coreso

Ensuring Operational Safety
on the European interconnected Grid

Annual Report 2017

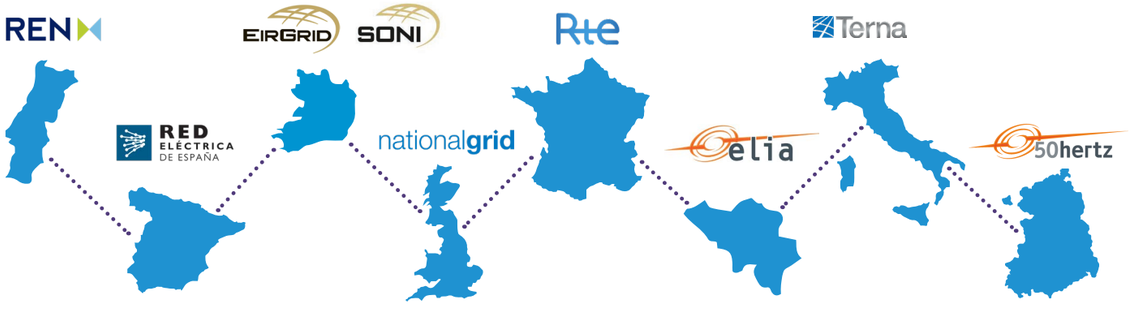
Editorial

Guaranteeing operational security on Europe's interconnected grid

As a European Regional Security Coordinator, Coreso strives every day to proactively assist transmission system operators in maintaining the operational security of the interconnected area. Greater renewable generation capacity, decentralised power generation and intensified cross-border exchanges make the operation of this power system increasingly complex.

Coreso's key objective is to develop a shared regional overview of the status of the highly connected electricity network. By coordinating different energy actors, studying the cross-border impact of actions and forecasting tense situations, Coreso and other Regional Security Coordinators add a valuable regional security layer to the operational management of the European grid.

Coreso's shareholders



Management Greeting

Dear reader,

Our mission, and that of the four other Regional Security Coordinators (RSCs), is to proactively support Transmission System Operators (TSOs) in guaranteeing security of supply in Europe at regional level.

To effectively perform our duties, we rely on an extremely competent team of professionals recognised for their skill, commitment and efficiency. They promote values and attitudes centred on team spirit, innovation and motivation. Moreover, as Coreso's remit continues to expand, the whole team's sense of responsibility, transparency and open-mindedness remain essential to dealing with our challenges.

2017 saw many challenges that required Coreso, its fellow RSCs and the whole TSO community to cooperate closely to achieve our industry's shared goals. Throughout the year we worked on new processes, improved existing ones and contributed to numerous projects. We maintained our track record regarding the extraordinary measures implemented during the cold spell in January 2017, the implementation of the Operational Planning Data Environment (OPDE) in mid-2017, the launch of the first services jointly operated by the five RSCs, and the adoption of the Critical Grid Situation approach initiated by ENTSO-E for winter 2017/2018.

Looking to cooperation, 2017 witnessed the signature of a Cooperation Framework Agreement with TSCNET Services to establish new levels of cooperation. Coreso and TSCNET Services agree to set up an efficient cooperation structure to jointly develop tools, operate services and optimise processes for TSOs.

2017 was also marked by the entry of two new shareholders, EirGrid and SONI, the grid operators for the Republic of Ireland and Northern Ireland respectively. Their involvement is an important milestone, heralding an efficient approach to cooperation on services in this region.

2018 will undoubtedly bring many complex challenges – ensuring that the five mandatory services reach full maturity, meeting shareholders' and customers' expectations, and responding suitably to System Operations Guideline articles on coordination. We have a duty to honour this commitment and will do everything in our power to ensure that we are worthy of the confidence of our shareholders and customers.

This annual report presents our main achievements in 2017. We hope you find the information useful – happy reading!

Jean-François Gahungu
CEO

Jan Van Roost
COO

Cécile Pellegrin
Head of Development

Erik Wolfs
Head of IT Department

Highlights

Coreso in 2017

Four special winter processes following adequacy issues in France and Belgium

1 JAN

22 JAN

A tense winter situation was forecast due to the forced outage of several nuclear generation units in France and Belgium. During an extended period of low temperatures combined with low volumes of renewable generation, a risk of adequacy issues (i.e. shortage of power) was identified.

To mitigate this risk, Coreso teamed up with the transmission system operators involved and TSCNET Services to develop four special processes:

- A weekly analysis to detect potential adequacy issues
- The optimisation of French import capacities from Belgium and Germany on the day-ahead market
- The optimisation of French import capacities from Switzerland on the intraday market
- An assessment of the availability of reserve generation units on the German and Austrian grid that could be activated if needed

The successful implementation of these special processes is an example of regional coordination, enabling TSOs to ensure security of supply at regional level.

Key figures

3
daily operational processes have undergone a major overhaul to better suit TSO needs and further improve the results achieved.

25 700
More than 25700 hours of operator work in the control room in 2017

3135
days of 24/7 activities since June 2009

4
new processes have been introduced into the operational dry-run and final testing phase to hone the results and operational procedures. After this extensive testing phase, these processes will become fully operational and will further improve services offered to our shareholders and the European grid.

ENTSO-E System Operations Committee approves the contractual framework for the Operational Planning Data Environment agreement

21 FEB

In connection with intensified and optimal data exchanges between TSOs and RSCs, ENTSO-E has begun developing a new digital platform: the Operational Planning Data Environment (OPDE). Coreso is involved here as a service provider tasked with cultivating the right environment for hosting and operating the OPDE and the associated database.

“TSOs, RSCs and ENTSO-E are laying the digital foundations of a smarter European power system that will help provide European citizens with a sustainable power supply for the decades to come.
Capitalising on emerging ICT and big data technologies, ENTSO-E has been developing a state-of-the-art IT platform on which operational planning data will be continuously exchanged in Europe, boosting system efficiency and security for the benefit of all grid users.
The Operational Planning Data Environment is the fundamental building block of this new digital layer that will support the coordination of system operators at regional and pan-European level. This environment could be opened up to other power system actors in the future. At ENTSO-E, we are particularly enthusiastic about being at the forefront of this new development in the European power system, alongside our members and RSCs like Coreso.”

Wim Ivens, CGM ICT manager, ENTSO-E -

Key figures

4
resources joined the project team.
Coreso has supported its project team by implementing a comprehensive change programme: the workforce has continued to grow, a project management method tailored to Coreso’s operating environment has been devised, new roles have been created, new processes as well as management and reporting tools have been adopted, and a project culture and associated training scheme have been introduced.

5
regions where Coreso actively contributes to the definition and implementation of methodologies.


entsoe

Coreso and TSCNET Services conclude the Cooperation Framework Agreement

30 MAY

This agreement aims to strengthen cooperation between both entities in order to efficiently and consistently respond to the regional needs of TSOs across Europe (shared development of new services, task sharing and exchange of methods).

> The Regional Security Coordinators should cooperate fully across Europe to maximise security of supply on highly interconnected power grids. Close cooperation between Coreso and TSCNET Services, Europe's largest RSCs, is a logical way to develop security services for our partner TSOs, especially within the large Core Capacity Calculation region in the heart of the European Union.

Maik Neubauer and Uwe Zimmermann, Managing Directors, TSCNET Services -

Let's welcome Jan Van Roost as Chief Operations Officer and Cécile Pellegrin as Head of Development

1 AUG

We had the pleasure of welcoming Jan Van Roost and Cécile Pellegrin to Coreso's management team. Jan and Cécile both previously held senior management positions at Elia.

They face the major challenge of managing Coreso's continued growth at operational and project management level, in light of the expanding role played by RSCs in Europe.

Furthermore, we would like to say farewell to Cédric Auxenfans, the former COO, and Stéphane Otjacques, the former Programme Manager. They have returned to their original TSOs to take on new professional challenges.

> It's been a pleasure and honour to serve Coreso as its COO and participate in the strategy exercise alongside the previous management team since early 2017.
> I discovered a start-up now striving to become a structured SME while adapting to constantly evolving external expectations. However, success is highly contingent on the ability of Coreso and its shareholders to accelerate growth and at the same time focus, make the right choices, and set priorities and stick to them. I found expert teams comprising experienced and dedicated staff who foster excellent collaboration with all stakeholders.
> I would also like to take this opportunity to thank all the staff at Coreso for their efforts and achievements in 2017. I'm confident that we will be able to count on their continued commitment to tackling the challenges that lie ahead in 2018 and beyond.

Jan Van Roost, COO, Coreso -

Key figures

- **3** new Security and Coordination Engineers
- **4** Interns
- **3** new FTEs on the project team: 2 new colleagues from shareholder TSOs and 2 additional part-time workers alternating with operational activities.
- **50** professionals on the Coreso team: Around 50 professionals and engineers combine their international expertise in projects and processes running 24/7

> As a service provider to TSOs, Coreso plays a significant role in supporting the development of methodologies and the implementation of new processes and/or services. Joining Coreso in 2017 as Head of Development was therefore an excellent opportunity for me to be at the heart of a major evolution in coordination between Europe's TSOs while the Network Codes will be implemented.
> Coreso is involved in five regions and is working together with TSCNET Services in four of them. Many of the projects (e.g. evolution of capacity calculation methodologies, new timeframes for capacity calculation, SMTA, OPC…) are undergoing a major acceleration phase. Being able to count on the highly qualified team of experts and project leaders that Coreso has managed to build and continues to reinforce is a key asset for the organisation in this context.
> Thanks to the teams, 2017 was a year of major achievements; these are currently in an implementation phase to be launched in 2018.

Cécile Pellegrin, Head of Development, Coreso -

Coreso 3.0 workshop, challenges, ideas and opportunities

21 SEPT

This event aimed to address our priorities in preparing to navigate the future. To encourage discussion and ideas among colleagues, the day kicked off with inspiring speeches on the future of RSCs in Europe given by external speakers active in the same environment as Coreso. Participants spent the afternoon in guided workshops intended to highlight opportunities, identify areas for improvement and tackle ongoing issues.

We would like to thank Mr Jean-Philippe Paul (RTE and ENTSO-E project TSO Coordination Strategy Implementation with RSCs), Mr Siem Bruijns (TSCNET Services, former Managing Director), Ms Kristel Romeo (ENTSO-E, System Operation Advisor), Ms Marine Binet, Ms Naomi Chevillard, Ms Pénélope Nabet, Mr Thomas Rave (Bureau RTE in Brussels) and Mr Tahir Kapetanovic (APG, Head of National Control Centre and Manager of the ENTSO-E project TSO Coordination Strategy Implementation with RSCs) for taking the time to meet us and enlighten us about their vision of the global ecosystem in which Coreso is active.

> The structural development of the electrical system and the efficiency of markets result in increased needs with regard to the monitoring and analysis of the system at regional level. Without this, TSOs cannot operate the system safely alone. In light of recently adopted EU legislation, we are entering a new world as regards these activities, the level of coordination between TSOs, and the role of RSCs. This poses a fundamental challenge to Coreso, which has been a front-runner in this field up to now – it needs to continue to respond to these changes and adapt its knowledge, teams, structure and tools to this new world.

Jean-Philippe PAUL, Operation Senior Advisor, Rte -

> Since the early 1950s, TSOs have pioneered regional coordination between Europe's electricity systems and markets: from the first UCPTE interconnection in 1953, through the emergence of ETSO and the EU's internal electricity market in the late 1990s, up to the challenges and disturbances of 2006 which resulted in the creation of the first two RSCs (Coreso and TSCNET Services) in 2008. The spirit and purpose of regional coordination has since found its way into EU legislation (Regulation (EU) 2017/1485 System Operation Guideline) through the EU-wide establishment of Regional Security Coordinators to cover the whole continent and provide standardised and aligned services to all TSOs. Cooperation between RSCs and TSOs will expand in an evolutionary way in the future, offering new services and paradigms like the intra and inter-regional management of Critical Grid Situations, all to facilitate and foster continent-wide security of the electricity supply, system operation and an effective, common market.

Dr. Tahir Kapetanovic
Head of National Control Centre, Austrian Power Grid AG
Manager of the TSOs regional coordination project
Convenor of ENTSO-E operational framework -

ElSeC 2017, the first Electricity, Security and Coordination conference hosted by TSCNET Services in Munich

17 OCT

The first ElSeC conference, organised by TSCNET Services and ENTSO-E, aimed to bring together leaders from European energy politics, Regional Security Coordinators, TSOs, security initiatives and regulatory authorities for a day of insight, dialogue and networking.

Jean-Francois Gahungu, Coreso's CEO, contributed as one of the keynote speakers on The way towards increased cooperation, a presentation of the opportunities afforded by enhanced cooperation between RSCs and the active role that Coreso is willing to play in this ongoing process.

TSCNET Services, www.tscnet.eu/elsec2017-retrospect

> Effective coordination between European power networks will be key to dealing with common challenges, such as a mixed generation portfolio, the application of new technologies, the engagement of active prosumers and the further electrification of transport. Regional Security Coordinators, such as Coreso and TSCNET Services, will play a key role in helping TSOs at regional level to maintain the operational security of our electricity system. The first conference on Electricity Security Coordination (ElSeC) proved to be an excellent chance to discuss these challenges and the regional approach towards tackling them. We had an inspiring day in Munich and gladly entrust Coreso with the organisation of ElSeC 2018.

Daan Belgers, Head of Corporate Services,
TSCNET Services -

Validation of cross-regional SMTA (Short and Medium-Term Adequacy) and OPC (Outage Planning Coordination) methodologies

6 DEC

ENTSO-E's System Operations Committee has validated these two methodologies, a major milestone after two years of cooperation between 5 RSCs and 32 TSOs. SMTA and OPC are hereby officially launched as the first two services to be jointly operated by the five RSCs and offered to all relevant TSOs.

EirGrid and SONI: two new shareholders join Coreso

15 DEC

EirGrid and SONI, the grid operators for the Republic of Ireland and Northern Ireland respectively, have joined and become shareholders in Coreso, choosing it as their coordinating body for regional security.

The involvement of the Irish operators arises from the recommendation of the European Commission and the European Network of Transmission System Operators for Electricity (ENTSO-E) in promoting greater coordination among European operators, with the support of a Regional Security Coordinator (RSC).

Key figures

181
meetings on Coreso premises
Almost 1 per working day

194
international trips. Every working day one or more Coreso employees travel abroad to attend workshops and help to devise methodologies or implement new projects

Conclusion of the Service Level Agreement between Core region TSOs and RSCs for the co-development of Capacity Calculation Services by Coreso and TSCNET Services

15 DEC

The conclusion of this SLA is a new milestone in the ongoing cooperation between both entities. A few months after the effective launch of the joint support on the project, this new agreement marks the best way forward in the ongoing development of improved capacity calculation in the region for all TSOs.

Key figures

36
Central Processing Units (512 GB each) performing quick calculations, which are crucial to providing reliable services.

3
additional resources on the IT team

Five Mandatory Services

Since its establishment in 2008, Coreso has taken on the responsibility for adopting a regional approach to European grid security. Though it started out as a Regional Security and Coordination Initiative, since late 2015 Coreso has held the status of Regional Security Coordinator as per the regulatory framework of the European Network of Transmission System Operators for Electricity. This framework clearly outlines five mandatory services that each RSC must provide to its shareholders and requires every TSO within the European interconnected area to be part of an RSC.

Five services, developed to facilitate, assist and improve the operations of Europe's TSOs from one year to one hour ahead :

SERVICE I : Coordinated Security Analysis

Identification, analysis and resolution of contingencies on grid elements close to national borders, and assessment of the impact on neighbouring TSOs.

SERVICE II : Coordinated Capacity Calculation

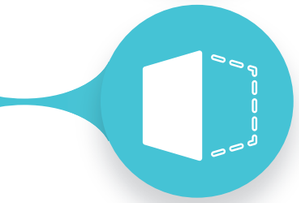
Determination and optimisation of available cross-border transfer capacities within secure operating margins.

SERVICE III : Short and Medium-Term Adequacy forecasts

Identification of possible adequacy issues on the European grid by assessing consumption, generation and grid status forecasts in the short and medium term.

SERVICE IV : Outage Planning Coordination

Coordination and optimisation in the maintenance planning of major grid assets to avoid major grid disruptions



SERVICE V : Common Grid Model

Improvement of the regional modelling of all major grid assets to visualise and simulate the future behaviour of the grid.

These five services reflect the driving forces behind Coreso's daily activities. These activities are intended to fulfil the specific needs of the shareholder TSOs, in which continuous improvement, reliability and effectiveness are key to ensuring the best possible service.

Service 1

Coordinated Security Analysis

Identifying operational risks and coordinating solutions

The intensely meshed European grid is characterised by a continuously increasing volume of volatile cross-border energy flows. Increasing energy trade between countries encourages interdependency between TSOs. Grid incidents in one area may have major consequences for neighbouring zones, requiring TSOs to adopt a regional approach to security calculations.

We need to look beyond national borders when forecasting and anticipating security risks. With its global overview of the grid and in-house expertise on border areas, Coreso is ideally positioned to provide this regional security overview.

This additional security layer strengthens TSO operational management and is essential in preventing large-scale security incidents with cross-border impact.

The Process

18:00

TSOs provide their best-estimated forecast of the expected grid situation in their control zone in D-1, in the form of an individual grid model (IGM).

18:00 – 19:00

Coreso combines the different forecasts to create a merged European overview of the grid status for the following day.

19:00 – 21:00

This merged model is used to simulate the loss of different grid elements, such as high-voltage transmission lines or large generation units, and evaluate the impact on the remaining assets. The aim is to provide a comprehensive overview of the security risks that threaten the security of supply in Europe on a daily basis.

21:00 – 22:00

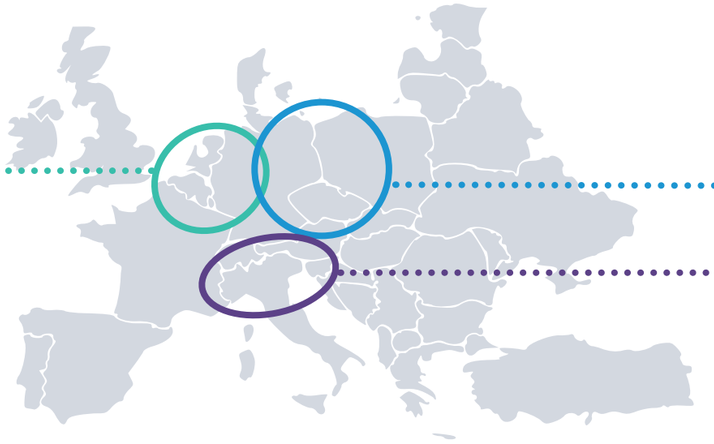
Communication on these risks is key and all information is shared among the RSCs and with other TSOs in a daily teleconference.

23:00 – 18:00

The process continues in intraday as TSOs send hourly updates of their forecast grid situation for the remainder of the day. As these forecasts become more accurate, security threats can be closely monitored.

If TSOs encounter tense grid situations, they can request that Coreso conduct specific studies, coordinate solutions in close to real time, or ask for post-event analyses to investigate the potential causes.

Areas of interest



Central Western Europe

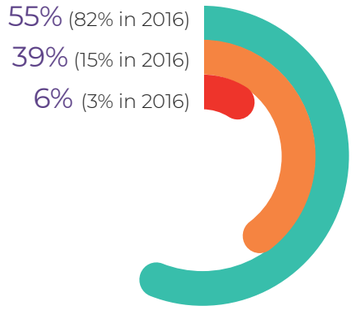
The Central Western European region comprises Northern France, Belgium, the Netherlands and Western Germany.

Features

- A high concentration of renewable energy in Germany
- A high proportion of nuclear generation in France
- A progressive market-coupling mechanism, aimed at optimising international exchange and maximising social welfare

These three features interact and lead to high volumes of cross-border flows that can change direction within hours depending on the market conditions in the countries within the area.

2017 Security forecasts



The change in the percentages is an indication of the considerable interdependency in the area and the growing complexity of system management.

Statistics Legend

Few constraints detected on the grid. The situation can be managed using conventional, inexpensive remedial actions.

A stressed grid situation is detected. Coordination between TSOs is needed to manage said constraints. However, the situation can be resolved through conventional remedial actions and minor internal redispatching of generation.

A highly stressed grid situation is detected. TSOs need to coordinate closely in real time to handle this situation. Substantial cross-border redispatching of generation or cancellation of major outages is required to control the situation.

Central Eastern Europe

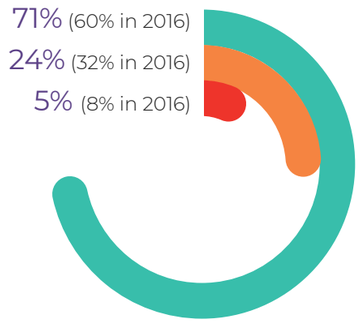
The Central Eastern European region comprises Eastern Germany, Poland, the Czech Republic and Austria.

Features

- A high concentration of offshore wind generation in the north east of Germany
- A high energy demand in the Southern part of Germany
- Major ongoing grid development projects to further develop the north-to-south transmission capacity in Germany

These generate major north-to-south flows crossing the area and requiring optimal use of available transmission capacities.

2017 Security forecasts



The change in the percentages reflects the ongoing grid development projects in the area and the successful integration of renewable generation in the operational management of the system.

Central Southern Europe

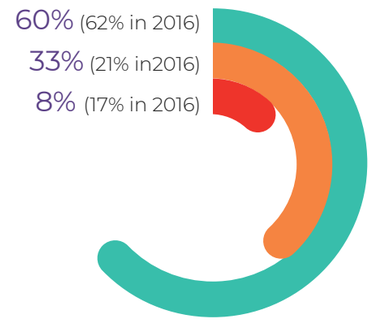
The Central Southern European region comprises Northern Italy, South-Eastern France, Switzerland, Austria and Slovenia.

Features

- A predominance of substantial Italian imports throughout the year
- The cascading effect of grid incidents on the remaining cross border lines
- The need for special security measures due to the mountainous environment

Italy's peninsular structure results in highly loaded transmission lines on its northern border. Due to the importance of these flows and the cascading impact of grid events, close coordination between all actors is essential.

2017 Security forecasts



The change in the percentages demonstrates the ongoing need for close cooperation in the area and efforts are already under way to make this a reality.

New areas for Coreso

South Western Europe

The South Western European area comprises the south of France, Spain and Portugal. Following the inclusion of Spain in 2016, all the TSOs in the area are now active shareholders of Coreso.

2017 marked the start of the integration of this new interest area into Coreso's coordinated security analysis process. The new shareholders were first given access to the operational data platforms and an updated version of the daily security report was prototyped. This improved report, scheduled for release in 2018, will incorporate relevant grid information, like load and renewable generation forecasts. Rather than striving to establish a coordinated remedial approach to security threats in the area, this first step is intended to have the operators of all entities get to know one another and boost their competencies.

Secondly, in the longer term a new, tailor-made process for the specific security risks faced in the area will be developed by a project team of experienced engineers from the different TSOs and Coreso.

Service **2**

Coordinated Capacity Calculation

Maximising pan-European energy exchanges to guarantee optimal use of available resources and maximise economic welfare.

Cross-border energy exchanges play a vital role in the management of the European energy landscape. This import and export of energy encourages optimal use of generation resources and can be crucial in the event of scarcity. The volume and importance of this trade is growing due to the following European trends:

- The decline in traditional generation
- The fluctuating nature of renewable energy
- The rise in renewable energy generation
- The open energy market structure

The trading capacity available to market participants on any given border is limited by the operational strength of the grid's assets. This threshold, which needs to be constantly re-evaluated, fluctuates and is contingent on a number of different parameters, such as:

- Seasonal conditions
- Availability of grid elements
- Grid topology
- Internal stability restrictions

Accurate estimates of this limit are essential for the efficient and safe operation of the grid. Overestimation will lead to unacceptably high flows and security constraints, which may jeopardise the entire interconnected area. If underestimated, the transfer capacity will be limited and will reduce the possibilities of trade between countries.

Coreso, with its regional overview and in-house expertise, plays a significant role in various operational capacity calculation processes on the European grid. Furthermore, as an experienced entity Coreso provides support and expertise in the development of new processes in other European regions and works closely with TSOs and other RSCs in the resulting implementation projects.

Operational Areas

Central Western Europe

Day ahead market capacities

The Flow-Based Market Coupling model was launched in the CWE area in May 2015. This advanced mechanism has been implemented to accurately calculate the available capacities between the TSOs in the area for the day-ahead market.

The flow-based method better allocates transmission capacities compared to conventional capacity calculation methods because it performs a more detailed simulation of the interdependencies between borders. Within the highly meshed CWE region, where physical exchanges are influenced by cross-border regional dynamics, this model is ideally suited to calculating the maximum available capacity.

From the outset, and in the 2.5 years since the FBMC process was launched, Coreso has been a valued player in the operational execution of the process and helps to ensure the successful day-to-day operation of the process.

Key services

- Creation of the reference grid model for flow based calculations
  - 100% successful delivery of the reference model
  - 78% reference model delivery before the target time (20:00 on D-2)

Delays can be caused by a variety of issues such as: quality problems with input files, divergence issues during the model creation or problems linked to the IT infrastructure. These issues require additional investigation by Coreso's operators

- Analysing market behaviour

07/11/2017: Go-live of the Edges methodology, a more precise way of analysing market trends. Coreso is the chosen provider of this service for all CWE TSOs.

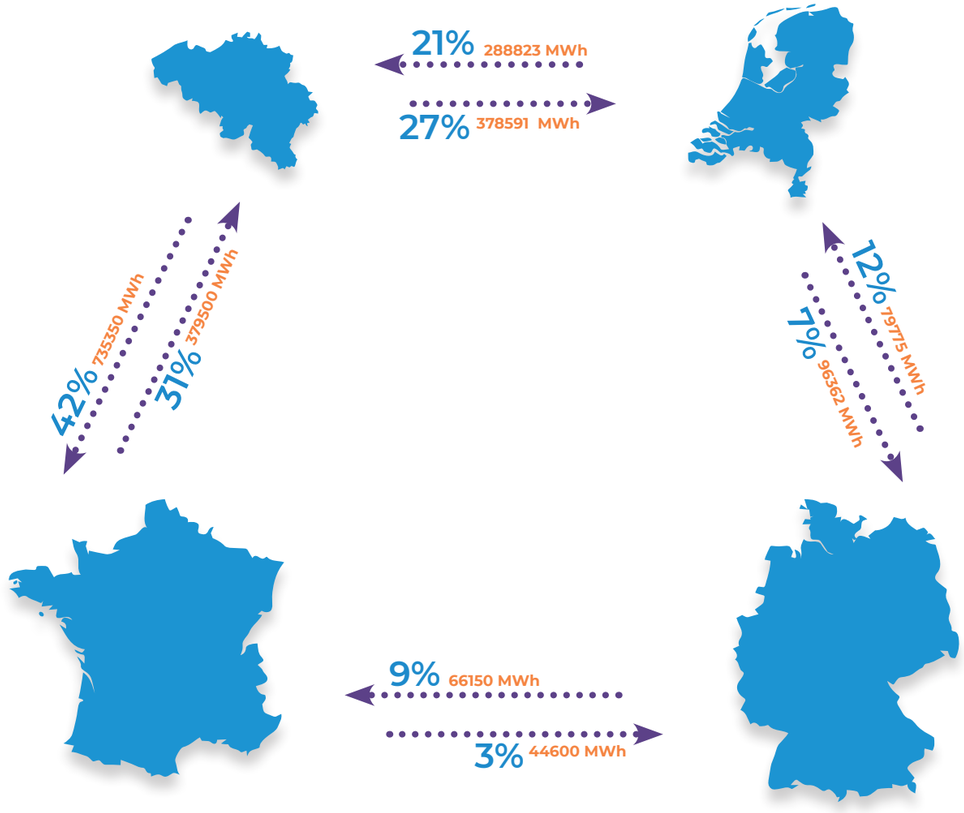
- Optimising grid topologies and coordinating remedial actions

07/11/2017: Go-Live of the Remedial Action Coordination Tool (RACT), which enables all CWE TSOs and RSCs to share information about and test the impact of remedial actions in neighbouring zones. This ensures a regional overview and facilitates agreement on optimised grid topologies.

Intraday market capacities

The capacity remaining after the close of the day-ahead market is offered on the intraday market. All RSCs and TSOs in the CWE area consider further fixed augmentation of the available capacity on a daily basis. The impact of this proposed increase on the different borders will be simulated and the increase can only be accepted if no critical security constraints arise in the area. Coreso is responsible for the simulations on the NL – BE and BE – FR borders in this process.

Statistics of the intraday capacity increase process :



The % values % of cases in the year where additional capacities could be offered to the market

The MWh values Additional capacity offered to the intraday market throughout the year

Development of capacity calculation processes

Central Southern Europe

Day ahead market capacities

The CSE area (located around Italy's northern border) is characterised by substantial imports onto the Italian grid. To maximise market welfare and ensure the safe operation of the grid, in 2012 the five TSOs and two RSCs active in the area began working on a coordinated D-2 capacity calculation process. The process went live in 2016. Coreso now provides this capacity calculation service for the five TSOs involved.

The process uses the input files from all the TSOs concerned in the CSE area, describing the best forecast for their individual grid situation from two days in advance in D2CF files. An algorithm is applied to the merged grid model to simulate different import levels and optimise the use of remedial actions in the area to achieve the highest possible secure level of imports on Italy's northern border.

8
timestamps: In August 2017, Coreso increased the number of daily calculated timestamps from 5 to 8

50 MW
on average, the capacities calculated using this methodology are around 50 MW higher than those of the pre-existing yearly process

CWE area

To further maximise and better define the available capacities for the intraday market, a CWE project is under way, intending to use the Flow-Based Market Coupling methodology as a calculation method in the intraday capacity calculation process.

30/05/2017: Start of the daily dry-run. The process is rolled out on a daily basis by Coreso or TSCNET Services and results are analysed to hone the methodology.

Central Southern Europe

In 2015, a project team was set up between the five TSOs in question, TSCNET Services and Coreso to develop an intraday capacity calculation process. The same methodology as in the D-2 process is applied to updated input, providing an updated value of the commercial capacities for the intraday market. In 2017, a daily testing phase began within Coreso and TSCNET in order to test and improve the process.

South Western Europe

Coreso, as the chosen capacity calculator for the Iberian Peninsula, is developing a coordinated process for daily capacity calculations on the borders between France and Spain and between Spain and Portugal. Launched in 2016, the project saw major progress in 2017 with the development of the process workflow.
Key elements in workflow development:

- First complete process that will use the new CIM format for input files
- Considering region-specific challenges
- Voltage constraints
- Angle constraints
- PST setting optimisation

Channel Region

The Channel region is characterised by the use of high-voltage DC interconnectors between two independent synchronous areas. A specific approach needs to be adopted to ensure accurate capacity calculations on the cables in this region. Since the project began in 2016, Coreso has been closely involved in the development of this new methodology and its implementation.

Core Region

The Core region spans the whole Central Western and Central Eastern European region and covers an area in which 16 TSOs are active. The objective is to extend the use of the Flow-Based Market Coupling methodology, currently used in the CWE, as a capacity calculation method in this area.

Coreso has been a strong partner since the start of the capacity calculation project for this area and has supported the project team via its experience and expertise during the definition of the method proposal in early 2017. This was followed by a testing phase, in which all RSCs and relevant TSOs worked together.

The implementation of the automatic optimisation of remedial actions poses one of the major challenges for Coreso in this project. Such a process, which maximises cross-border capacities for the whole region by determining the best grid topology, is already in use in other regions, but its use in the vast Core region poses new challenges.

Service 3

Short- and Medium Term Adequacy (SMTA)

Identifying possible adequacy issues in week-ahead and coordinating mitigating actions to prevent scarcity on the European Grid.

A TSO's main mission is to ensure adequacy within its remit. This means guaranteeing that the available power (from generation units or imports from neighbouring TSOs) is always able to cover the requested load.

In recent years, harsh winter conditions and forced power plant outages triggered critical situations where exceptional measures had to be taken to avoid a lack of adequacy and possible load-shedding of European consumers.

Anticipating these situations is a core priority for TSOs and requires a regional and cross-regional perspective. The seasonal outlooks conducted by ENTSO-E allow for a year-ahead adequacy assessment at European level. However, it was deemed necessary to conduct additional studies on a shorter timeframe in order to provide more refined results with updated input. To cover this need, the SMTA (Short and Medium-Term Adequacy) service was defined as the third mandatory service of RSCs.

The SMTA service comprises two steps:

- Cross-regional calculation: This study is performed for all European TSOs to detect potential adequacy issues in light of generation schedules, load schedules and maximum capacities on the borders
- Regional adequacy assessment: This step, which is only triggered if a risk of adequacy issues is revealed by the cross-regional calculation, aims to determine which mitigation actions on outages, load or generation will be most effective in maintainin the security of supply.

Under the guidance of Coreso, as convenor of the project, the main cross-regional methodologies were defined in 2016 and 2017 thanks to the fruitful cooperation of 32 TSOs and 5 RSCs.

S M T A

Summer dry-runs

During the summer, the prototype tool developed by Coreso was tested in two consecutive dry-run phases using real input data from the TSOs. Simulations were performed in a probabilistic approach, using 500 scenarios per timestamp for the next seven days to deliver adequacy flags that give a clear signal about the probability of adequacy issues.

Methodologies

Following the dry-runs, cross-regional methodologies were submitted for validation by ENTSO-E's System Operation Committee in December 2017.

Team work

The Cross-Regional SMTA Methodology was approved in December. The launch was announced on 8 December and the week-ahead SMTA calculation started with a rolling operating schedule for the five RSCs using the same tool. ENTSO-E also validated the proposal that an industrialised tool would be developed following ENTSO-E's lead to better serve Europe's TSOs, providing on-demand reports, better performance, higher flexibility, annual reporting and further services.

And for 2018?

Three focal areas have been identified for 2018:

- Integration of new cross-regional elements in methodology and development: moving-window calculation, must-run calculation, downward regulation approach
- Development of the cross-regional industrialised tool, focusing on the needs of European TSOs
- Development of the Regional Adequacy Methodology to provide results for winter 2018-2019.

Service 4

Outage Planning Coordination

Ensuring the security of supply with smartly planned maintenance

Performing maintenance on grid assets is key to preserving the high reliability expected from a TSO. However, every local outage weakens the grid, so it is necessary to carefully anticipate bottlenecks and evaluate the compatibility of outages when planning maintenance operations. This requires coordination between TSOs in areas impacted by cross-border flows.

The RSCs were assigned responsibility for performing this analysis at regional level in the medium and long term. In accordance with the ENTSO-E network code, OPC (Outage Planning Coordination) was defined as the fourth mandatory service of RSCs. This ENTSO-E-wide project is led by TSCNET Services. Coreso participated in the design and experimentation of the different timeframes (yearly, monthly and weekly process).

As part of the weekly testing process, RSCs collect the outage plans of the different TSOs, perform consistency checks and incorporate them into a shared grid model. A security analysis then indicates whether all the planned outages are compatible, meaning that their simultaneity does not cause critical security constraints. If so, further coordination between the relevant TSOs may be required.

Coreso participated in the yearly process experimentation in November. Applying the same methodology as for the week-ahead assessment, RSCs focused on detecting outage incompatibilities in the 52 weeks of 2018 using year-ahead data. Following the dry-runs, the methodology was submitted for validation in December 2017. Following validation, the Outage Planning Coordination was approved.

The launch of the week-ahead assessment has been validated for mid-January 2018 with a rolling process taking place among RSCs. The yearly process test will continue in 2018, and a monthly timeframe will be devised.

Key results of the OPC project:

Harmonised data exchange

Common format for the exchange of European outage plans

Inconsistency check

Verification of the concordance of outage data for both sides of every tie-line

Outage incompatibilities

Detection of critical constraints caused by simultaneous outages

Service

5

Common grid model

Sharing detailed forecasts and relevant data to obtain an improved overview of the interconnected European grid

Europe's interconnected energy grid is constantly evolving, and new concepts are being introduced at a rapid pace. Electric modes of transportation, renewable generation in the home, smart metering and big data are just some of the trends that will have a major impact on the way consumers use energy and how the electrical system will be managed.

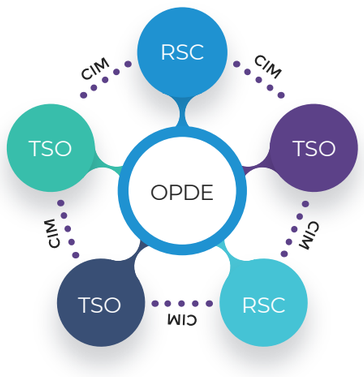
Energy actors will need to further expand their cooperation and incorporate a clear pan-European vision if they want to successfully incorporate these trends, overcome the obstacles they present and profit from the benefits they offer.

An efficient, large-scale exchange of detailed data between all European actors will play a vital role in managing the increasingly complex interconnected European grid.

To achieve this goal, the Common Grid Model project has been launched at ENTSO-E level, incorporating all TSOs and RSCs. It aims to improve and replace existing data exchanges and merge processes currently performed as part of the RSCs' services.

The Common Grid Model service has three main goals:

- Establish a new Operational Planning Data Environment (OPDE) to exchange data between all parties
- Integrate a new, improved data format into exchange grid models, the Common Information Model (CIM), replacing the current UCT format
- Incorporate these new standards into all existing services and functions of the RSCs and TSOs



Coreso is heavily involved in the implementation of the project as all three objectives will have a major impact on its future way of working.

- Coreso will act as one of the hosting entities for the new OPDE.
- Coreso is the convenor for designing the European merging function intended to handle the combination of all individual CIM-formatted grid models, and will be one of the providers of this service to all European TSOs.
- The impact on all services and operational tools has been assessed. All are scheduled to be upgraded on time before the go-live.

Financial Report

Composition of management bodies

1.1 Board of Directors

The Board of Directors has the following members:
- Mr Pier Francesco Zanuzzi, Chairman of the Board of Directors;
- Mr Philip Sheppard, Vice-Chairman of the Board of Directors;
- Mr Duncan Burt, director;
- Mr Dirk Biermann, director;
- RTE Réseau de Transport d'électricité SA, with Mr Sébastien Henry as its permanent representative, director;
- Ms Brigitte Peyron, director;
- Mr Carlo Sabelli, director;
- Mr Patrick De Leener, director;
- Ms Maria José Clara, director;
- Ms Pascale Fonck, director;
- Mr Tomás Domínguez Autrán, director;
- Mr Emilio Cerezo Diez, director;
- Mr Robin Mc Cormick, director as of 15 December 2017.

None of the directorships are remunerated and all (except Mr McCormick, whose term will expire immediately after the 2019 Ordinary General Meeting that will be asked to approve the annual accounts for the financial year ending on 31 December 2019) will expire immediately after the 2018 Ordinary General Meeting that will be asked to approve the annual accounts as at 31 December 2017.
The Board of Directors met seven times in 2017 (on 27 January 2017, 20 April 2017, 16 June 2017, 29 September 2017, 27 October 2017 and 15 December 2017 – two times) and discussed technical, financial, economic and strategic issues.

1.2 Daily management responsibilities

Mr Jean-François Gahungu was appointed Chief Executive Officer, effective from 1 November 2016.

Mr Cédric Auxenfans was appointed Chief Operating Officer, effective from 1 August 2012. He was replaced by Mr Jan Van Roost, appointed by the Board of Directors of 27 January 2017, effective on 1 August 2017.

1.3 Auditors

The Ordinary General Meeting of 24 April 2015 appointed KPMG Réviseurs d'Entreprises SCCRL and Ernst & Young Réviseurs d'Entreprises SCCRL as the company's auditors for a term of three years, expiring at the 2018 Ordinary General Meeting to approve the annual accounts for the year ending 31 December 2017. KPMG Réviseurs d'Entreprises SCCRL is represented by Alexis Palm and Ernst & Young Réviseurs d'Entreprises is represented by Patrick Rottiers.

`The auditors' remuneration is €13,350.00 per year, to be indexed annually in line with the consumer price index.

Main events during the year

2.1 Coreso in a nutshell

Coordination of Electricity System Operators (Coreso) founded in 2008, encompasses nine European operators[1] which are also its shareholders. When Coreso launched its operations in February 2009, it was one of the first technical coordination centres in continental Europe to be shared by multiple electricity Transmission System Operators (TSOs)[2].
Coreso provides services to secure energy transmission for over 55% of the population of the European Union. Located in Brussels, about fifty engineers, seconded from their companies, combine their expertise 24 hours a day, 7 days a week to anticipate the operation both in the short term and the long term.

The mission of Coreso is to proactively support TSOs to ensure security of supply on a European regional basis. Coreso focuses its coordination activities and thus provides the highest added value from a year ahead until Intraday (few hours before real time). Coreso, as the other RSCs, is a service provider of nationally regulated TSOs. Since 2017, System Operation Guideline (European Commission) defined recommendations regarding RSCs activities.

[1] Elia System Operator (Belgium), RTE (Réseau de Transport d'Electricité, France), National Grid (UK), Terna (Italy), 50Hertz (eastern Germany and Hamburg), REN (Redes Energéticas Nacionais, Portugal), REE (Red Eléctrica de España), SONI (System Operator for Northern Ireland) and EirGrid (Ireland). Eirgrid and SONI, the two grid operators on the island of Ireland have joined and become a shareholder in Coreso on December 15th, 2017.
[2] TSOs throughout the rest of the document.
[3] The CSE (Central South Europe) area comprises Italy, Slovenia, Switzerland, Austria and France.
[4] Using a data improvement loop, security analyses and an innovative algorithm that automatically identifies the best set of remedial actions in situations in which there are constraints (phase-shifting transformer, specific topology in a substation and redispatching), Coreso and its partners implemented this service

Accordingly, Coreso collaborates with the TSOs and other RSCs to:
- provide the control centres with forecasts about the security of systems
- perform operational planning activities,
- conduct security analyses which simulate numerous scenarios,
- suggest remedial actions and coordinates exchanges between national control centres, which remain responsible for implementing these actions in their respective systems.

Coreso has notably enhanced the operational coordination of transmission systems in the Western Europe region in response to new challenges. The development of renewable energies, which are by nature intermittent, and the increase in cross-border exchanges within the European electricity market make electricity flows increasingly variable. In this field, Coreso has demonstrated an important level of reliability and expertise. Its added value in terms of identifying situations which pose a potential risk to the electricity system – risks which can only be detected by having an overview extending beyond the national scope of each individual transmission system – is now essential.

2.2 The 5 mandatory services: Coordinated Security Analysis

In 2017, Coreso was able to provide D-1 (Day-Ahead, i.e. one day before real time) analysis and coordination services every day for the ninth consecutive year.

Coordination Security Analysis is implemented in a dedicated way for each region. A specific approach is necessary to adapt the service provided by Coreso to each shareholder expectations.
At the longer term, some evolution may have to be implemented, based on the SOGL requirements, to evolve to a more coordinated approach within each region.

AREA	COMMENTS
CWE, CSE and CEE	Coreso provided the service successfully during the whole period.
Channel	Coreso is assessing evolutions of process as adaptation of files used for computation to the new Common Grid Model format is on progress
South Western Europe	Coreso has identified operational security checks useful and beneficial for the integration of Spain and Portugal.

2.3 The 5 mandatory services: Calculation of capacity to be allocated to regional markets

2.3.1 Capacity calculation on the Italian border (CSE[3] area)

CALCULATION DATE	COMMENTS
Two Days Ahead	D-2 capacity calculation[4] service was launched in June 2016[5].
(D-2)	In 2017, the main milestone has consisted in enhancing the process with a 12 timestamps calculation. As a coordination centre (on behalf of APG[6] , Eles[7] , RTE, Swissgrid[8] and Terna) and in cooperation with and TSCNET, Coreso oversees checking data quality, file merges and two-days-ahead (D-2) calculations regarding maximum import capacities at Italy's northern border.
Day-Ahead (D-1)	In 2017, the main milestone consisted in enhancing the process with eight computations a day.
Intraday	This project is currently at the internal parallel run (offline then online) stage. The main challenges are a high degree of automation and improved performance due to the very short deadlines expected for intraday market allocation processes. The industrialized tool should be developed in 2018. While awaiting the release of the automated process for the region, which is scheduled for 2018, Coreso developed a new intraday security analysis process for Terna and RTE. The new process assesses the impact of the market's use of the new capacity calculated for D-2, bearing in mind any new event, and confirmation of the availability (or otherwise) of preventive and remedial measures. This was also an opportunity for Coreso to test out new tools and an 'agile' IT method in cooperation with a new partner.

which is geared towards a technically and economically optimised D-2 capacity system compared to the annual capacity calculation process.
[5] Testing and development of the new service started early 2014 in the form of the results of two optimised capacity calculations being supplied daily. The analyses conducted by Coreso enable TSOs to fine-tune the method used and to provide better quality input data.
[6] Austrian TSO.
[7] Slovenian TSO.
[8] Swiss TSO.

2.3.2 Activities linked to the market coupling mechanism (CWE[9] area)

Since May 2015, Day-Ahead market coupling within the CWE area has been based on the flow-based method[10] for calculating border exchange capacities, replacing the ATC market coupling mechanism. This was a world first and has had an immediate and significant positive impact on electricity prices, which are converging much more frequently in the CWE area.

Since this flow-based coupling mechanism became operational, Coreso has been confirmed as the operator of the CWE area's joint flow-based system on behalf of RTE and Elia. Coreso also hosts the platform used in market coupling.

Furthermore, the seven TSOs involved in the CWE area have confirmed Coreso's operational role in coordinating validation and verification of D-2 capacity forecasts for each TSO's grid; these values are crucial for calculating regional flow-based capacity.

CALCULATION DATE	COMMENTS
Two Days Ahead (D-2)	In 2017, a new 'Edges" method (determination of likely market directions based on Net Positions forecasts) and new common tool for remedial action coordination (Remedial Action Coordination Tool known as RACT) has been used by CWE parties, including Coreso, during the CWE flow-based Day-Ahead qualification process. These improvements should support CWE TSOs and Coreso to identify and to apply available remedial actions (RAs) that could enlarge the FB-domain in the direction of the chosen reference points ('Edges')) with the purpose to be faster, more reliable and more transparent for all CWE parties.
Intraday	The IT solution developed by Coreso has been chosen as common target solution. CWE TSOs have decided to initiate a project with the purpose to industrialize the solution and integrate the tool within the current IT System.

2.3.3 Day-Ahead capacity calculation using the flow based method in the CORE area[11]

Following the European regulator ACER's[12] decision of November 2016 regarding future capacity calculation areas in Europe and in application of the European guideline on capacity allocation and congestion management (CACM), a new area, called CORE, has been formed by merging the CWE (Central West Europe) and CEE[13] (Central East Europe) areas. The new area's TSOs have launched a new project for calculating D-1 capacity in the CORE area using the flow-based method. Together with TSCNET, Coreso is taking part in this project and is preparing to act as a Coordinated Capacity Calculator in application of the new guideline.

2.3.4 Day-Ahead Capacity Calculation in SWE[14] region

The methodology has been drafted between TSOs and Coreso. Parallel run is expected in 2018.

2.3.5 Channel Ireland United Kingdom Capacity Calculation (Channel IU CC)

In 2017, the definitive version of "Day-Ahead and intraday capacity" methodology (extensive description, explanatory notes & consultation report) for the Channel capacity calculation region (CCR) was sent to concerned Regulators.

Next step will consist in Go Live "Channel" in January Jan 2019 and Go Live "Ireland UK" in October 2018.

2.4 *The 5 mandatory services: Short and Medium-Term Adequacy at European level*

European countries are currently and increasingly faced with the challenge of responding to load – i.e. demand – with sufficient electricity generation. The underlying reasons for this are the strong and intermittent presence (or absence) of renewable energy and the increasingly uncertain profitability of conventional generating facilities.
If energy is not present - at any given time - in a country, potential help from other countries depends on the overall availability of electrical energy and the grid capacity to transmit it to the country in need of energy.

[9] The CWE (Central West Europe) area comprises the Netherlands, Germany, Belgium and France.
[10] The flow-based method is an approximative, linear model of the grid that allows the physical margin on the infrastructure to be calculated with a view to ensuring grid security. This method is used for market coupling within a given area, in the aim of determining capacity allocations.
[11] The CORE area was formed by merging the CWE and CEE areas. The Agency for the Cooperation of Energy Regulators (ACER) decided to create this new area on 17 November 2016 as part of the implementation of the regional capacity calculation project.
[12] Agency for the Cooperation of Energy Regulators.
[13] The CEE (Central East Europe) area comprises Germany, Austria, the Czech Republic, Hungary, Poland, Slovakia and Slovenia.
[14] The SWE (Southern Western Europe) area comprises Spain, Portugal and France.

The aim of the SMTA project, led by Coreso, was to design and implement a week-ahead process. The works carried out within the global approach has been implemented globally for the different regions (CWE, CEE, CSE, SWE, Channel).

Setting up the project, analysing the existing situation as well as developing a straightforward design and prototype tools enabled Coreso to continue testing with 29 European TSOs and four other RSCs (Regional Security Coordinators) in 2017. The analytical model, which was originally deterministic, was improved by the addition of a probabilistic module developed in collaboration with the ULB[15]. This module can simulate several consistent climate scenarios with a view to gauging the impact of fluctuations in wind and solar power generation on generation/demand adequacy.

In 2017, after the approval by TSOs of the cross-regional methodology, the go-live of the service took place early December with active participation of the five Regional Security Coordinators using the prototype integrally developed within Coreso (the future industrialized tool will be developed in 2018, based on the Coreso prototype).
In parallel, Coreso has also implemented a regional experimentation to prepare the next steps which will take place in 2018.

2.5 *The 5 mandatory services: Outage Planning Coordination (OPC)*

Coreso contributed actively to the definition of the Outage Planning Coordination methodology driven by TSCNET and approved in 2017. This service aims at:

- Identifying outage incompatibilities between relevant assets whose availability status have cross-border impact.
- Limiting pan-European consequence by relevant coordination of planned outages timing.
- Proposing solutions to relieve these incompatibilities.
- Coordinating findings and Remedial Actions proposals with other adjacent RSCs.
- The go-live of weekly process will take place early 2018 with involvement of the five Regional Security Coordinators using the prototype tool developed by TSCNET.

2.6 *The 5 mandatory services: Improved delivery of the Individual/Common Grid Model*

2.6.1 Project Team Common Grid Model

Coreso is involved at the ENTSO-E level in the Project Team Common Grid Model (PT CGM) which deals with the future format to exchange grid models (CGMES), the future exchange platform Operational Planning Data Environment (OPDE), and the quality assessment, merging and alignment Functions to build the Common Grid Model.

This represents a major challenge:
- Implementation of a new IT architecture,
- Expertise and investment,
- Need for agile approach with regard to projects, tools and processes to guarantee future developments to be fully compliant with the future format.

Within regional projects, Coreso is also giving support to TSOs regarding adaptations to CGMES format.

2.6.2 ENTSO-E operational planning data exchange platform

Coreso played an active role in designing and establishing the ENTSO-E operational planning data exchange platform (OPDE[16] Project) to ensure that the platform was integrated as well as possible:
- Early 2017, ENTSO-E System Operation Committee approved the hosting of the necessary components for the Operational Planning Data Environment (OPDE) Minimum Viable Solution (MVS) by Coreso and TSCNET.
- Late 2017, Coreso has put the OPDE MVS platform in production.

2.7 *Cold spell January 2017*

Following the tense winter forecast due to missing nuclear in France for the 2016 – 2017, Coreso has implemented a set of extra processes to face the adequacy situation.
Abstract of Platts analysis on cold spell : "The cooperation of the Western European TSOs within the Coreso (informed mid October [...] and followed the development of the situation from a general regional perspective) offers an example of regional coordination enabling TSOs to ensure security of supply on a regional level."

[15] Université Libre de Bruxelles
[16] Operational Planning Data Environment.

2.8 Operational Services implemented for winter 2017-2018 preparation

Following 2016-2017 winter, Coreso, in collaboration with ENTSOE and TSCNET[17] contributed to the implementation of a common approach within the ENTSO-E Task Force "Critical Grid Situations"[18]

Late 2017, Coreso has also implemented a process to actively update the 'seasonal adequacy outlook' for the winter 2017/2018.

2.9 Implementation of the Coreso Private cloud

To be able to deploy IT environments in a reliable / secure way with the requested flexibility both for internal platforms and external platforms necessary for service development, Coreso has implemented a private cloud.

Concretely, it means that Coreso has invested and will keep on investing on IT platforms to:
- manage data (example: ENTSO-E OPDE)
- provide computation services (example SWE, CSE CHANNEL CC projects, RAO etc....)
- provide hosting services (CWE FB system).
- This cloud gives Coreso the possibility to share resources between platforms and configure resources when needed, giving more flexibility in spreading the needed resources over the different platforms in a cost-efficient way. This cloud can be extended in the future based on the necessary resources for the different platforms.

2.10 Organigram chart, job creation and reorganization of teams

To cope with the extension of its services and to manage related projects, Coreso continues to strengthen professionally.
- Organigram chart has evolved to clarify roles within the team and introduce greater rigour in daily activities.
- more staff were taken on for the Operations, Project and IT units.

2.10.1 Organization of the project team

In view of the application of new European guidelines (the CACM guideline and the System Operation Guideline (SOGL)) and the expected rapid growth in activities, both from a geographical point of view due to the arrival of new shareholders and the joint offer of services with TSCNET, as from a functional point of view due to the development of the five coordination services, Coreso has revised the structure of its project team by implementing a comprehensive change programme: the workforce has continued to grow, a project management method tailored to Coreso's operating environment has been produced, new roles have been created, new processes and new management and reporting tools have been adopted, and a 'project culture' and associated training scheme have been introduced. A PMO support was introduced to support this implementation and the portfolio management

The project portfolio that was implemented consists of several projects, most of which are linked to the development of the capacity calculation activities described above in the five areas in which Coreso is active. Projects related to the implementation of the CGM Program, SMTA and OPC are also foreseen.

2.10.1.1 Arbitrage process

An arbitrage process for the various developments required has been drafted so that these developments can be aligned with Coreso's aims and priorities through a clear delegation and decision-making process involving Coreso's project/IT teams, management team and Governance Bodies.

This represents a major challenge:
- Implementation of a new IT architecture,
- Expertise and investment,
- Collateral impacts on projects and existing tools/process.

Within regional projects, Coreso is also giving support to TSOs regarding adaptations to CGMES format.

2.10.1.2 Developing new project tools by "clustering" common functionalities

To face the high volume of new tools developments needed by the Capacity Calculation projects raising in all regions in parallel, Coreso has organized projects by "clustering" common functionalities. It aims to group the requirements and development efforts to:
- increase project efficiency,
- find consistent solutions between regions

[17] Regional Security Coordinator based in Munich.
[18] The Task Force "considered recommendations [...] in critical grid situations in general i.e. not only for cold spell situations but also including hot-waves, critical loop flows, etc. [...]."

2.10.2 IT reinforcement

The IT department was extended to be able to implement and maintain the different projects and platforms within the foreseen schedule. Following IT functions were added in 2017:
- IT project management to support new software implementation and software design.
- IT Operational Management to manage the Coreso IT assets.
- Software Architecture to define, document and guard the development framework used by all the software development projects.

This reinforcement has shown first results:
- Production platform is stable and running without issues.
- Development practices have been defined and used for projects.
- Logging of business and technical information usable for KPIs.

2.11 Cooperation with TSCNET

June 12th 2017, Coreso and TSCNET Services have concluded a Cooperation Framework Agreement with the purpose to strengthen their cooperation in assisting transmission system operators (TSOs) in their task of maintaining the operational security of the electricity system with its growing share of renewable energy.
Coreso and TSCNET have agreed to set up an efficient cooperation structure and to set out principles mainly to:
- share existing tools, methods, and procedures of either Coreso or TSCNET
- operate services alternately or cooperatively
- jointly optimize services and tools for TSOs and to develop new ones.

The agreement paves the way for the two service companies representing 21 TSOs from 18 European countries (Austria, Belgium, Croatia, Czech Republic, Denmark, Italy, France, Germany, Hungary, Ireland, Northern Ireland, the Netherlands, Poland, Portugal, Slovenia, Spain Switzerland, and the United Kingdom) to further enhance coordination at a regional level.

Outlook

3.1 Provision of the five services

In late 2015[19], European TSOs took up the commitment to establish five regional services and to appoint RSCs to perform these coordination services. Since then, two European Union regulations (guideline on electricity transmission system operation or System Operation Guideline[20] and guideline on Capacity Allocation & Congestion Management[21]) have been published to defined recommendations and further describe the 5 mandatory services to be delivered by RSCs.

To summarise, the services can be described as follows:

1. Improved delivery of the Individual Grid Model (IGM)/Common Grid Model (CGM);
2. Coordinated calculation of transmission capacity in a given region (or Capacity Calculation Region) by the "coordinated capacity calculators";
3. Operational security analysis and coordination;
4. Short and medium-term regional adequacy assessment;
5. Inter-TSO outage planning coordination.

With both these regulatory and contractual frameworks, the official roles and responsibilities of Coreso as RSC are now totally formalized. It must be pointed that Coreso fulfils its role in providing the five services but also acts as developer of criteria and procedures for ENTSO-E (hence for all associated TSOs).

With this major step taken, RSCs have now evolved from voluntary initiatives to initiatives with a structural role and place. 2018 will certainly show an extension of the 5-services scope related to the implementation of network codes (Long-Term Capacity Calculation, Coordinated Security Analysis methodology,). Against this backdrop, SONI and EirGrid, the Irish and Northern Irish transmission system operators, joined Coreso as a shareholder on December 15th, 2017.

Some discussions are also taking place regarding implementation of additional services.

[19] At the ENTSO-E Assembly of 10 December 2015, the multilateral agreement for RSC-based TSO cooperation was approved and signed by the TSOs.
[20] The guideline on electricity transmission system operation entered into force on August 2nd 2017. The System Operation specifies what transmission system operators should do in managing their grid. The fact that the generation mix in Europe is integrating more and more renewables, that there is more and more interconnections and cross-border competition has been considered in the System Operation Guideline.
[21] The Guideline on Capacity Allocation and Congestion Management entered into force on July 24th 2015. sets out the methods for calculating how much space can market participants use on cross border lines without endangering system security. It also harmonises how cross border markets operate in Europe to increase competitiveness but renewables' integration. CACM is the cornerstone of a European single market for electricity.

3.2 Cooperation between the five RSCs

In the interests of guaranteeing consistency and efficiency and looking ahead to the harmonisation of approaches required by the upcoming SOGL guideline, Coreso and TSCNET have signed a cooperation framework agreement on June 12th, 2017 to cooperate and share operations in a balanced way and to pool their tool development efforts (see 2.12 for details). Now that five RSCs are active (Coreso, TSCNET, Nordic RSC, Baltic RSC and SCC in South-East Europe) and considering the specific context of cooperation on electricity transmission, 2018 will certainly show the beginning of cooperation actions with other RSCs. The joint implementation of SMTA and OPC by the five RSCs could be a model for future cooperation on regional level.

3.3 System Operations Guidelines (SOGL) Reporting

The way forward on "SOGL reporting" will be a joint effort between TSOs and RSCs. Therefore, the implementation, in a step-by-step approach, will imply a coordinated work between RSCs and TSOs:

A significant adaptation of certain processes and/or tools will be essential to cope with System needs as most probably the addition of new processes between TSOs and RSCs or RSCs and RSCs (ex: validation of RA and/or feedback on RA that have been used).

3.4 Enhancement of coordination

Some crucial needs to meet requirements from SOGL articles relative to coordination have been identified in 2017 (among others: Article 17 on Annual report on regional coordination, Articles 76 & 78 on regional operational security coordination). Next steps will take place in 2018:

- workshops dedicated to the drafting of requirements needed for an enhanced operational coordination between RSCs and TSOs and pave the way to the preparation of future reporting actions.
- Coreso will also keep on contributing to the "ENTSO-E inter-RSC coordination" and "Coordinated Security Analysis" Task Forces which aim is to define the requirements needed for an efficient operational coordination between RSCs and TSOs.

3.5 Contribution to ENTSO-E missions and activities

Late 2017, ENTSO-E System Operation Committee (SOC) acknowledged the fact that RSCs need access to Extranet information that is relevant to provide effective services and agrees to form a group to work further on investigating appropriate access arrangements.
This important milestone will be Coreso better opportunity to contribute efficiently to ENTSO-E activities.

3.6 Annual conference on Electricity Security Coordination

In 2017, TSCNET hosted the first Conference on Electricity Security Coordination. This conference, co-organized by TSCNET and ENTSO-E, aims at communicating towards leaders from European energy on Security Coordination main challenges.

In 2018, Coreso will host the second edition. The timing would be perfect to communicate on some important achievements in terms of cooperation with TSCNET and other RSCs.

Subsidiaries

The company has no subsidiaries.

Events after the end of the year

No remarkable events occurred after the end of the budget year.

Notes to the annual accounts

6.1 Introduction

6.1.1 Key figures

IN THOUSAND €	31 DECEMBER 2017	31 DECEMBER 2016
EBITDA*	1.369.8	1,061.3
EBIT*	474.0	429.0
Net result (before tax)	470.0	428.6
Net result (after tax)	245.8	209.7
Solvency ratio	43.06%	47.68%
Liquidity ratio	79.19%	97.06%

6.2 Balance sheet

6.2.1 Fixed assets

Fixed assets include the following:

IN THOUSAND €	2017	2016
Intangible fixed assets	1,522.6	320.3
Property, plant and equipment	1,560.5	1,922.0
TOTAL FIXED ASSETS	3,083.1	2,242.3

An amount of €1,737k was invested in 2017, of which €1,470k in software and hardware.
The net book value of fixed assets was €3,083k and includes cumulative depreciations at year-end 2017 totalling €896k.

6.2.2 Current assets

Trade debtors' totalled €789k, compared to €1,136k end of 2016. The decrease is due to the accrual for the settlement of operational services fees for 2017 (credit of €776k), according to the 'cost-plus' mechanism.

'Other amounts receivable' consists mainly of recoverable taxes and VAT totalling €262k and a total of €150k reimbursable social security contributions.
At year-end the cash and cash equivalents amount to €1,207k compared to €860k end of 2016.

6.2.3 Deferred charges and accrued income

This item comprises operating expenses to be deferred to accounting year 2018 (€117k).

6.2.4 Equity

As at 31 December 2017, share capital totalled €1,000k represented by 15,210 shares and was fully paid up at the time Coreso was set up.

Following the positive result for the budget year 2017 (€246k), a €12k appropriation to the legal reserve was booked. The remainder of the distributable profit (€234k) has been carried forward.

Equity amounted to €2,418k after appropriation of the 2017 result.

Solvency = equity/total assets
Liquidity = current assets/short-term liabilities
*EBIT = earnings before interest and taxes
*EBITDA = EBIT + amounts written off/depreciation

6.2.5 Debts

'Trade debts' at year-end 2017 totalled €2,248k. They relate to invoices not yet due totalling €650k and invoices to be received totalling €1,598k.

Social security liabilities cover many provisions such as holiday allowances, bonuses and personnel insurance. The total amount for this item is €839k.
An amount of €60k is recorded under 'Tax debts' and relates to corporate income tax payable on the results of accounting years 2016 and 2017.

6.2.6 Accrued charges and deferred income

Following the European regulator ACER's decision of November 2016 regarding future capacity calculation areas in Europe and in application of the European guideline on capacity allocation and congestion management (CACM), a new area, called CORE, has been formed by merging the CWE (Central West Europe) and CEE (Central East Europe) areas. The new area's TSOs have launched a new project for calculating D-1 capacity in the CORE area using the flow-based method. Together with TSCNET, Coreso is taking part in this project and is preparing to act as a Coordinated Capacity Calculator in application of the new guideline.

6.3 Income statement

6.3.1 Operating income

Operating income can be subdivided as follows:

IN THOUSAND €	2017	2016
Service fees	9,954.8	8,916.0
Other operating income	561.3	324.7
TOTAL	10,516.1	9,240.7

The service fees relate to a number of analysis services for the grid, as described in chapters 2.2 until 2.7 of this annual report and are based on the 'cost-plus' mechanism (operational service fees).

'Other operating income' encompasses mainly recovery of withholding tax.

6.3.2 Services and other goods

Services and other goods totalled €4,808k in 2017 (compared to €4,394k in 2016) and relate mainly to the costs of IT maintenance and consultants. The increase is due to the increased activities of Coreso.

6.3.3 Personnel expenses

Remuneration and social security costs are broken down as follows:

IN THOUSAND €	2017	2016
Remuneration	3,252.3	2,902.8
Social security costs	1,049.6	870.9
Other social security expenses	36.4	36.4
TOTAL	4,338.3	3,785.5

The increase is partly due to the increase in full-time equivalents from 33.0 in 2016 to 35.3 in 2017.

6.3.4 Depreciation

Depreciation of property, plant and equipment totalled €896k and is calculated according to the valuation rules approved by the Board of Directors, as indicated in the annual accounts.

6.3.5 Financial result

A net financial result of €-4k is recorded in 2017, mainly due to €-1.2k exchange losses €-2.2 interests on a shareholders' loan.

6.3.6 Taxes

Profit before tax amounts to €470k in 2017. After applying notional interest and considering disallowed costs, Coreso's corporate income tax amount for 2017 is €224k.

6.3.7 Net profit

In 2017 Coreso realized a net profit after tax of €246k.

6.4 Appropriation account

At the Ordinary General Meeting to be held on 19 April 2018, the Board of Directors will propose the following appropriation:

IN THOUSAND €	2017	2016
Profit of the accounting year	245.8	209.7
Profit carried forward from the previous year	1,113.6	914.4
Appropriation to the legal reserve	12.3	10.5
Distribution of the dividend	0.0	0.0
Result to be carried forward	1,347.1	1,113.6

6.5 Financial instruments

Coreso does not use financial instruments.

Description of the risks and uncertainties facing the company

7.1 Financial risks

Coreso's funding needs are met by the contributions of its shareholders. To meet its needs, Coreso draws up a budget and a business plan and reviews it in appropriate time with its shareholders, which are also its main customers. In the event of unforeseen funding needs, Coreso can appeal to its shareholders for the release of extra cash at very short notice.

Since its shareholders are also exposed to inherent financial risks, there is a residual financial risk for Coreso if any of its shareholders default. However Coreso's residual risk remains very low when its shareholders are considered.

7.2 Data quality risks

In its role as a coordinator of Transmission System Operators (TSOs), Coreso performs analyses of cross-border electricity flows, advises TSOs on congestion management, and contributes to Security of Supply (SoS) operations. To perform these tasks as effectively as possible, Coreso relies heavily on data from all the TSOs concerned and on this data being complete, validated according to the agreed acceptance criteria, consistent, accurate and delivered on time. Initiatives are underway within ENTSO-E to put in place a structural framework for the provision of harmonised qualitative data by TSOs. Coreso is actively involved in this.

7.3 ICT[22] risks

Coreso is also highly dependent on the continuity of its ICT infrastructure to deliver its services in appropriate time.

The management of the ICT infrastructure, including software applications and their hosting and data storage, are being outsourced to external suppliers and service providers. A single supplier acts as the first line of support for troubleshooting any ICT issues. All contracts with ICT providers include guarantees on long-term support and maintenance services for all critical ICT components.

The power supply of ICT infrastructure is also backed up by uninterruptible power supply systems in Brussels and Lomme (France).

[22] Information and Communication Technologies.

7.4 HR risks

Coreso's strength lies in the quality of its staff, exposing the company to various risks, i.e. inadequate skill sets, the strain of work shifts inherent to Coreso's monitoring activities, and FTE turnover.

Coreso relies on the pool of experts provided by its shareholders to fill any sudden gaps in human resources and has drawn up plans for joint training with the engineers employed by its TSOs.

To cope with future challenges, Coreso will need to maintain the quality of its staff. In 2017, Coreso and its shareholders analysed 4 business plan scenarios regarding the future organizational structure of Coreso. After internal discussion, it has been decided to initiate the actions related to the Scenario which is the most robust to answer the needs of Coreso in an evolutionary environment.

This scenario for future will allow not only the provision of the five services but also the anticipation of other challenges to the best extent possible. The improvements identified within this scenario focusses on proactively addressing shareholder requests as well as on finance, governance and staffing enlargements in operations, projects and IT.

7.5 Risks related to regulatory changes among European TSOs regarding coordination

The consolidation of international power exchanges following the liberalisation of the European electricity market, combined with the need to ensure overall security of supply in Europe, led to a need for increased cooperation and coordination among European TSOs.

Although decisions will still need to be taken by TSOs on the legal front, on roles and responsibilities, on governance and on the tools or expertise of future European coordination entities, there remains a risk that Coreso may not be sufficiently prepared for the future cooperation and coordination needs of the market and its players. Coreso can mitigate this risk by proactively identifying needs, adapting to be able to meet those needs and positioning itself as a trusted long-term partner.

This risk will still have to be cautiously assessed within next years as cooperation between RSCs and provision of new services such as Short and Medium-Term Adequacy at the European level create conditions for an increase of shared activities on European wide area.

Furthermore, the need for greater coordination is now widely acknowledged and in fact formally established as a multilateral contract was signed committing all TSOs in December 2015.

Finally, the increase of services to be delivered to TSOs combined with the short delays for implementation will challenge the capacity of Coreso to maintain a high-quality service on existing activities while developing new services, new tools and new procedures.

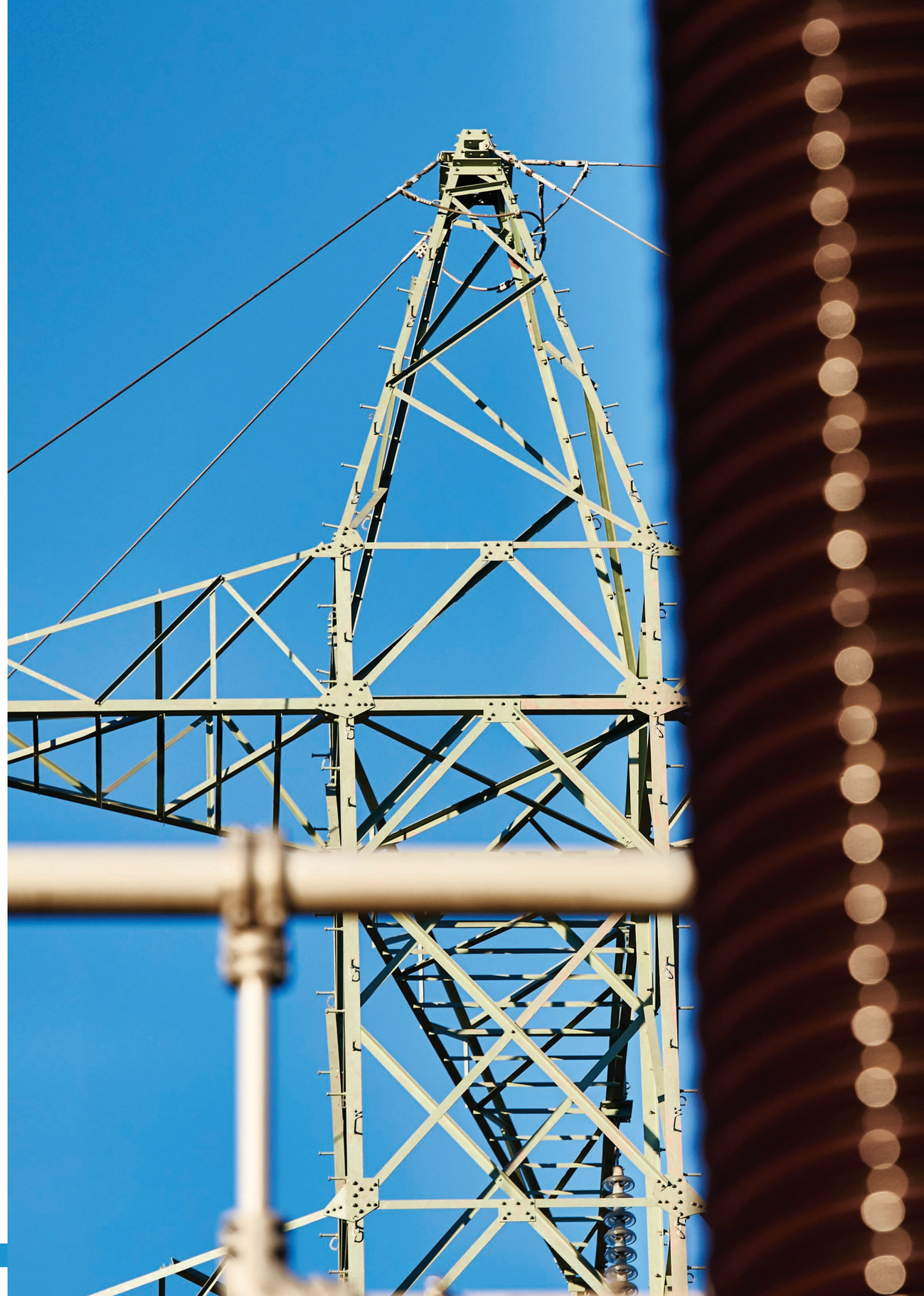
7.6 Other risks

Coreso realises that there may be other risks of which the company is unaware, or that risks currently deemed negligible may become more significant in the future.

Research and development

To define calculation methodologies, develop tools and implement new services, Coreso has its own "Research and Development Unit" and collaborates, among other partners, with RTE Research and Development Department. Coreso constantly develops its activities by designing new coordination processes that require innovation in terms of both methods and tools.

April 19th, 2018



Glossary

50Hertz	is one of the TSOs responsible for the German grid. Visit its website at http://www.50hertz.com/en/
APG	is the TSOs responsible for the Austrian grid. Visit its website at www.apg.at/en/
CIM	Common Information Model
Core region	Region comprising 13 countries, spanning from France to Romania and including 16 different TSOs
CSE	Central Southern Europe
CWE	Central Western Europe
EirGrid	is the TSOs responsible for the Irish grid. Visit its website at www.eirgridgroup.com
Elia	is the TSO responsible for the Belgian grid. Visit its website at www.elia.be/en
ENTSO-E	European Network of Transmissions System Operators for Electricity. Visit its website on www.entsoe.eu
FBMC	Flow-based market coupling
National Grid	is the TSO that operates energy systems in the United Kingdom Visit its website on www.nationalgrid.com/uk/.
OPC	Outage planning coordination
OPDE	Operational Planning Data Environment
PST	Phase-shifting transformers (PSTs enable TSOs to better control energy transmissions along power lines.
RACT	Remedial action coordination tool
REE	(Red Eléctrica de España) is the TSO responsible for the Spanish grid. Visit its website at www.ree.es/en.
REN	(Redes Energéticas Nacionais) is the TSO responsible for the Portuguese grid. Visit its website at www.ren.pt/en-GB.
RSC	Regional Security Coordinator
RTE	(Réseau de transport d'électricité) is the TSO responsible for the French grid. Visit its website at www.rte-france.com/en.
SMTA	Short- and medium-term adequacy forecasts
SONI	(System Operator of Northern Ireland) is the TSO responsible for the grid of Northern Ireland. Visit its website at www.soni.ltd.uk.
SWE	South Western Europe
Terna	is the TSO responsible for the Italian grid. Visit its website at www.terna.it.
TSCNET Services	is the RSC of 13 TSOs who are members of TSC (TSO Security Cooperation). Visit its website at www.tscnet.eu.
TSO	Transmission system operator

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