighbouring countries in the Continental Europe region. Although improvements are visible (summer 2013 vs. summer 2012), not all the necessary control measures are yet in operation.

Secondary control performance

Secondary control plays a central role in eliminating system frequency deviations and in correcting errors in programmed power interchanges between different control areas. This issue concerns the absolute values of the area control error (ACE), which should be kept within the limits set (instantaneous values exceeding 175 MW to be kept at less than 11% of the total and those exceeding 100 MW at less than 33%). Impressive improvement has been achieved over the three years of tests.

TSO COOPERATION

ELIA (BELGIUM), NATIONAL GRID (UK),
RTE (FRANCE), TENNET TSO B.V. (NETHERLANDS)
LINK OWNERS: BRITNED, NGIC (IFA)

REDIRECTING POWER FLOWS OVER INTERCONNECTORS

Redirecting power flows over interconnectors (RFIs) is a TSO operational tool enabling the adjustment of HVDC interconnector power flows post gate closure without affecting commercial or market arrangements. It consists of modifying power flow on each of the two interconnectors by the same amount in opposite directions, so that the energy balance between each TSO is unchanged but the internal power flows are altered for the benefit of one or more parties.

Although in the early stages of agreement, a memorandum of understanding has recently been signed to develop the procedure and commercial arrangements for RFIs on the IFA and BritNed DC interconnectors linking the UK with France and the Netherlands. TSOs Elia, National Grid, RTE and TenneT and interconnector operators BritNed and NGIC (IFA) will be able to use the proposed service with the assistance of Coreso, the TSO Regional Coordination Service Centre, as facilitator.

The service will potentially provide a number of operational efficiencies, including procedures to recover and maintain network security under strained conditions, managing imbalance costs for the HVDC link owners in the event of interconnector failure, and helping to reduce system operations costs post gate closure.

RFIs may also offer an alternative to real time countertrading, which often turns out to be very expensive and sometimes impossible to execute. As they have no impact on the market and market-based power flows, RFIs will not negatively impact the HVDC link owners or the TSOs.

ALBANIA

The Albanian power system, operated by OST, has been synchronously interconnected to the Continental European synchronous area since 1986, therefore, it is not a real system extension.

However, OST was created in 2004 with the commitment to upgrade the system to join UCTE (ENTSO-E's predecessor organisation in Continental Europe). This required it to become compliant with Continental European operational standards and this process is treated in the same way as a new system extension.

To achieve this, a catalogue of measures was defined, which includes technical and other measures to improve system performance. During this process, the Albanian power system remained interconnected with the Continental Europe synchronous area.

The agreement with OST initially aimed at full compliance within two years, starting in May 2009. However, due to delays in the project implementation beyond OST's direct control, the period was extended to May 2014. In the meantime, the list of required measures was updated.

OST has made steady progress in implementing a variety of organisational and infrastructure projects (including new lines and upgrades) and at restructuring the sector and liberalising the Albanian electricity market (Albania is member of Energy Community). Practically all of the technical measures foreseen are now in place. If missing contractual measures are implemented as well, it is expected that the decision on permanent synchronous operation will be taken in 2014.

THE ELECTRONIC HIGHWAY

The electronic highway (EH) provides a highly secure, fast communication infrastructure for real-time data exchange between TSOs, as well as for less time-sensitive communications. It is a private network run by ENTSO-E member TSOs and monitored by two network operating centres. New TSO operating tools such as the ENTSO-E awareness system will increasingly depend upon it.

Currently 37 TSOs are connected to the electronic highway through 71 dedicated data lines. As a consequence of the platform's increasing use for the exchange of operating data and information such as schedules and market data, its line capacity is being enhanced from 2 to 10 Mbps. The majority of the lines are due to be upgraded by the end of 2013. In parallel with this activity, the ENTSO-E Electronic Highway working group continues to improve both the availability and the security of the information on the network. In this, it cooperates closely with ENTSO-E's Critical System Protection expert group on cyber security.

ENTSO-E AWARENESS SYSTEM

The ENTSO-E Awareness System (EAS) delivers a pan-European view of the network. Building on decades of TSO cooperation, it went live in April 2013. It covers Continental Europe, Scandinavia, the Baltic States, and the British Isles. It provides an essential collaborative tool for TSOs in 32 countries and increases European consumers' security of supply.

A main priority for TSOs is to ensure that European consumers stay seamlessly connected to the network during extreme peaks in weather or during system failures.

When a disturbance occurs in a particular country, TSOs coordinate their responses to restore the system to a normal operating state. To do this rapidly and efficiently, they need a real-time view of the energy flows and state of the network across the whole of Europe.

The EAS allows them to monitor this information in real time and react quickly with appropriate measures. Almost all TSOs in the main synchronous areas are now using the system, with the remaining few in the process of becoming connected. These connections should be completed in early 2014.

By displaying system frequency, operational state, generation, consumption, inter-TSO transfers and area control errors, the EAS is an essential tool in ensuring the quality of the overall network. It has already highlighted incidents in all the synchronous areas.

TSO COOPERATION

50HERTZ, AMPRION (GERMANY), APG (AUSTRIA), ČEPS (CZECH REPUBLIC), ELES (SLOVENIA), ENERGINET.DK (DENMARK), HOPS (CROATIA), PSE (POLAND), SWISSGRID (SWITZERLAND), TENNET TSO GMBH (GERMANY), TENNET TSO B.V. (NETHERLANDS), TRANSNETBW (GERMANY). OBSERVER: MAVIR (HUNGARY).

The official inauguration of the TSC TSO joint office took place in October 2013.

JOINT OFFICE FOR TSC TSOS

TSOs from TSC (Transmission System Operator Security Cooperation) launched a joint office in Munich, Germany, in July 2013 to further facilitate their cooperation in assessing network security and capacity in the face of the increasing challenges posed by RES integration, delayed grid development and more cross-zonal electricity trades.

While the responsibility for grid operational planning and the secure day-to-day operation of the grid remains with individual TSOs, some 15 experts at the joint office currently take care of data quality and are deeply involved in the ongoing development of operational procedures to improve the security of the overall network. As well as managing data quality and maintaining the stable operation of TSO IT tools, they provide input for the development of new processes for 24/7 operational planning and security analysis.

Forecast data from 26 control areas - not only from the 10 countries represented by the TSC TSOs, but also from other countries in the Continental Europe synchronous area - are automatically quality checked and merged to a common grid model for the whole area. Individual TSOs then receive the results of the quality checks, correct and improve their own data sets, analyse contingencies and coordinate the results and necessary remedial actions through secure video conference calls. The processes serve both the day-ahead and the rolling 24 hour intraday operational planning horizons.

Since February 2013, the TSOs have successfully undertaken a trial 24/7 process, including an hourly contingency analysis and an intraday congestion forecast. As circumstances require, additional video conference calls are held to coordinate any action.

The joint office offers the TSOs a modern, inspiring environment to share experience, cooperate even more closely together and further improve the processes and tools to ensure grid security. Workshops and multinational project teams also facilitate the development of new areas of cooperation.

SYSTEM FREQUENCY CONTROL

For several years the quality of system frequency within the Continental European area has slowly decreased, with the number, duration and amplitude of frequency deviations growing each year. As the nominal 50 Hz frequency reflects the balance between electricity production and consumption at any given time, it provides an important indicator of the operational quality of the network.

TSOs use frequency control schemes to match generation, demand and energy flows within the network and maintain a stable system frequency. ENTSO-E's Continental Europe System Frequency working group was, therefore, set up to assist in this process and halt the ongoing decline in frequency quality.

Its 2012 Frequency Control report set out the commonly agreed causes for the decline and proposals for short, medium and long-term measures to resolve it. In parallel, the group sought the opinion of all ENTSO-E TSOs and, since autumn 2012, has been reviewing each of the 20 measures proposed.

Some short-term measures have already been implemented. These include improved TSO reporting of large deviations, an upgraded Load-Frequency Control (LFC) quarterly report, and the development of a coordinated procedure for restoring frequency after a large permanent excursion. Others, in addition to the ENTSO-E Awareness System, are close to implementation.

Activities involving other market participants or requiring important changes in market rules are discussed with stakeholders before a work programme is prepared to further explore them. The group is currently working on the financial settlement of inadvertent power exchanges and the influence of better network observation of generation output and demand, as well as of the spread of dispersed integrated gasification combined cycle (IGCC) generation units.

INADEQUATE PROTECTION SETTINGS

Many dispersed generation units in Europe are installed with frequency protection settings to automatically disconnect from the grid that are not in line with the standard 47.5 - 51.5 Hz limits used by the network. If large frequency deviations occur, these can trigger a massive loss of power and thus jeopardise the security of the network.

In 2013, ENTSO-E carried out a simulated study on the impact of dispersed generation units on the security of the Continental Europe synchronous area. The results show that, after a large generation loss, the frequency decreases below 49.8 Hz.

When dispersed generation units are producing maximum power and on-going retrofit programmes have not been completed, disconnection settings of units in the range of 49.0 - 49.8 Hz might be triggered successively, as the power deficit and frequency gradient is increasing after each disconnection threshold. Large amounts of load shedding will be triggered below 49 Hz and the prevention of system collapse is not ensured.

Simulations demonstrate that retrofit programmes in Germany and Italy reduce the need for load shedding. But even after completion of the German and Italian programmes, the probability of load shedding being triggered remains significant. Retrofit programmes in other countries are needed to avoid the threshold being reached.

ENTSO-E regularly collects data on the frequency disconnection settings of dispersed generation equipment in the Continental European area in order to update the study. The objective is also to determine the amount of dispersed generation that can be used without retrofitting - mostly the smallest units. All other units will need to be retrofitted, which involves an assessment of the technical solutions and costs and the initiation of a suitable programme in all the countries affected. Ideally, such a programme should optimise retrofitting for the whole Continental Europe area.

The inventory of dispersed generation frequency settings and technical characteristics also needs to cover units currently under construction as well as future installations, so that a clear view can be achieved. Coordinated action by TSOs, DSOs, regulators, political authorities and stakeholders is necessary to undertake this task in a way that delivers meaningful and sustainable results.

THE ENTSO-E ACADEMY

The ENTSO-E Academy is an educational institution helping TSOs expand their knowledge and providing training support. Its activities include workshops and seminars, as well as the organisation and supply of training materials on specific topics related to operating the interconnected network.

The Academy started operations in 2012 and is an ENTSO-E working group run by its System Operations Committee and member TSOs. Its aim is to share experience and best practice among TSOs and other system operators, promoting mutual support for common training and technical solutions, the exchange of information on grid disturbances, and networking opportunities for system operations trainers.

The Academy organised six workshops during 2013. Two were on system operations training issues - "Operator/Dispatcher Training Simulators" and "Sharing Trainers' Experience". The third was a common training course on the ENTSO-E Awareness System (EAS).

The Academy's "Grid Congestion Management" workshop in June covered several aspects of this important topic, including phase-shifting transformers and the international coordination of current redispatch measures. Its workshop on "HVDC links" in September featured presentations on different HVDC technologies, as well as on the challenges and opportunities for a European grid with an increasing number of these links.

In December, the Academy held its final workshop of the year on "Network codes and their influence on grid operation". This gave an overview of the structure, content and key issues covered by ENTSO-E's system operations network codes and discussed the challenge of their implementation and their influence on grid operation.

In cooperation with the relevant ENTSO-E committees, the Academy intends to expand its activities in future to cover market and system development topics. This is considered an important step towards a global approach to TSO knowledge management and training support.

RESEARCH & DEVELOPMENT

- ENTSO-E R&D ROADMAP
- SET PLAN INTEGRATED ROADMAP
- ENTSO-E R&D PROJECT PROGRESS
- R&D IMPLEMENTATION PLAN 2015-2017
- KEY PERFORMANCE INDICATORS
- REGULATORY FRAMEWORK FOR TSO R&D
- STANDARDISATION

ENTSO-E R&D ROADMAP

By promoting the scaling-up and replication of best practice in network planning and operations, TSO Research & Development is the key to the creation of an efficient and sustainable energy market in Europe. A coordinated R&D effort by European TSOs will facilitate the deployment of new technologies, while keeping their network capital and operating expenditures under control.

Europe's energy and climate change objectives are leading to major structural changes in the electricity sector. Dispersed sources of intermittent generation such as RES require a more robust energy network to accommodate more frequent, large cross-border exchanges of electricity and investment in new expertise and innovation in transmission technology.

R&D plays a crucial role in Europe's ability to meet its low-carbon objectives and EU Regulation (EC) 714/2009 and Directive EC/72/09 charge ENTSO-E with promoting and coordinating TSOs' R&D activities in this respect.

The ENTSO-E R&D Roadmap 2013-2022 provides ENTSO-E's vision of the R&D projects that need to be carried out by TSOs to meet the EU objectives. It is supported by the annual ENTSO-E R&D Implementation Plan, which serves as the backdrop for developing calls for proposals under the European Energy Research and Innovation (EERI) Programme. The Roadmap also provides input for initiatives by the European Commission, the European Electricity Grid Initiative (EEGI), technology providers and other stakeholders.

The EEGI also publishes an R&D Roadmap which covers both transmission and distribution systems. ENTSO-E actively contributes to this, ensuring that core TSO R&D activities and functional objectives are defined in a consistent way. The EEGI Roadmap complements the ENTSO-E Roadmap with a detailed account of R&D at DSO level.

SET PLAN INTEGRATED R&D ROADMAP

Through its work on the ENTSO-E and EEGI Roadmaps, ENTSO-E is actively involved in the EC's process to prepare the Integrated European R&D Roadmap. This will cover the whole energy value chain within the Horizon 2020 European Research & Innovation (R&I) framework programme.

The EC launched the preparation of its Integrated R&D Roadmap in the latter part of 2013 under the guidance of the Strategic Energy Technology (SET) Plan Steering Group.

The roadmap consolidates the SET Plan's different technology roadmaps and covers the entire R&I chain from basic research to demonstration and support for market rollout. It also identifies clear roles for various stakeholders including the European Energy Research Alliance (EERA), the European Industrial Initiatives (EIIs) and the European Institute of Innovation and Technology (EIT), as well as for relevant European public-private partnerships and other groups such as universities, investors and financiers.

The integrated roadmap sets out the key R&I activities to be undertaken over the next six years and forms the basis for EU, national and joint Member State R&I. It can also act as the basis for private investments in energy research and innovation.

Drafting of the roadmap has been steered by the EC, with the Joint Research Centre's Strategic Energy Technology Information System (JRC/SETIS) in charge of its operational and scientific management. Member States have been involved through the SET Plan steering group and their voluntary participation in various expert groups.

ENTSO-E's contribution, based upon its R&D roadmap and its cooperation with the EEGI, was considered highly relevant in ensuring that the R&I tasks in the integrated roadmap are detailed in a coherent and harmonised way.

ENTSO-E R&D PROJECT PROGRESS

Progress in TSO R&D activities during 2013 at European, national and operator levels has been encouraging. Although R&D is still relatively new for many TSOs and resources are limited, comparisons with ENTSO-E's 2012 R&D Monitoring Report point to many examples where significant advances have been made in reaching the objectives of the ENTSO-E R&D Roadmap. Identification of gaps in R&D has allowed corrective measures to be applied and priorities assigned in the R&D Implementation Plan 2015-2017.

ENTSO-E remains optimistic that the goals set out in its R&D Roadmap 2013-2022 will be achieved. An immense effort will be required, however, with respect to finance, timing, dedication and resources. Of the 38 R&D projects considered for inclusion in this report, those which are most relevant to TSOs and have been, or are being, carried out within Europe have been selected. All the projects considered have been funded through the EU, Member States or TSOs.

Top achievements in 2013 include the funding and start-up of three major new projects (Best Paths, Garpur and InspireGrid) and the successful completion of four others (Twenties, Safewind, Pegase, and Optimate). Further information on these projects can be found in the ENTSO-E R&D Monitoring Report 2013.

Results from the Twenties project have demonstrated that Europe's network infrastructure can be used much more efficiently, as far as wind power is concerned. By combining the effects of dynamic line rating and power flow controllers, more wind infeed can be integrated into the grid and local congestion alleviated in a flexible way.

Leading-edge research into 'high wind ride-through control' (Safewind) and short-term forecasting of wind power has also been successfully tested. In addition, the Twenties project successfully tested a prototype DC circuit breaker, establishing confidence in the future outcome of the Best Paths project.

Within Pegase, powerful new algorithms and full-scale prototypes have been developed which can run on the European transmission network model

for estimations of the network state, dynamic security analyses, optimisations and real-time dispatcher training.

Under Optimate, an open platform has been developed that simulates a wide range of market designs and compares economic efficiency with massive intermittent generation capacity. The assessment demonstrates the benefits by type of TSO portfolio, as well as the costs, benefits, environmental impact and security of supply for the entire European power system.

R&D PRIORITIES

Four areas require priority R&D attention. They encompass asset management, the integration of novel power technologies, market design and the improved coordination of boundary grids:

- Asset management: the realisation of robust, long-life infrastructure that effectively utilises capital assets to overcome uncertainties on component life with renewable infeeds.
- Integration of novel technologies: the provision of continuous technological solutions to meet increasing demands for transmission capacity and flexibility, and to accelerate their deployment.
- Market design: new market mechanisms for balancing, ancillary services, and aggregator agents at a European level to support security of supply and fair trading.
- Improved coordination of boundary grids: the emergence of ancillary TSO services, such as aggregated small-energy sources, demand response and grid management at DSO level, will be the starting point of a chain of joint R&I activities required to improve cooperation between networks and to define a new, active role for consumers.

ENTSO-E R&D IMPLEMENTATION PLAN

During 2013, ENTSO-E has undertaken substantial work on its R&D Implementation Plan 2015-2017. This second issue of the Implementation Plan builds on progress in achieving the objectives of the ENTSO-E R&D Roadmap and on new or updated inputs from TSOs and other stakeholders.

The plan combines both top-down and bottom-up approaches in that it meets the requirements of the R&D Roadmap and also reflects the upcoming needs and priorities of TSOs and other stakeholders. Its new rolling timespan aims to establish a continuous learning process. Hence, while some projects are already at execution stage, new topics can be identified and initiated to tackle upcoming challenges to European energy policy targets.

Manpower and financing remain major constraints. Although the issue of incentives for TSO R&D and the recovery of its associated costs is widely recognised, it has not been solved.

NOVEL TECHNOLOGICAL SOLUTIONS

The paradigm shift in electricity systems worldwide is particularly evident in Europe. With its high energy demand and political desire to counteract climate change, Europe urgently needs technological and engineering solutions to these new problems. It is essential to explore all innovative technologies that can benefit Europe's industry and its citizens.

The European electricity network will play a central role, first by optimising the use of its existing assets and then by creating a European super-grid to handle bulk exchanges of energy in pan-European and, possibly, intercontinental energy markets.

This will require the integration of novel technologies such as HVDC, superconducting and extra high-voltage systems, as well as carefully redesigned market mechanisms.

TSO COOPERATION

REE (SPAIN), RTE (FRANCE), ENERGINET.DK (DENMARK), ELIA (BELGIUM), TENNET TSO B.V. (NETHERLANDS), 50HZ (GERMANY)

THE TWENTIES PROJECT

The aim of the Twenties project, led by Spanish TSO REE, was to advance the development and deployment of new technologies to facilitate the widespread integration of onshore and offshore wind power into the European network by 2020 and beyond.

With a total budget of more than €56.8 million, including an EU financial contribution of close to €32 million, the project was undertaken by a consortium of 26 electricity companies and institutions from 11 countries.

The project was organised around six large-scale demonstrations within three task forces - The contribution of variable generation and flexible load to network services, Reliable offshore network and wind development, and Improvements to the flexibility of the transmission grid.

Three work packages complemented the demonstrations. The first concentrated on assessing and overcoming non-technological barriers to the development of a real offshore grid, while the other two focused on the replicability and scalability of the results EU-wide, based on their individual impact and potential synergies.

The main findings demonstrate that Europe's existing network infrastructure can integrate far more variable energy than at present. Among the most outstanding outcomes were:

- Wind farms can provide wide area voltage and secondary frequency control services to the network.
- Virtual power plants enable the reliable delivery of ancillary services such as voltage control and reserves through intelligent control of distributed energy resources, including wind and industrial and other forms of energy consumption.
- A prototype high voltage DC circuit breaker operated successfully and local controls were designed to enable various DC grids to accommodate wind power transmission and a large range of network contingencies.
- Reserve requirements can be halved and risks of system instability and blackouts significantly reduced by applying smart 'high wind ride-through control' at mill level and by balancing wind power variations with other energy sources such as hydropower.
- A combination of dynamic line rating, measuring additional transmission capacity, and flow control devices enables more wind in-feed to be integrated into the grid without jeopardising system security. Use of dynamic line rating to measure and forecast line capacity allows, without significant investment, an average of 10% more power to flow through existing overhead lines in day-ahead operation planning and more than 15% in close to real-time operation.
- A Power Flow Controller device based on mechanically switched series reactors has been designed, installed and validated. Smart control active equipment (phase shifting transformers, HVDC links and FACTS) alleviates grid congestion, providing even more grid flexibility.
- Harmonising environmental impact assessment (EIA) practices, studies and documentation and timely explanation of the necessity of offshore interconnectors in combination with offshore grid development are key elements for the smooth development of new interconnectors.

A key factor in the success of the project was the environment of collaboration and commitment among the TSOs. In addition, the active involvement of a number of TSOs who were not members of the consortium in the EU-wide impact assessment added significant value to the project outcome.

KEY PERFORMANCE INDICATORS

ENTSO-E has developed a set of key performance indicators (KPIs) tailored to the management of its R&D Roadmap. They emphasise the enabling role of the integrated network in achieving the European policy goals of a sustainable network, a competitive energy market and security of supply.

The ENTSO-E KPIs complement existing KPIs developed by other initiatives under the SET Plan and provide a methodological guide to the latter's definition and use in relation to the R&D projects in the ENTSO-E R&D Roadmap.

The roadmap's overall objective was to allow European electricity networks to continuously deliver effective, flexible capacity and to integrate the actions of grid users at an affordable cost. This goal translates into two overall KPIs - increased system flexibility at affordable cost and increased network capacity at affordable cost.

They are supported by six further KPIs used to monitor the contribution of each project in the R&D Roadmap in achieving one or more of the specific objectives:

- → Increased RES hosting capacity
- → Reduced energy curtailment with RES
- → Power quality and quality of supply
- → Extended asset life time
- → Increased flexibility from energy players
- → Improved competitiveness of the electricity market.

The KPIs will be used to monitor the progress of the aggregated results of European and national R&I projects in achieving the roadmap's goals. They will also provide valuable insight into the objectives to be addressed by future projects. Additionally, they may provide a useful tool for project coordinators to assess the contribution of their own R&D projects in meeting the roadmap's objectives.

REGULATORY FRAMEWORK FOR TSO R&D

The existence of a suitable regulatory framework to encourage effective TSO R&D is a key factor in reaching the objectives of the SET Integrated Roadmap, as well as those of the ENTSO-E and EEGI Roadmaps and Implementation Plans.

Following the recommendations of the THOR study by the independent Sumicsid consultancy on the "Regulatory Funding of Transmission System Research and Development in ENTSO-E Countries" and ACER's positive opinion on the ENTSO-E R&D Roadmap, ENTSO-E has started discussions on suitable funding mechanisms with the Council of European Regulators (CEER) and national regulatory authorities.

The objective of the THOR study was to provide a rationale for TSO involvement in R&D activities, clarify the added-value for market participants and stakeholders, and propose solutions that meet regulatory concerns and are effective in delivering the new technologies and operational practices needed by the European power sector by 2020.

The Third Energy Package explicitly tasks TSOs with the R&D necessary for the innovation of their

activities and, at the same time, tasks National Regulatory Authorities to support this R&D by defining appropriate incentives to grid operators via the tariff.

Regulatory policies were generally not designed with grid modernisation in mind and an unintended side effect of deregulation has been a significant reduction in investment in network R&D. Deploying modern grid technologies is costly and, without suitable incentives, TSOs are reluctant to invest in them.

Legislators and regulators should, therefore, take a strong leadership role in support of grid modernisation and define appropriate regulatory policies to support effective TSO R&D programmes.

Furthermore, inconsistent national policies also present barriers to R&D support at European level, so it is necessary to promote harmonised policies among EU Member States.

STANDARDISATION

Close involvement in standardisation activities has significant relevance for TSOs, such as in bridging the gaps between existing standards and the requirements of the network codes and smart grids. ENTSO-E set up its Standardisation working group in 2013 so member TSOs can mutually benefit from participation in the different standardisation bodies.

The working group plays an important role in the coordination and monitoring of standardisation activities affecting TSOs, the identification of gaps in standards supporting ENTSO-E products, and in recommending the standards that TSOs should closely follow.

Although individual TSOs are currently involved in the activities of the main technical committees of bodies such as CEN/CENELEC and the IEC, greater coordination of these activities at ENTSO-E level can build on the synergy of their common interests and optimise resources.

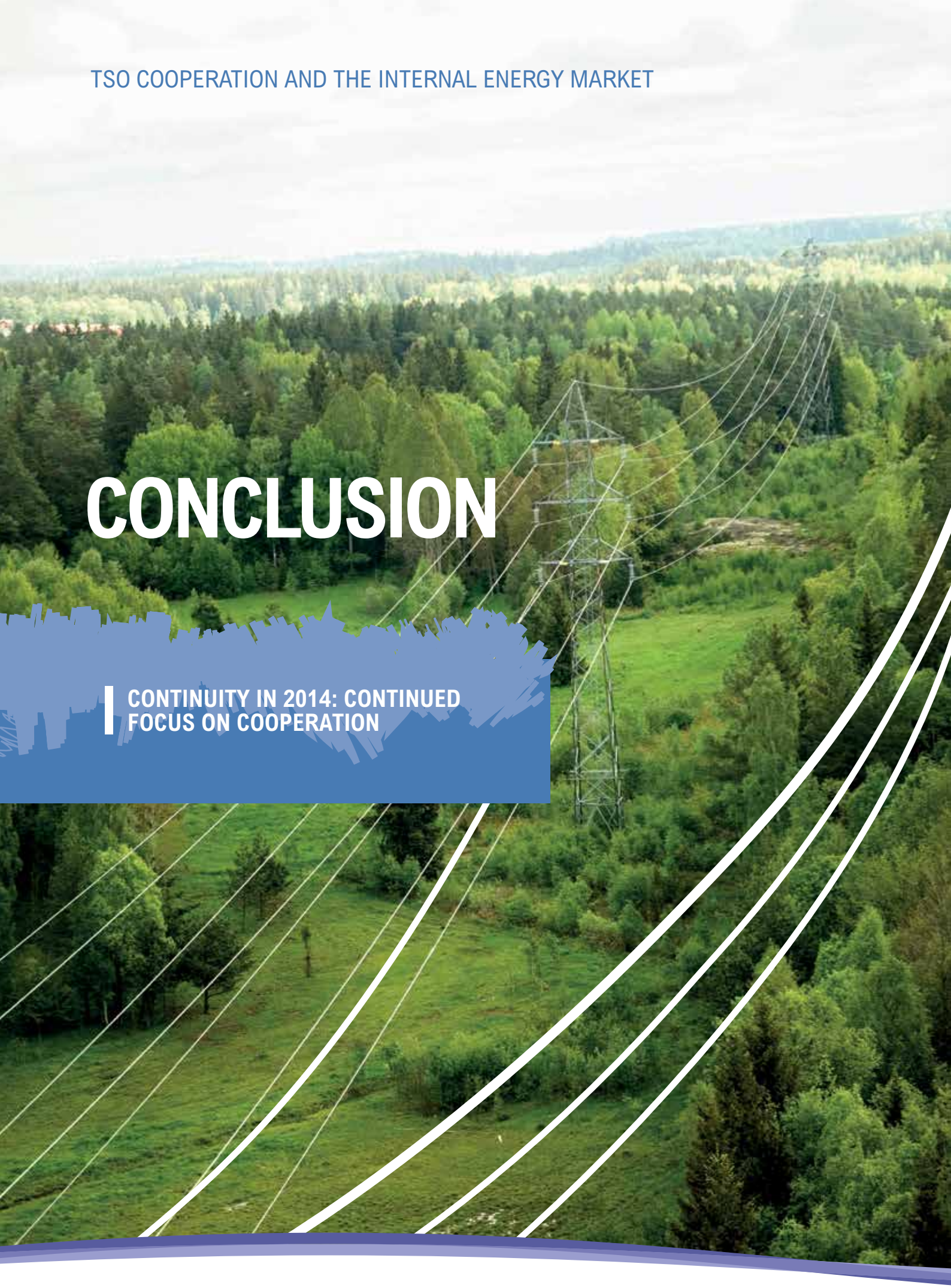
TSO DATA EXCHANGE

ENTSO-E has now approved the Common Grid Model Exchange Standard (CGMES). The CGMES is a superset of the IEC's CIM (Common Information Model) standard and was developed to meet the requirements for TSO data exchange in the areas of system development and system operations, particularly with regard to the TYNDP and the network codes.

The latest version of the CGMES was tested in July 2013 as part of the fourth CIM interoperability test on power system model data exchanges.

CGMES will be the baseline standard for the CIM methodologies required for implementation of various network codes. It will be applied in tools dealing with power system data management, as well as in those supporting network analysis. These include load flow and contingency analyses, short circuit calculations, market information and transparency, calculations for capacity allocation and congestion management, and dynamic network security assessment.

The conformity of the tools with CGMES, as well as their interoperability with other tools used in system operations and development information exchanges, will be tested via a conformity assessment process defined by ENTSO-E. This will ensure that vendors of tools used by TSOs properly implement the standard.



CONCLUSION

CONTINUITY IN 2014: CONTINUED FOCUS ON COOPERATION

CONTINUITY IN 2014: CONTINUED FOCUS ON COOPERATION

The review of activities highlights the progress made by ENTSO-E and its member TSOs in 2013 in assisting the EU to realise its energy policy objectives and to facilitate the internal energy market (IEM). It underscores the significance of TSO cooperation in meeting the goals, to the benefit of energy consumers throughout Europe. This cooperation is likely to intensify in 2014.

Last year's annual report focused on the challenges faced by ENTSO-E and its member TSOs in decarbonising the European energy system and in integrating increasing amounts of intermittent RES energy. Substantial progress has been made in overcoming these challenges in 2013 and much of this work will continue over the coming year.

Ensuring that the strategic infrastructure is built in a timely, cost effective manner to support a sustainable and competitive IEM remains a concern. Completing some 52,300 km of transmission lines required, more than 80% of which are linked to RES integration, is a significant undertaking in the light of public acceptance, regulatory and financial issues.

Any increase in the transparency of projects of European significance is beneficial to all stakeholders, and particularly to national and European regulatory and political bodies, so they recognise the impact of delays. In 2014, ENTSO-E looks forward to national and European authorities implementing the provisions of Regulation (EU) 347/2013 with regard to permitting in the most pragmatic way, so that projects remain on track.

NETWORK PLANNING

Progress on the IEM has so far been underpinned by the policy framework provided by the EU's 2020 objectives. During 2014, the EU institutions will develop proposals for a policy framework up to 2030. ENTSO-E would very much appreciate a stable framework including clear climate and energy targets that are aligned between Member States and the EU institutions.

ENTSO-E will publish its TYNDP 2014-2024 towards the end of the year. Development of the TYNDP is currently underway, with pan-European market studies being prepared based on the four ENTSO-E scenarios of the future of the network.

The new Regulation (EU) 347/2013 has expanded the scope of ENTSO-E's TYNDP to include projects from third-party promoters. Furthermore, it establishes the ENTSO-E TYNDP as the unique basis for the future selection of European projects of common Interest (PCIs). The regulation also requires ENTSO-E to publish harmonised Europe-wide cost-benefit analysis (CBA) methodology to assess projects for the TYNDP. Assessment using the new CBA methodology has already begun and will continue during 2014.

Ensuring the effective engagement of stakeholders in advance of the TYNDP 2014's publication will be a priority for ENTSO-E in order to ensure that they clearly understand its methodology, outcomes and impact. ENTSO-E and ENTSOG will continue working in partnership to increase the consistency of their TYNDPs, as required by

the regulation, and to deliver common gas and electricity network models later in the year.

NETWORK CODES

Practical TSO cooperation has been most evident in the development of the network codes. In 2013, ENTSO-E submitted six codes to ACER, so eight of the main codes have now been developed.

Initial work started on a tenth code - Emergency Procedures & Restoration (NC ER) - with official drafting expected to begin early in 2014. ENTSO-E may also be requested to start work on additional codes later in the year, although this will be driven by the European Commission's priority list and the work of ACER and the European regulators.

The network code Comitology process began in earnest in 2013 and many of the codes are expected to be adopted into EU law in 2014. While their adoption has been slower than ENTSO-E originally anticipated, planning for their implementation will be expanded over the coming year. Successful implementation of the codes throughout the European network will require further close cooperation between TSOs and the rest of the industry.

MARKET INTEGRATION

Work on the integration of Europe's regional electricity markets has advanced. Regulation (EU) 543/2013 now formalises ENTSO-E's role in this process, mandating it to develop and operate a central information transparency platform and a manual of procedures. The first steps towards the new platform were realised at the end of 2013, with its full implementation targeted for the end of 2014.

2014 will also see the realisation of important regional steps towards a fully integrated European market. ENTSO-E will continue to coordinate the different initiatives to pave the way for a Europe-wide roll-out consistent with the CACM network code. The "go live" of the North West Europe (NWE) price coupling project, the pilot for day-ahead market coupling, has already been accomplished in February 2014. Progress will also continue on market coupling initiatives in other regions.

OPERATIONAL COOPERATION

A continued focus of ENTSO-E's work in 2014 will be close TSO cooperation in system operations. The roll-out of the ENTSO-E Awareness System (EAS) will increase individual operators' awareness of the status of the European grid in real time. It will complement on-going TSO regional security coordination initiatives through organisations such as Coreso, SSC and TSC.

RESEARCH & DEVELOPMENT

Finally, there has been encouraging progress over the year on TSO R&D at European, national and operator level, with the funding and start-up of a number of major new research projects and the completion of others. Significant advances are being made in reaching the objectives of the ENTSO-E R&D Roadmap. With the continued cooperation of TSOs, this progress looks set to continue during 2014.

The following pages of the report show the detailed status of ENTSO-E activities against its 2013 work program, in line with the requirements of Regulation (EC) 714/2009. They also include an overview of ENTSO-E's member TSOs, its organisational structure, and the publications, position papers, workshops, consultations and public announcements distributed or held by ENTSO-E in 2013.

APPENDICES

ENTSO-E WORK PROGRAM STATUS - END 2013

Deliverable	Goal	Status - end 2012
Progressing and delivering network codes - Connection		
Network code on Requirements for Generators (NC RfG)	Deliver to ACER draft binding EU legislation for generation connection to underpin system development fit for the future Support ACER Opinion and Comitology phases	Being delivered to ACER
Network code on DSO and Industrial Load Connection (NC DCC)	Deliver to ACER draft binding EU legislation for demand connection to underpin system development fit for the future Support ACER Opinion and Comitology phases	Entering into public consultation
Network code on HVDC Connections (NC HVDC)	Deliver to ACER draft binding EU legislation for HVDC connections to underpin system development fit for the future	Setting up drafting team
Progressing and delivering network codes - Market		
Network code on Capacity Allocation and Congestion Management (NC CACM)	Deliver to ACER draft binding EU legislation for market integration, especially allocating capacity in the day-ahead and intra-day timeframe, for calculating the levels of available cross border capacity, and for allocating and recovering costs Support ACER Opinion and Comitology phases	Analysis of stakeholder comments from public consultation
Network code on Forward Markets (NC FCA)	Deliver to ACER draft binding EU legislation for forward market integration	Scoping, internal approval of key issues
Network code on Balancing (NC EB)	Deliver to ACER draft binding EU legislation for market integration and system security, especially the cross border exchange of reserves and balancing energy	Commenting on ACER draft framework guideline
Progressing and delivering network codes - System Operations		
Network code on Operational Security (NC OS)	Deliver to ACER draft binding EU legislation for operational security based on TSO coordination Support ACER Opinion and Comitology phases	Continued drafting; stakeholder interactions
Network code on Operational Planning and Scheduling (NC OPS)	Deliver to ACER draft binding EU legislation for operational planning and scheduling based on TSO coordination Support ACER Opinion and Comitology phases	Continued drafting; stakeholder interactions
Network code on Load-Frequency Control and Reserves (NC LFCR)	Deliver to ACER draft binding EU legislation for the definition and dimensioning of reserves and for load- frequency control, based on TSO coordination and the requirements for generators Support ACER Opinion and Comitology phases	1st working draft under preparation; beginning stakeholder interactions
Consultation tool improvements	Enhance the ENTSO-E consultation tool	Proposed enhanced specifications at preliminary stage

Deliverable & AWP 2013 completion (quarter/year)	Internal & external consultation	Status - end 2013 Comments/explanations
Q2/2012 Amendments following ACER Opinion in Q1/2013 Comitology expected to conclude in 2014	Written consultation in Q1/2012 - continuous consultation mainly via User Group	Network code prepared by EC for formal Comitology
Q1/2013 Comitology expected to conclude in 2014	Written consultation in Q3/2012 - continuous consultation mainly via User Group and DSO Expert Group	Network code prepared by EC for formal Comitology
Formal EC mandate received in April 2013, requesting final code by 01/05/2014	Written consultation in Q4/2013 - continuous consultation mainly via User Group	Draft network code in written consultation
End Q3/2012 2013	Q1-Q2/2012	
NC FCA is submitted to ACER Q3 2013	Written public consultation in Q1/Q2 2013 Additional consultation via Stakeholder Advisory Group Q1-Q3 2013 Trilateral (ACER/EC) Q4 2013	ACER opinion received in Q4 2013
Q4/2013	Q2/2013	
Q1/2013 2013-14	Q3-Q4/ 2012	Submitted to ACER end of Q3 2013 ACER reasoned opinion for adoption by EC issued in Q4 2013 Awaiting Comitology
Q2/2013 2013-14	Q4/2012	Submitted to ACER end of Q3 2013 ACER Reasoned opinion for adoption by EC issued in Q4 2013 Awaiting Comitology
Q3/2013 2014	Q1/2013	Submitted to ACER Q3 2013 ACER reasoned opinion for adoption by EC issued Q4 2013 Awaiting Comitology
Q2/2013		

ENTSO-E WORK PROGRAM STATUS - END 2013

Deliverable	Goal	Status - end 2012
Planning & delivering Europe's future energy networks - Ten-Year Network Development Plan (TYNDP), system adequacy reports		
Adequacy reports	Build scenarios for the TYNDP 2014 and deliver the Scenario Outlook & System Adequacy Forecast 2013 Winter Outlook 2012/2013/Summer Review Summer Outlook 2013/Winter Review Winter Outlook 2013/2014/Summer Review	Continued discussions on scenarios, stakeholder interactions not yet started
TYNDP 2014	Prepare the 2014 TYNDP with common market and network models to derive the trends, needs and future development of the transmission network at pan-European level	Preparation of methodologies, CBA projects assessment and stakeholder interactions
Cost-benefit analysis in the context of energy infrastructure legislation	Deliver methodologies for cost-benefit analyses of transmission infrastructure (TYNDP; Projects of Common Interest) for a pragmatic and comprehensive approach to drive policy, incentives and investment decisions	Ongoing
Planning & delivering Europe's future energy networks - public acceptance for power infrastructure, financing		
Contributions to the infrastructure regulation	Contribute expertise on permitting, financing and transmission investment evaluations to the draft Regulation; potential development of a guideline on investment incentive schemes and on cross-border trade	Legislative discussions; scoping with ACER on investment incentives
Public awareness campaign coordinated between EC, ENTSO-E and TSOs	Definition, proposal and launch of a campaign, aimed at EU citizens, that reconnects people with electricity and how it is delivered to their community, so they recognise the need for power infrastructure to maintain or enhance living standards	Scoping, interaction with EC and selected stakeholders
Permitting and public acceptance of best practice	Collection and consolidation of best practice on activities related to permitting and public acceptance processes. This work will be informed by other activities undertaken by TSOs in various external relationships as well as stakeholder input within the Long-Term Network Development Stakeholder Group	Yet to commence
Implementing and enhancing the internal electricity market		
Electricity Market Fundamental Information Platform (EMFIP)	Implementing EC Guidelines on Fundamental Data Transparency in an integrated IT system for all of Europe	Tendering for IT vendor selection
Support and pan-European guidance for regional market integration developments	Ensure that regional developments continue to develop in a manner consistent with the overall EU Target Model. Establish a coherent vision for market integration	Regional market development discussions are well underway with different regions at various stages of cooperation and development
Shaping discussions around the optimal design for the European electricity market	Proactively considering issues around market design and the creation and promotion of an effectively competitive market. This will include issues such as remunerating capacity	Discussions with stakeholders have been underway for some time

Deliverable & AWP 2013 completion (quarter/year)	Internal & external consultation	Status - end 2013 Comments/explanations
Q1/2013		Published 4 April 2013
Q4/2012		Published 30 November 2012
Q2/2013		Published 30 May 2013
Q4/2013		Published 28 November 2013
2014	Consultation on TYNDP 2014 scenarios: Q4/2012 Long-Term Network Development Stakeholder Group: 2012-2014	Process ongoing towards the delivery of the TYNDP 2014 for consultation during the summer 2014
Q1/2013	Q4/2012 - Q1/2013	
2013		Implementation achieved in 2013
2013-14	Establishment of project Steering Committee comprised of ENTSO-E, EC, TSOs and NGOs	In April 2013 the EC released a tender for a pilot project on public acceptance of grid infrastructure. Successful tenderer appointed and project commenced in Q3 2013 Expected completion Q2 2014
Q1/2014	Internal consultation conducted throughout 2013	Report on main environmental issues associated with electricity transmission projects finalised in Q1 2014
2014	Regular stakeholder meetings in 2013 with a public consultation on the manual of procedures before submission of the draft to ACER	First draft of manual of procedures was published at the end of 2013. Preparation for first release of the new platform launched in early 2014
2014	AESAG and the Florence Forum	Creation of a new ENTSO-E Working Group to deal with regional projects on capacity calculation, day-ahead and intraday markets is ongoing. The group will facilitate the exchange of information and monitoring of different regional projects in these three areas
Throughout 2013	November 2013 Florence Forum, various workshops and conferences on market design	The Ad-hoc Team on Long-Term Market Design is continuing its work to identify concrete market design options. The results of the work will be discussed with stakeholders starting in Q2 2014

ENTSO-E WORK PROGRAM STATUS - END 2013

Deliverable	Goal	Status - end 2012
Research and Development towards stronger and smarter grids including the e-Highway2050 project		
R&D Roadmap, R&D Implementation Plans	Foster TSO coordination on R&D, with strong links to the SET Plan and EEGI, by: Publishing and disseminating the ENTSO-E R&D Roadmap 2013-2022 Publishing and disseminating the ENTSO-E Implementation Plan 2014-2016 Publishing and disseminating the ENTSO-E Implementation Plan 2015-2017 Facilitating the process for creating consortia to answer FP7 2013 calls	R&D planning work ongoing
Implementation of the R&D Plan/R&D Roadmap	Monitoring and managing implementation of the R&D Plan Monitoring and managing implementation of the R&D Roadmap 2013-2022 Contributing in the Grid+ project activities	Published Q3/2012
Modular Development Plan on Pan-European Electricity Highways System - e-Highway2050	Contribute to the e-Highway2050 R&D consortium, e.g. through the dissemination work package, so that the study becomes the definitive study on the methodologies and architecture (e.g. voltage levels) of the long-term future grid fit for 2050 goals	Kick-off
Enhancing TSO cooperation - coordination of network operation		
ENTSO-E Awareness System (EAS)	Effective implementation of a pan-European Awareness System for instantaneous exchange of operational information among TSOs	Site acceptance tests
Electronic highway	Implement bandwidth upgrades to meet the increased challenges and coordination needs of the future, including the EAS	Planning and individual link upgrades in progress
Incident Classification Scale (ICS)	Implementation with ICS software and software upgrades	
Recommendations on reducing frequency deviations	Follow-up on recommendations for concrete remedies to the findings of the joint investigation with EURELECTRIC on frequency deviations	In progress

Deliverable & AWP 2013 completion (quarter/year)	Internal & external consultation	Status - end 2013 Comments/explanations
Q4/2012 Q4/2012 Q4/2013 Q3/2012	Q3-Q4/2012 Q4/2013	Published in Q1/2014
2013-2014 Q4/2013		Published in Q1/2014
End 2014/early 2015		On schedule
2013		Commissioned Fully operation from Q4 2013
2013		Upgrades in progress; further planned to be completed by Q2/14
ICS annual report submitted to ACER Q2/2013		ICS methodology draft still under development (to be aligned with NC OS, NC OPS & NC LFCR) Expected Q2/2014
Q4/2012		Following one of the recommendations: Task force set up to consider technical impact of fast HVDC link changes on frequency and look at ways to mitigate. Report issued Next steps to look at market interaction and changes

REPORTS & PUBLICATIONS

December	ENTSO-E Yearly Statistics & Adequacy Retrospect 2012
November	Winter Outlook 2013/14 & Summer Review 2013
October	ENTSO-E Annual Work Programme 2013 - 2014 Report on Third ENTSO-E CIM for Market Interoperability Test Grid Connection Codes Implementation Guidelines First International Standard on a CIM-Based Business Process for Energy Markets
September	CIM Interoperability Test Results ENTSO-E ITC Transit Losses Data Report 2012
July	Monitoring Update Report - Infrastructure Projects of European Relevance (TYNDP 2012) ENTSO-E Overview of Transmission Tariffs Report
May	Summer Outlook 2013 & Winter Review 2012/13 The ENTSO-E Annual Report 2012: Europe's Low-Carbon Challenge and the Electricity Network
April	Scenario Outlook and Adequacy Forecast 2013-2030 ENTSO-E Memo
January	Final Report on 2nd ENTSO-E CIM for Market Interoperability Test ENTSO-E TYNDP 2014 - Final Procedure on the Inclusion of Third Party Projects ENTSO-E TYNDP 2014 - Procedure for the Inclusion of Third Party Projects

Further statistics and data are provided and updated regularly throughout the year on ENTSO-E's website: *www.entsoe.eu* and on our transparency platform: *www.entsoe.net*

POSITION PAPERS

November 6	ENTSO- E Initial Response to the EC Communication on 'Delivering the IEM and making the most of public intervention'
September 10	ENTSO-E Response to ACER Position on Scenario Outlook and Adequacy Forecast 2013-2030
July 2	ENTSO-E Response to the EC 2030 Framework for Climate and Energy Policies
May 28	ENTSO-E Highlights Challenges for TSOs in Attracting Finance for Large Scale Infrastructure Projects
May 14	ENTSO-E Response to the Draft Annual Priority List on Network Codes and Guidelines
May 3	ENTSO-E Position on the Revised Environmental Impact Assessment Process
April 23	The Impact of Dispersed Generation on Continental Europe's Security of Supply
March 19	ENTSO-E's Views Regarding ACER's Recommendation on the CACM Network Code
February 14	ENTSO-E Response to the EC Public Consultation on Generation Adequacy, Capacity Mechanisms and the Internal Market in Electricity
February 7	ENTSO-E Response to the European Commission Public Consultation on Generation Adequacy, Capacity Mechanisms and the Internal Market in Electricity

WORKSHOPS

December 4	Public Stakeholder Workshop & Webinar on the Network Code on HVDC Connections
November 26	Public Stakeholder Workshop on the Ten-Year Network Development Plan 2014
October 23	Public Stakeholder Workshop on the Network Code on Electricity Balancing
September 16	Public Information Session on Operational Network Codes
July 18	Public Stakeholder Transparency Workshop
July 17	Public Stakeholder Workshop on the Network Code on Electricity Balancing
July 10	Public Stakeholder Workshop on the Network Code on Forward Capacity Allocation
July 2	3rd ENTSO-E Visions 2030 Workshop
June 24	Cost Benefit Analysis (CBA) Methodology Workshop
May 23	Public Stakeholder Workshop (and Webinar) on the HVDC Connections Network Code
May 8	Public Stakeholder Workshop on the Forward Capacity Allocation Network Code
April 10	TYNDP 2014 - ENTSO-E Baltic Sea Regional Stakeholder Workshop
March 12	3rd Public Stakeholder Workshop on Load Frequency Control and Reserves Network Code
March 7	Public Information Session on the Network Code "Requirements for Generators", ENTSO-E Prepares Amendments to the Code
February 14	4th Operational and Scheduling Network Code Public Stakeholder Workshop
January 31	Public Transparency Stakeholder Workshop

CONSULTATIONS

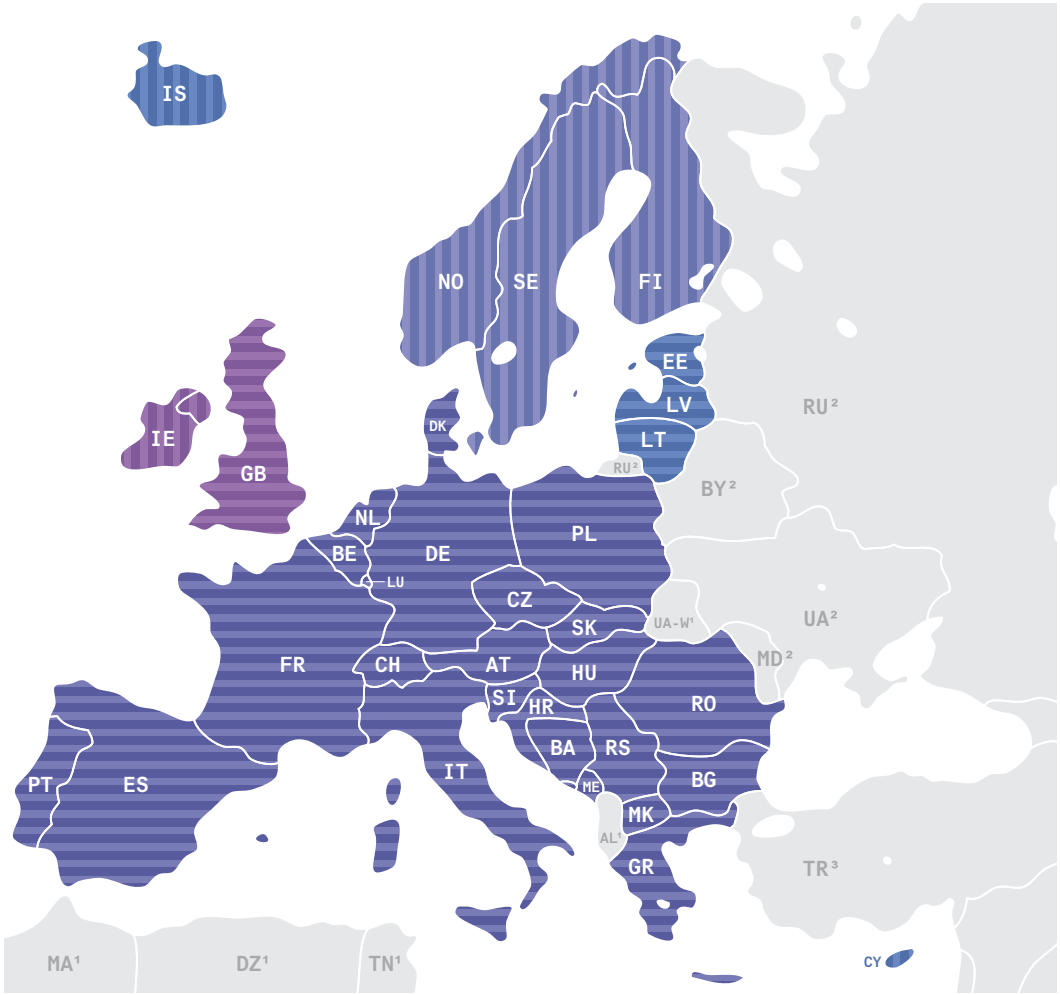
November 26 - December 17	ENTSO-E Draft R&D Implementation Plan 2015-2017
November 7 - January 7 2014	Network Code on HVDC Connections (HVDC)
July 19 - September 20	TYNDP 2014-2030 Visions
July 3 - September 6	ENTSO-E Draft Annual Work Programme 2013-2014
July 3 - September 15	Cost Benefit Analysis Methodology
July 1 - August 12	Manual of Procedures for the ENTSO-E Central Information Transparency Platform
June 17 - August 16	Network Code on Electricity Balancing (EB)
March 28 - May 28	Network Code on Forward Capacity Allocation (FCA)
February 1 - April 2	Network Code on Load Frequency Control and Reserves (LFCR)
November 7 - January 7	Network Code on Operational Planning and Scheduling (OPS)

ANNOUNCEMENTS & PUBLIC RELEASES 2013

December 23	Network Code on Electricity Balancing Delivered to ACER
December 20	Call for Vendors: CGMES Conformity Assessment Process Test Models
December 20	ACER Provides Reasoned Opinion on the Network Code on Forward Capacity Allocation
December 19	The ENTSO-E Assessment of the TYNDP 2030 Visions Consultation is Available
December 19	ENTSO-E Approves Crucial Milestone for Grid Operation, Development and Electricity Market Integration
December 17	Fourth ENTSO-E CIM for Market Interoperability Test Completed
November 28	The ENTSO-E Winter Outlook 2013/14 and Summer Review 2013
November 26	Public Consultation on the ENTSO-E R&D Implementation Plan 2015-2017
November 15	ENTSO-E Publishes and Submits the Cost Benefit Analysis of Grid Development Projects
November 15	The ENTSO-E Annual Work Programme 2013-2014 Released
November 14	The 2013 ENTSO-E Interconnected Network Grid Maps are now Available
November 8	CIM Guidelines for the IEC 62325-351 European Style Market Profile Approved as a Technical Specification
November 7	ENTSO-E Opens a Public Consultation for the Network Code on HVDC Connections
November 6	ENTSO-E Initial Response to the EC Communication on 'Delivering the IEM and making the most of public intervention'
October 25	Report on Third ENTSO-E CIM for Market Interoperability Test is Available
October 24	ENTSO-E Launches Dedicated Network Codes Website
October 22	ENTSO-E Publishes Grid Connection Codes Implementation Guidelines
October 17	Registration Open for ENTSO-E's Fourth CIM for Market Interoperability Test
October 4	A First International Standard on a CIM-Based Business Process for Energy Markets
October 2	Network Code on Forward Capacity Allocation Delivered to ACER
September 27	ACER Issues Positive Reasoned Opinion on NC LFCR
September 25	OS and OPS Network Codes Submitted to ACER
September 23	ENTSO-E has Opened a Second Window for 3rd Party Project Submissions for TYNDP 2014
September 20	ENTSO-E Publishes CIM Interoperability Test Results
September 19	Application by Turkey for Permanent Synchronous Operation with Continental Europe Progressing Positively
September 16	ENTSO-E Signs MoU with CEN and CENELEC
September 13	ITC Transit Losses Data Report 2012 Now Available
September 10	ENTSO-E Response to ACER Position on Scenario Outlook and Adequacy Forecast 2013-2030
September 06	Date Announced for TYNDP 2014 3rd Party Transmission and Storage Project Submissions
August 30	Third ENTSO-E CIM for Market Interoperability Test Completed
August 27	CIM European Market Model Exchange Profile now an International Standard
July 19	Consultation on the TYNDP 2014-2030 Visions
July 15	ENTSO-E Conducts 4th CIM Interoperability Test
July 10	Monitoring Update – Infrastructure Projects of European Relevance (TYNDP 2012)
July 04	ENTSO-E Publishes 'Overview of Transmission Tariffs 2013'
July 03	Public Consultation on the ENTSO-E Draft Annual Work Programme 2013-2014 is Open
July 03	Public Consultation on the Cost Benefit Analysis Methodology is Open
July 02	Update: Network Code on Load Frequency Control and Reserves (LFCR)
July 02	Public Consultation on the Manual of Procedures for the Transparency Platform is Open
June 28	ENTSO-E Announces New President, Nick Winser from National Grid (UK)
June 21	European Electricity & Gas Sector Welcomes Adoption of Anti-VAT-Fraud Package by ECOFIN Council
June 17	Public Consultation on the Network Code on Electricity Balancing is Open
June 7	Montenegrin TSO CGES Asked to Balance its System and Compensate TSOs for Power Flows

May 30	ENTSO-E Publishes Summer Outlook 2013 and Winter Review 2012/13
May 29	Registration Open for ENTSO-E's Third CIM for Market Interoperability Test
May 28	ENTSO-E Highlights Challenges for TSOs in Attracting Finance for Large-Scale Infrastructure Projects
May 14	Employment Opportunities at ENTSO-E
May 13	The ENTSO-E Annual Report 2012: Europe's Low-Carbon Challenge and the Electricity Network
May 7	ENTSO-E Proposes Scope on the HVDC Connections Network Code: Call for Stakeholder Input
April 30	ENTSO-E Publishes a New Draft of the Load Frequency Control and Reserves Network Code
April 26	ENTSO-E Members Launch the European Awareness System to Help Keep Europe Switched On
April 25	Planning Europe's Future Electricity Highways
April 23	The Impact of Dispersed Generation on Continental Europe's Security of Supply
April 22	Cross-border Capacity between Bulgaria, Greece and Turkey to Increase
April 4	ACER Recommends the Adoption of the ENTSO-E Network Codes for "Requirements for Generators" and "Demand Connection" to the European Commission
April 3	ENTSO-E Publishes the Scenario Outlook and Adequacy Forecast 2013-2030
March 29	ENTSO-E Submits the Network Code on Operational Planning and Scheduling to ACER
March 28	Forward Capacity Allocation Network Code: Public Consultation and Public Workshop
March 27	Network Codes: Facilitating the Future of Pan-European Electricity Transmission
March 25	ENTSOG is an Energy Identification Code (EIC) Local Issuing Office
March 25	European Electricity & Gas Sector Strongly Supports Anti-VAT Fraud Measures Proposed by the European Commission and the Irish Council Presidency
March 19	ENTSO-E's Views Regarding ACER's Recommendation on the CACM Network Code
March 12	ENTSO-E Concludes the Amendment Process of the Network Code for "Requirements for Generators"
March 8	ENTSO-E Market Committee Approves ITC Audit Results and 2013 Perimeter Fee
March 4	ENTSO-E Submits the Next Network Code, Operational Security, to ACER
February 27	InnoGrid2020+ Conference Summary
February 21	Reminder: Only 1 Week to Submit Applications for the Inclusion of 3rd Party Projects in the TYNDP 2014
February 14	ENTSO-E Response to the EC Public Consultation on Generation Adequacy, Capacity Mechanisms and the Internal Market in Electricity
February 7	ENTSO-E Publishes the Draft Network Code on Operational Planning and Scheduling after Public Consultation
February 1	ENTSO-E Launches a Public Consultation on the Load Frequency Control and Reserves Network Code
January 30	ENTSO-E Invites Interested Parties to Join User Group for Network Code on HVDC Connections
January 28	Final Report on 2nd ENTSO-E CIM for Market Interoperability Test is Now Available
January 21	TYNDP 2014 – ENTSO-E Publishes the Final Procedure for the Inclusion of Third Party Projects
January 8	Status on the Network Code on "Requirements for Generators"
January 7	ENTSO-E Finalises Network Code on Electricity Demand Connection
January 3	ENTSO-E TYNDP 2014 - A New Procedure on the Inclusion of Third Party Projects

SYNCHRONOUS AREAS & GRID MAPS



- Continental European synchronous area
- Baltic synchronous area
- Nordic synchronous area
- British synchronous area
- Irish synchronous area
- Isolated systems of Cyprus and Iceland

[1] synchronous with the continental European system

[2] synchronous with the Baltic system

[3] Since September 2010 in trial parallel interconnection with the continental European system

ENTSO-E grid maps

ENTSO-E produces three grid maps - the interconnected network of ENTSO-E, the interconnected network of Continental Europe and the interconnected network of Northern Europe. The grid maps show power plants, power stations and substations, existing high voltage lines and lines under construction of voltages of 220 kV and more (and of 110 kV to 150 kV if they cross national borders).

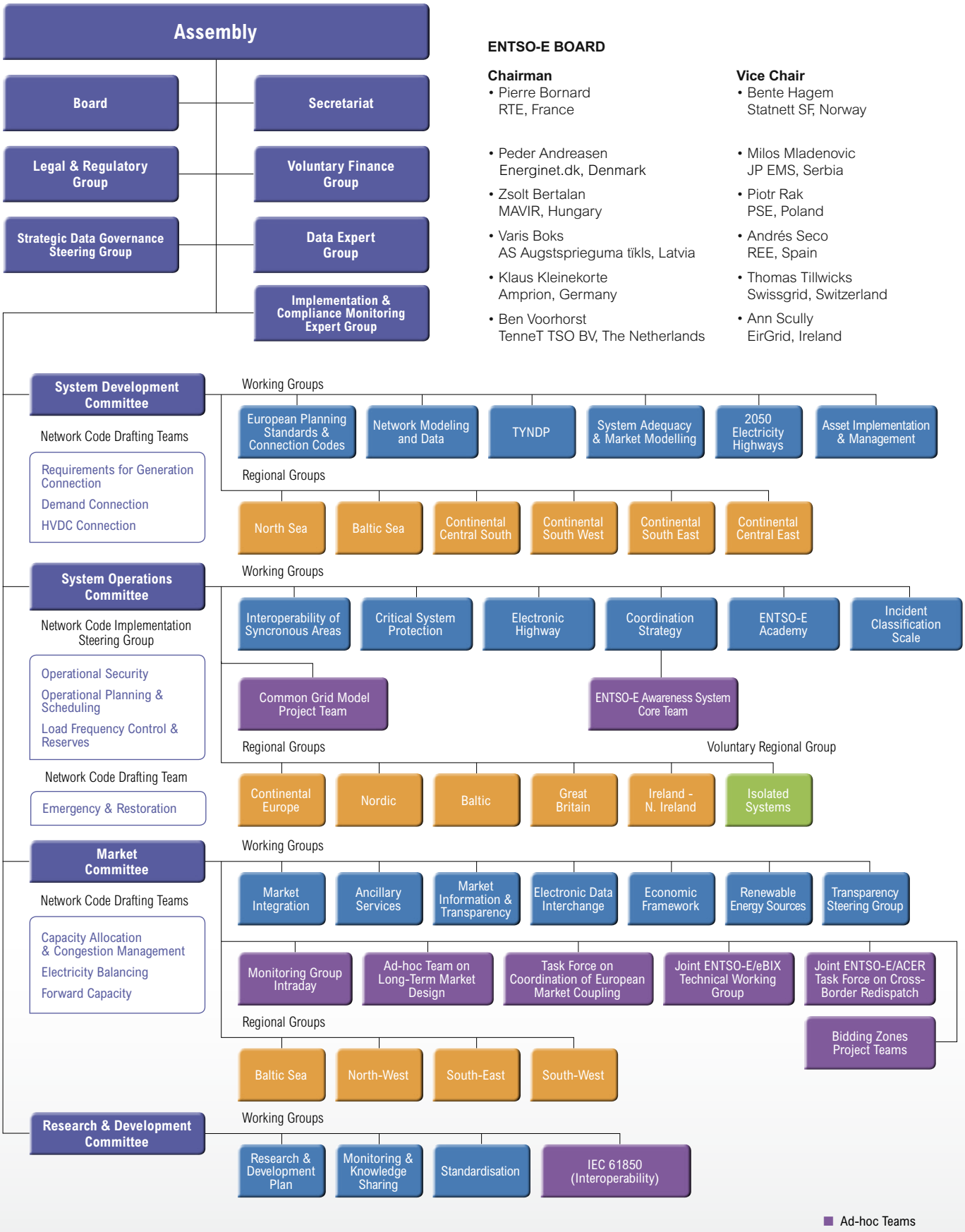
Electronic versions of the maps can be downloaded from ENTSO-E's website at: **www.enstsoe.eu/publications/order-maps-and-publications/electronic-grid-maps**. Hard copies can also be ordered at: **www.enstsoe.eu/publications/order-maps-and-publications/printed-publications-and-maps**.

ENTSO-E MEMBER TSOs

COUNTRY	COMPANY	ABBREVIATION
AT | Austria	Austrian Power Grid AG	APG
	Vorarlberger Übertragungsnetz GmbH	VÜN
BA | Bosnia and Herzegovina	Nezavisni operator sustava u Bosni i Hercegovini	NOS BiH
BE | Belgium	Elia System Operator SA	Elia
BG | Bulgaria	Electroenergien Sistemen Operator EAD	ESO
CH | Switzerland	Swissgrid ag	Swissgrid
CY | Cyprus	Cyprus Transmission System Operator	Cyprus TSO
CZ | Czech Republic	ČEPS, a.s.	ČEPS
DE | Germany	TransnetBW GmbH	TransnetBW
	TenneT TSO GmbH	TenneT GER
	Amprion GmbH	Amprion
	50hertz Transmission GmbH	50Hertz
DK | Denmark	Energinet.dk	Energinet.dk
EE | Estonia	Elering AS	Elering AS
ES | Spain	Red Eléctrica de España S.A.	REE
FI | Finland	Fingrid OyJ	Fingrid
FR | France	Réseau de transport d'électricité	RTE
GB | United Kingdom	National Grid Electricity Transmission plc	National Grid
	System Operation Northern Ireland Ltd	SONI
	Scottish Hydro Electric Transmission Limited	SHETL
	Scottish Power Transmission plc	SPTransmission
GR | Greece	Independent Power Transmission Operator S.A.	IPTO
HR | Croatia	Croatian Transmission System Operator Ltd	HOPS
HU | Hungary	MAVIR Magyar Villamosenergia-ipari Átviteli Rendszerirányító Zártkörűen Működő Részvénytársaság	MAVIR ZRt.
IE | Ireland	EirGrid plc	EirGrid
IS | Iceland	Landsnet hf	Landsnet

COUNTRY	COMPANY	ABBREVIATION
IT | Italy	Terna – Rete Elettrica Nazionale SpA	Terna
LT | Lithuania	Litgrid AB	Litgrid
LU | Luxembourg	Creos Luxembourg S.A.	Creos Luxembourg
LV | Latvia	AS Augstsprieguma tīkls	Augstsprieguma tīkls
ME | Montenegro	Crnogorski elektroprenosni sistem AD	CGES AD
MK | FYROM	Macedonian Transmission System Operator AD	MEPSO
NL | Netherlands	TenneT TSO B.V.	TenneT NL
NO | Norway	Statnett SF	Statnett
PL | Poland	PSE S.A.	PSE
PT | Portugal	Rede Eléctrica Nacional, S.A.	REN
RO | Romania	C.N. Transelectrica S.A.	Transelectrica
RS | Serbia	JP Elektromreža Srbije	EMS
SE | Sweden	Svenska Kraftnät	Svenska Kraftnät
SI | Slovenia	Elektro Slovenija d.o.o.	ELES
SK | Slovak Republic	Slovenska elektrizacna prenosova sustava, a.s.	SEPS

ENTSO-E ORGANISATION & GOVERNANCE



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ENTSO-E is governed by an Assembly and structured along the lines of four committees: System Development, System Operations, Market, and Research & Development. These committees are organised in a number of working groups, as well as regional and voluntary regional groups.

- → The System Development Committee coordinates at pan-European level the network development and prepares the Ten-Year Network Development Plan.
- → The System Operations Committee is in charge of technical and operational standards as well as the power system quality. It ensures compliance monitoring and develops tools for data exchange, network models and forecasts.
- → The Market Committee works towards an integrated and seamless European electricity market and is in charge of cross-border congestion management, integration of balancing markets, ancillary services, and the inter-TSO compensation mechanism.
- → The Research & Development Committee ensures the effective implementation of ENTSO-E's mandate in the area of R&D and to correspond to the EU's greater emphasis on electric grids.

The ENTSO-E Board coordinates the committees' work and implements Assembly decisions. A Legal & Regulatory Group advises all ENTSO-E bodies on legal and regulatory issues and Expert Groups on Data, Implementation & Compliance Monitoring, and External Relations provide expertise to the association and ensure cooperation between all member TSOs in their fields of expertise. The Brussels-based Secretariat is the association's representation to EU institutions, regulators and stakeholders.

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*As of 31/01/2014

ABBREVIATIONS

ACE	Area control error
ACER	Agency for the Cooperation of Energy Regulators
AGC	Automatic generator control
ATC	Available transmission capacity
CACM	Capacity allocation & congestion management
CBA	Cost-benefit analysis
CC	Coordinated calculation of capacity
CEER	Council of European Energy Regulators
CEMC	Coordination of EU market coupling
CEN	European Committee for Standardisation
CENELEC	European Committee for Electrotechnical Standardisation
CGM	Common grid model
CGMES	Common grid model exchange standard
CIM	Common information model
CORESO	Coordination of Electricity System Operators
DA	Day-ahead
DCC	Demand connection code
DSM	Demand-side management
DSO	Distribution system operator
DSR	Demand-side response
EAS	ENTSO-E awareness system
ebIX	European Forum for Energy Business Information Exchange
EC	European Commission
EDI	Electronic data interchange
EEGI	European Electricity Grid Initiative
EERI	European Energy Research & Innovation
EFET	European Federation of Energy Traders
EH	Electronic highway
EIP	European Infrastructure Package
EMS	Energy management system
ENTSOG	European Network of Transmission Operators for Gas
EP	European Parliament
ER	Emergency & restoration
ESMP	European-style market profile
EURELECTRIC	Union of the Electricity Industry in Europe
FCA	Forward capacity allocation
HVDC	High voltage direct current
ID	Intraday
IEC	International Electrotechnical Commission
IEM	Internal energy market
IGCC	Integrated gasification combined cycle
IOP	Interoperability
KPI	Key performance indicator
LFCR	Load-frequency control and reserves
MiFID	Markets in Financial Instruments Directive
MIT	Market information & transparency
NRA	National regulatory authority
OS	Operational security
OPS	Operational planning & scheduling
PCI	Project of common interest
PCR	Price coupling of regions
RES	Renewable energy source
RIP	Regional investment plan
RfG	Connection requirements for generators
SET	Strategic energy technology
SOAF	Scenario Outlook & Adequacy Forecast
SPS	Special protection scheme
SSC	Security Service Centre
TCA	Transmission capacity allocators
TSC	TSO Security Cooperation
TSO	Transmission system operator
TYNDP	Ten-Year Network Development Plan
XML	Extensible mark up language

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