



coresg

Ensuring Operational Safety
on the European interconnected Grid

Yearly Operational Review
2018

Regional coordination to foster the European power grid

As a European Regional Security Coordinator, Coreso's mission is to proactively assist the European Transmission System Operators with the operational management of the European power grid. By creating and sharing regional grid models, coordinating different energy players, studying the cross-border effects of actions and forecasting stress situations, Coreso's regional overview enhances the vision of its TSOs and offers an invaluable layer of system security for all European energy consumers.

Over the past 10 years the combination of accumulated in-house experience and a dedicated focus on the challenges of tomorrow, have allowed Coreso to grow at an increasingly rapid pace. With the coming implementation of the ENTSO-E network codes in 2020, 2018 was a year of even more operational activities, more project development, and more enthusiastic colleagues.



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Management Greetings

Highlights

CORESO IN 2018

Dear Reader,

For the past ten years, Coreso's (COoRdination of Electricity System Operators) stated mission has been to handle the coordination of electricity flows in Western Europe.

Those ten years were marked by steady organic growth, from two shareholders and six staff members in early 2009 to nine shareholders and 55 employees at the end of 2018. When Coreso launched its operations in February 2009, it was one of the first technical coordination centers in continental Europe to be shared by multiple electricity Transmission System Operators (TSOs). Since then, four other RSCs have been created and all European TSOs have committed to the pan-European development and rollout of five standard services to be delivered by RSCs.

A lot of work has been done over the last decade to enable us to carry out our duties. We are dedicated to fulfilling our mission in accordance with our values of proactive collaboration, a focus on results and respect of commitments, and we can count on the competences and the commitment of our team.

2018 was a challenging year for many reasons. All activities, whether at the operational level, service development level or solution implementation level, were aware that the expectations of the different associated stakeholders for an extension of the services provided were growing. To take on those challenges, we initiated actions to seek greater internal efficiency and develop a comprehensive vision of the different expectations through a series of workshops with our shareholders.

In terms of our collaboration with our counterparts, the other RSCs, 2018 was also marked by the creation of the "RSCs Working Table" one year after the signature of a Cooperation Framework Agreement with TSCNET Services. As we are all facing the challenge of the fundamental work required to implement the System Operation Guidelines and Capacity Allocation and Congestion Management Guidelines, close collaboration between RSCs, TSOs and ENTSO-E is a must.

Finally, 2018 also allowed Coreso to host the second-yearly Conference on Regional Coordination in collaboration with ENTSO-E. By assembling high-level policy makers, experts, academia, thought leaders and the TSO community on a European, regional and national level, this conference was an ideal opportunity to reflect on the concept of regional coordination and discuss the way ahead in the next decade.

2019 will certainly be one of the most challenging years in our young history as major milestones will have to be reached to bring the mandatory services to maturity. To cope with this, our aim is to build a sustainable company while at the same time providing operational and implementation activities. We are aware of our responsibilities and are committed to carrying out our missions effectively and efficiently, in a spirit of cooperation and teamwork.

This annual report presents our main achievements in 2018. I hope you will find the information useful and enjoy reading it!

Jean-François Gahungu

CEO

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JAN

The first REE colleagues join Coreso

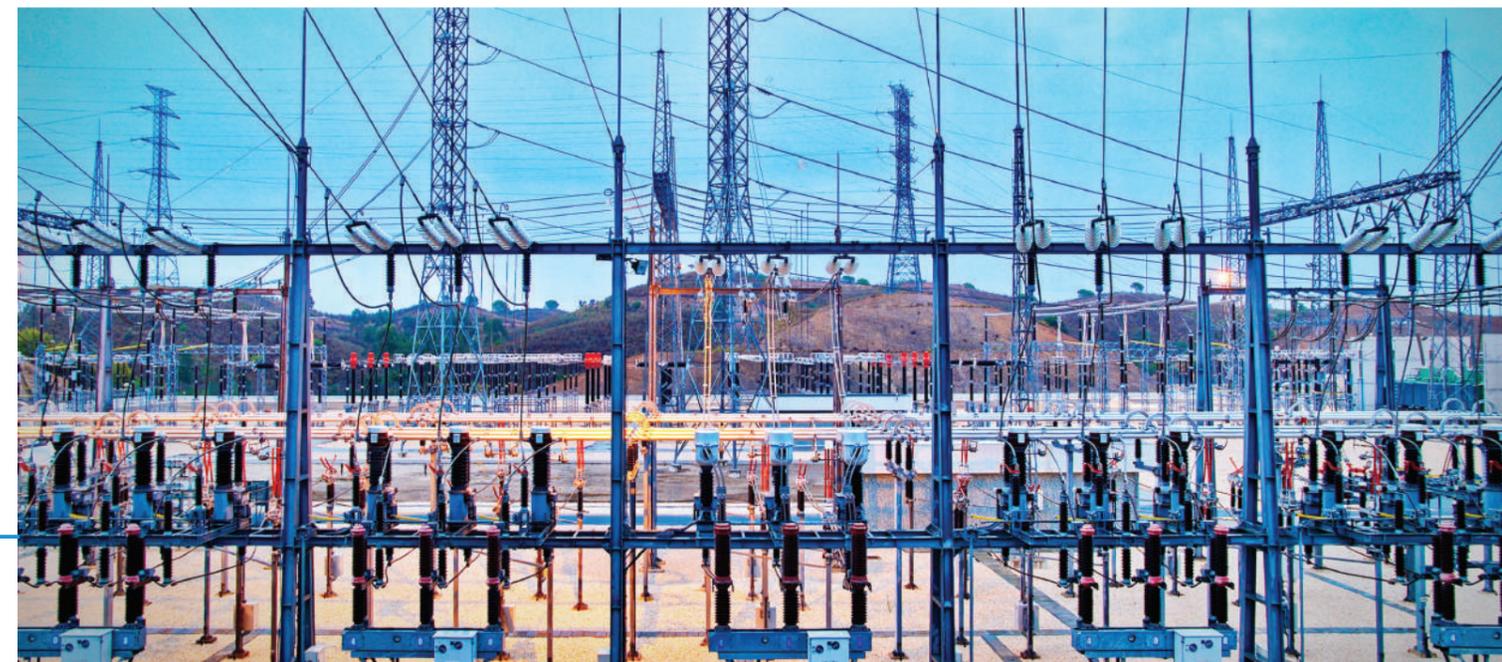
As the New Year got underway, Coreso was very pleased to welcome its first two new colleagues from Red Eléctrica de España to its staff. The expertise and knowledge they bring

to the operational and project team is vital to strengthening the team and supporting the different developments in the South Western European grid.



Capacity Calculation and Security Analysis developments in the SWE region will help the TSOs in that region increase, very significantly, the number of timestamps for which specific calculations are performed and will also push them closer to real-time. This will allow adaptation of the results to the specificities of each hour of the day and deliver results with lower uncertainty. The harmonization of methodologies and the optimization of remedial actions will also aid the operators who will have an already-tested set of options to implement in real-time.

*Juan Bola Merino, REE Head of National Control Center and representative in the Coreso Governance Board.
Tomás Domínguez Autrán, REE Director of Operations, member of the Board of Directors.*





Creation of the RSCs working table

An RSC working table was established in 2018 as part of the regional power coordination perspective. Three different workshops were organized: the first in Munich on April 25th and the following ones in Copenhagen and Hamburg. The managers of the five European RSCs met with the common goal of ensuring alignment between RSCs and providing support to the ENTSO-E RSC Project, focused on the delivery of the best possible service levels for the TSOs.

The long-term goal is to have regular meetings with all the European RSCs in order to exchange views on common challenges. These fruitful meetings represent the concrete output of earlier discussions between Coreso and TSCNET Services with regards to the enhancement of inter-RSC coordination and RSC cooperation on development issues. They are an illustration of the fact that enhanced cooperation between RSCs will be key to reaching our common target.



Maik Neubauer, Managing Director at TSCNET Services GmbH.

In mid-2013, the first two joint service providers by and for the European TSOs, TSCNET Services and immediately thereafter, Coreso, were launched to provide, step-by-step, all of the legally required services for the power transmission grid that can only be realised jointly or better and far more cost-effectively created together. Today, five years after these initial activities, we are in a position with our shareholders to make a first positive assessment: the model has proven itself from the very beginning, and it is getting better and more efficient almost every day. However, we also don't have any other choice - in view of the expansion of renewables and the mostly delayed extension of the grid, stabilization challenges continue to increase. Together, the RSCs and TSOs are able to manage these challenges! With this in mind, we are very much looking forward to further cooperation with Coreso and the other Regional Security Coordinators in Europe.



Jens Møller Birkebæk, Nordic RSC Manager at Energinet.

"The TSOs are responsible for ensuring a reliable power supply across Europe and they are working for the benefit of European society at large. This also holds true for the RSCs as service providers and is proven in their daily work and cooperation.

The RSC Working table was established in 2018 with the goal of enhancing collaboration amongst European RSCs, sharing development activities and creating the most efficient and reliable operational processes internally in the RSCs and across RSCs for the benefit of all stakeholders.

The European Power system will change significantly in the coming years, with different challenges from Region to Region. This will require regional prioritization but also enhance the need for close cooperation to ensure that all common services can be implemented as efficiently and as seamlessly as possible. The RSC Working table will be the fulcrum for the RSC's efforts in this respect and provide the RSCs with a common voice in stakeholder relations." Jens Møller Birkebæk, Nordic RSC Manager at Energinet.



Coreso CIM workshop

On 26 February 2018, Coreso's TSOs were invited to join the Coreso CIM Workshop. The objective of the one-day CIM, or Common Information Model, workshop was to align and share knowledge between TSOs and highlight the 2018 expectations for the CGM, or Common Grid Model, program. All nine TSOs were present and shared their experiences about the different aspects and scopes of the CGM project and the development of the Operational Planning Data environment,

the IT infrastructure for the CGM project. The workshop was organised to present the OPDE's central applications as well as the CGMES standard, which will be the future standard for the creation of Individual Grid Models. The event strengthened the links and exchanges between Coreso and the TSOs and offered the TSOs welcome support and guidance in their progress towards the use of the new data exchange format and data exchange infrastructure.



Christophe Lallemand, CGM programme manager at Coreso.

The aim of the CGM programme is to set up an Operational Planning Data Exchange platform, i.e. the IT structure. The platform will allow TSOs to exchange data on a Pan-European scale and serve as the basis for running the CGM process. Furthermore, the application will provide the capability to upload/download Individual Grid Models and Common Grid Models, validate the quality of the data submitted and provide the reference schedule for IntraDay, Day-Ahead and D-2 (two days in advance) as well as the Year Ahead format.



On-the-job immersion at Coreso

Several on-the-job immersions inside Coreso were organised in 2018. We have had the pleasure to welcome colleagues from different TSOs in order to present them Coreso's main missions and challenges. Our guests had the opportunity to follow a double shift with operators for a general overview of the different operational processes and were able to attend the daily Coreso/TSCNET Services video conference.

Furthermore, they got the chance to exchange with Project Engineers and Experts about Coreso's Project organization and portfolio. The main objective of these immersions is to give colleagues of the shareholders TSOs the opportunity to discover Coreso's activities and to experience a behind-the-scenes overview of regional cooperation.

31
JUL

Shareholders workshop at Coreso

The first of our two shareholders workshops was organised at the Coreso offices in Brussels. With all our shareholders around the table, the goal was to jointly identify and align on common challenges and confirm the project portfolio and roadmap. The workshops (the follow-up one

was held in early September) took place within the framework of the yearly update of Coreso's roadmap and enabled proactive alignment of our internal organisation with the expectations and needs of our shareholders to ensure effective support for current and upcoming challenges.



When there is a long list of projects, agreement on setting the right priorities is key, otherwise everything is considered equally important and people lose focus. The workshop Coreso organized certainly helped me to advise my board members about the right level of resources required to meet our expectations in an effective way.

Filip Carton, Head of the National Control Centre and member of the Coreso Governance Board (Elia).



These two workshops were very important for reaching alignment on major challenges and to provide the Board with all the information needed to dimension the company's resources for the next three years, within the context of implementing five services, in five regions and on five timeframes.

Olivier Arrivé is Operations Department Head at RTE.



Olaf Ziemann, Senior Manager Energy Turnaround and System Operation (50Hertz) and member of the Coreso Governance Board.

The TSOs and their Regional Security Coordinators are facing more and more challenges in Grid Operation. The implementation of processes and deliverables by Coreso to provide services and to fulfil the requirements of Network Codes can only be aligned and prioritised by taking shareholder expectations into consideration.



Stefano Montone, National Control Centre, National Dispatching (Terna).

The shareholder workshop held at Coreso's offices in Brussels on 31 July 2018 was characterized by proactivity and a goal-oriented approach. Coreso, with the full support of its shareholders, has proven that it is deeply committed to tackling not only current challenges, but also future ones. A draft reference plan was prepared during the workshop based on Coreso's goals and expectations for the coming years and on an analysis of what is currently being executed. The active involvement of all shareholders was subsequently requested via brainstorming sessions, ice-breakers and open discussions. Finally, a detailed overview of all of CORESO's current and future projects was drafted by the whole group, addressing priorities and highlighting criticalities. This way of working once again demonstrated Coreso's commitment to delivering high-quality services to its shareholders to ensure security of supply on a European basis

1
SEPT

Shift Organization Analysis finalized & implemented

In 2018, following years of organic growth, Coreso's operational staff was reorganized into two more focused teams, all within the same staffing contingent. Clear roles and responsibilities were defined, including the introduction of a shift leader. This optimized

structure allows for a more natural progression in training and career development. In addition, the operations day staff was restructured. A team leader was introduced in order to better focus on support for the shift teams and to prepare for the upcoming growth of the operations department.



This evolution of the organisation would not have been possible without the empowerment, buy-in and alignment of the respective teams, both top down and bottom up. It's an example of the maturity Coreso is gaining, which will be repeated in other parts of the company in the years to come. I would like to express my gratitude to all Coreso staff for their continued commitment, efforts and openness to change.

Jan Van Roost, Coreso COO.



1
SEPT

Arrival of Bart Van Brabant as Chief Information Officer

We had the pleasure of welcoming Bart Van Brabant to Coreso's management team. As Chief Information Officer, he follows in the footsteps of Mr Erik Wolfs who will take on the role of Coreso Enterprise IT Architect.

Coreso is actively preparing for the future of regional coordination and its related challenges thanks to this new structure and the strengthening of the IT team.

Coordination and the delivery of the 5 services is key for Coreso. These 5 services rely heavily on Applications, Systems and Networking Ecosystems. Exchanging data and information from TSO's to Coreso, apply specific calculations for i.e. Capacity Calculation, Security Analysis and Short-term Analysis are only one aspect of a multitude of tasks done by our operators and our computer systems.

The time window to provide the services is decreasing every year. In addition, more and more processes are being run within these timeframes. Investments in new and faster machines, better programming languages and the introduction of automation and intelligence will be key for the survival of Coreso in the years to come. The Clean Energy Package will also bring new challenges for Coreso teams. New services and processes need to be developed and supported by more complex applications, message streams and IT systems. The operations time window will become even narrower as will the margin for error.

Coreso will have to become a leader and a challenger and find ways to standardize, industrialize and automate its service delivery. Coreso will be the partner of choice for customers and authoring bodies across Europe and ICT is part of the total value chain, Bart Van Brabant, Coreso Chief Information Officer.



Bart Van Brabant, Coreso Chief Information Officer.

2018 IT Achievements:

- Setup of OPDE CGMA hosting for Entso-e.
- Migration of the CWE FB environment to our private cloud.
- Implementation of the automated platform for the CSE DA CC process.
- Definition of a data management catalogue to improve data quality and availability.
- Setup of our GIT as a first step in going to fully automated CI processes.

16
OCT

Power Coordination Europe Conference in Brussels

Under the title #PowerCoordinationEurope – “Think globally, Coordinate regionally and Act locally”, the second edition of the EISec, or ELectrical SEcurity Coordination conference was organised and hosted by Entso-E and Coreso in partnership with the Florence School of Regulation and the Energy Post. Over 250 participants from all of the different fields of the energy industry attended the

conference. They contributed to the lively discussions throughout the day and had a unique opportunity to explore the European electricity ‘stellar system’ with its local, national, regional and European dimensions, its market, operations, planning and innovation galaxies, with IT as the vehicle connecting the dots between them.



*Louise Nøhr Strange Nørring,
Business Analyst for Nordic RSC.*

Coreso took advantage of the conference location in Brussels to involve different stakeholders and broaden the debate beyond the TSO community. Regional electricity cooperation is becoming an increasingly integrated part of maintaining security of supply and understanding the dynamics behind this development is key for all stakeholders in the electricity community. The way in which Coreso involved all RSCs in planning the conference was a great example of the direction in which we are moving with RSCs sharing knowledge and supporting each other to achieve the best and most efficient results,



*Cassandre Lambert,
Communication Officer at Coreso.*

Coreso has worked for ten years to ensure coordination at the European regional level. Regional coordination is the key to developing and carrying out coordination services at the forefront of electricity system expertise. The #PowerCoordinationEurope conference was an opportunity to explore the way forward for the next decade with TSOs, RSCs, and other actors of the electricity sector in order to meet contemporary challenges. This event was a real success thanks to our 250 participants!



CORESO celebrated its

10th ANNIVERSARY



Coreso celebrated its first decade in 2018. On 16 October, the company marked the occasion with a dinner with the entire staff, past as well as present, to celebrate 10 years in business! The speeches of Olivier Arrivé (first Coreso CEO & RTE Operations Department Head), François Boulet (second Coreso CEO & RTE Regional Managing Director) and Patrick De Leener (third

Coreso CEO & ELIA Chief Officer Customers, Market & Systems) reflected on the evolution of this growing company that has managed to keep the innovative start-up spirit of its beginnings. This event was also attended by Cédric Auxenfans (Head of "RTE Lyon" Regional Operational Planning Department) and Jean-François Gahungu (Coreso CEO):



Jean-François Gahungu, Coreso CEO.

What a long way we've come since 2008 with a team of experts from different countries, all motivated by a genuine European approach for the benefit of Electricity System users! It all started with an idea which took root simultaneously within ELIA and RTE and was followed by an informal discussion between Daniel Dobbeni (ELIA) and Pierre Bornard (RTE). This was just the beginning of the adventure!

As a European Regional Security Coordinator, Coreso has facilitated the operational security of Europe's interconnected grid over the past 10 years. Coreso, along with the four other Regional

Security Coordinators, has overcome the many development obstacles of this shared regional view of the highly connected electricity network.



Of all my memories at Coreso, I would like to highlight two special periods: Of course, the first week of operational activities was something special. Coreso was only performing D-1 security analysis at the time, with just six Security and Coordination Engineers working on a day-ahead shift. Coming from a TSO, it was an exciting feeling to be in a start-up situation. But the most important thing was the feeling of great responsibility, of taking care of something (Coreso) both new and fragile, and making it grow, improving and developing its activities.



Olivier Arrivé, first Coreso CEO & Head of the Operations Department (RTE).

The second key period was, quite simultaneously, the start of 24-hour activities and the arrival of National Grid as a shareholder, with our first English colleague. It was in June 2009. I think it was a very important step:

- First because the arrival of NG and of an English colleague really made Coreso a European Company.
- Second, because developing intra-day activities after D-1 reinforced Coreso's added value and made Coreso more and more present in day-to-day system operations with the TSOs.

I wish Coreso a long life. It has grown a lot and become something amazing, beyond my wildest dreams in the beginning. For my part, I will continue, as a Board Member now, to do my best to help Coreso's development.



François Boulet, second Coreso CEO & RTE Regional Managing Director.

Based on my experience at Coreso, I want to focus on the people I have met, because Coreso is a people-based adventure in many ways. First, I would like to thank the members of the board who were all very supportive and strong leaders of their companies. I had the opportunity to explain the Coreso concept and reality to many visitors during the first years of Coreso's life. It was always very interesting to speak with people from many different horizons with differing opinions. But the people I will remember most are Coreso's employees. We came from many different countries, with different cultures and technical approaches but all shared the same energy and vision about what a coordination centre could offer European supply security. The spirit was that of a start-up and everyone participated actively in building the strong culture of innovation and cooperation that is now the Coreso DNA



Patrick De Leener, third Coreso CEO & ELIA Chief Officer Customers, Market & Systems.

I was lucky to be involved in setting up Coreso - together with Olivier - from the very beginning. Coreso started up in early 2008 with no more than six employees...

Based on the real belief of its founders in the need for international coordination, the mission these pioneers were given was to try out the idea of operational coordination beyond national borders. What started as a trial and a free initiative became a real success over time. The ideas and ways of working turned out to be a reference and were embedded in formal European legislation. The journey continues. A key success factor was, and still is, the people. They have a dynamic, international and entrepreneurial culture which combines operational expertise with the ability to develop solutions. They make a difference!



12th Coreso Operation Workshop at Red Eléctrica de España

The 12th edition of the Coreso Operation Workshop was hosted by REE in Madrid, Spain. The workshop offered a great opportunity to meet face-to-face with participants from all of Coreso's TSOs. The main topic of discussion concerned the various regional approaches

to capacity calculation. Furthermore, visits to the San Sebastian substation and the Spanish National Control Center (CECEOL) were included. We would like to express our special thanks to REE for their excellent hospitality.



We organized this event to facilitate networking between operators from every Coreso stakeholder, to learn together about the services to be delivered by the RSC, increase our knowledge about how real-time operations are carried out in Spain and contribute to the understanding of the different operational practices.

The aim of this workshop was to find a common best solution for current and future problems, learn from each other's experience and increase awareness about the relevant issues on the different parts of the network. We would like to highlight the quality of the presentations, along with the interesting content, professionalism, great participation of the assistants and excellent atmosphere throughout the workshop. The workshop provided a very fruitful forum for sharing operational experiences and for further improving the services provided to European society.

Gemma García, Senior Engineer at the Support Area of Spanish National Control Centre.



The goal of these meetings was to discuss operational matters (capacity calculation, security analysis, HVDC links...), to present different ways of working (for example, problems related to the integration of renewable production are not dealt with in the same way in the North and South of Europe), to have the opportunity to learn more about TSOs (each workshop was hosted by a different shareholder TSO) and to network with operators who usually only communicate by phone.

The preparation for the workshop was a challenge and the workshop itself was too! We received feedback from attendees who were pleased with the topics tackled, the warm atmosphere and the interesting visits to the substation and National Control Centre.

Jean-Louis Léonard, Security and Coordination Engineer at Coreso.

Coreso in numbers



25 new employees

joined Coreso's staff. The company has supported the implementation of new services, whilst structuring and standardizing its processes. This growth, including continuous staff rotation between Coreso and its TSOs, is reflected in this number.



69 employees

Coreso had 69 internal and external employees on 31 December 2018. There were six employees in 2008. Their international expertise in projects and processes benefits Coreso and all its shareholders on a daily basis.



11 different nationalities

work together in the capital of Europe.



+2 operator shifts were added

to accommodate the growing number of operational services. This increased the daily operational staff to 11 Security and Coordination Engineers.



19 interns

During 2018, Coreso welcomed 19 interns for short-term assignments (3 to 6 months) in light of their advanced studies. We would like to thank them all for their contributions and wish them the very best in pursuing their professional goals.



5 new operational processes

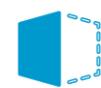
were introduced to the control room. Their purpose is to better accommodate the needs of our shareholders.



The 10-year anniversary marks **3,501 days of 24/7 continuous operation**, which started in June 2009.



1 new service, effective communication and coordination during critical grid situations, was introduced for all Coreso's shareholders.



Coreso office space was expanded by over **50%**.



28,690 hours of operator activity

in Coreso's control room. This is a **11%** increase from 2017. It is the result of the growth in operational activities. In addition, **5,000** hours were invested in double shifts, in order to train and educate new colleagues.



250 attendees were present at the #PowerCoordinationEurope EISec conference



5+ Mandatory services

Service 1

Common Grid Model delivery
The essential ground layer for coordination

Since its establishment as a Regional Coordination and Security Initiative in 2008, Coreso has strived to assist its TSOs with the daily management of the European power grid by providing a regional approach and vision.

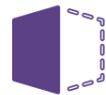
A regulatory framework was introduced by ENTSO-E in 2015. It formalised the concept of regional coordination and led to the creation of Regional Security Coordinators with well-defined roles and responsibilities.

5+ mandatory services have been defined within this framework. The RSCs are responsible for facilitating, improving and strengthening the operations of the European TSOs:

An efficient, large-scale exchange of detailed grid data between all European TSOs plays a vital role in all services delivered by Coreso. A dedicated telecommunications network enables the TSOs to provide Coreso with their most up-to-date grid data. Coreso is then in a position to monitor the quality of the data provided and to convert it into a single common grid model. Finally, Coreso uses this model as

a reference for all the services and makes it available to all TSOs and RSCs.

During 2018, Coreso successfully provided its shareholders daily with 1 CGM every 15 minutes with the most up-to-date grid information; 1 CGM each hour with the TSO's best forecast for the following hours and 1 CGM per day with the TSO's best forecast for the day-ahead horizon.



SERVICE 1 : Common Grid Model

Creation and distribution of a common grid model to augment the view of the interconnected European Grid.



SERVICE 2 : Security Analysis

Identification, analysis and coordinated remediation of operational risks on major transmission elements and grid elements close to national borders.



SERVICE 3 : Coordinated Capacity Calculation

The calculation of available cross-border transmission capacities within the safe operational limits of the power system.



SERVICE 4 : Short Term Adequacy forecasts

Identifying adequacy and scarcity risks at an early stage based on forecasted consumption, available generation, renewable potential and grid situation.



SERVICE 5 : Outage Planning Coordination

Alignment and optimisation of the TSOs individual outage schedules in order to avoid major grid disruptions.



SERVICE + : Critical Grid Situation

Efficient, clear and coordinated communication and actions in times of crisis.

Daily operational excellence, continuous improvement and increased reliability within each of these services form the basis for all of Coreso's daily activities. Coreso and its staff aim to provide the best service possible for the shareholder TSOs and effectively assist them in the daily management of the European power grid.

CGMS DELIVERED PER BUSINESS DAY

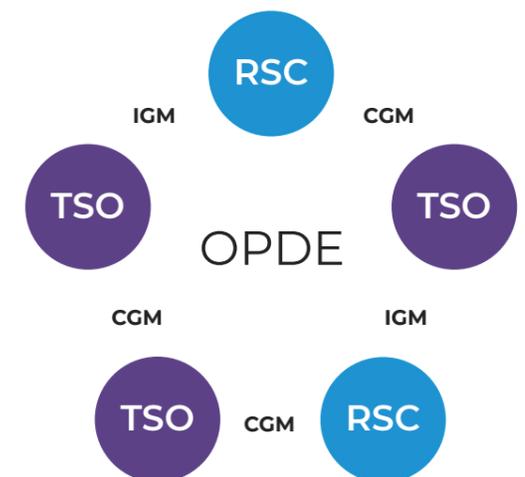


FACTS

Common Grid Model Program

In order to overcome the challenges posed by the energy transition, it is essential to increase the level of detail in the grid data exchanged among TSOs and RSCs and upgrade the IT-infrastructure that enables it. To that end, ENTSO-E launched the Common Grid Model Exchange Standard (CGMES) programme, aiming for an improved exchange standard, capable of integrating a large amount of grid details. New infrastructure to support the massive amount of data exchanged called the Operational Platform for Data Exchange (OPDE) is being developed by ENTSO-E together with the programme.

Coreso, as the merging entity, upgraded its tools during 2018 in order to accommodate the requirements of the new CGM Exchange Standard. In addition, Coreso is providing guidance and support to its shareholders and ENTSO-E to implement the CGMES and specify the central application of the OPDE as the business lead manager of the CGM program.



Security Analysis

Identifying operational risks and coordinating solutions

Service 2

Security forecasts for Central Western Europe (CWE)

The continuous integration of renewable energy sources (RES) in the area coordinated by Coreso (additional 4.2 GW of wind power and 4.9GW of solar power in 2018), increases the volume of volatile cross-border energy flows and encourages interdependency between TSOs. Grid incidents in one area may have major consequences for neighbouring zones, requiring TSOs to regionally coordinate security calculations.

With its global overview of the grid and in-house expertise on border areas, Coreso is ideally positioned to provide this security analysis for

its shareholders.

In 2018, Coreso performed security analysis for CWE, CSE and CEE on a daily basis. The analysis aims to identify potential security violations with a cross-border impact and provide the impacted TSOs with an efficient and optimal solution.

This security assessment strengthens the operational management of the TSOs and is essential in preventing large-scale security incidents with a cross-border impact.



FACTS

Inter RSC Coordination

With guidance from the ENTSO-E Inter RSC Project, Coreso and TSCNET Services launched a joint task force in 2018 to design a common process to efficiently deliver the Coordinated Security Analysis service in the capacity calculation regions where both RSCs are active.

New process for South Western Europe (SWE)

In 2018, Coreso started development of a process to deliver a security analysis service to the TSOs of the SWE region (REN, REE and RTE).

FIGURES

- The grid situation can be described as calm. Only a limited number of security constraints have been detected and the need for coordination is low.
- A stressed grid situation has been detected and coordination between TSOs and RSCs is needed to ensure optimal use of remedial actions.
- The situation is highly stressed. Extended coordination between the TSOs and RSCs is required and exceptional remedial actions need to be implemented.

D-1 Stress Level CWE in 2018

2018 shows an increase in stressed grid situations compared to 2017. One of the reasons for this rise in stress was the combination of increased volumes of volatile generation and the unexpected unavailability of conventional generation in Belgium over September – December. Both trends required close monitoring and the coordination of remedial actions.



Figure 1 D-1 Stress Level CWE 2018

Evolution of D-1 Stress Level CWE 2017-2018

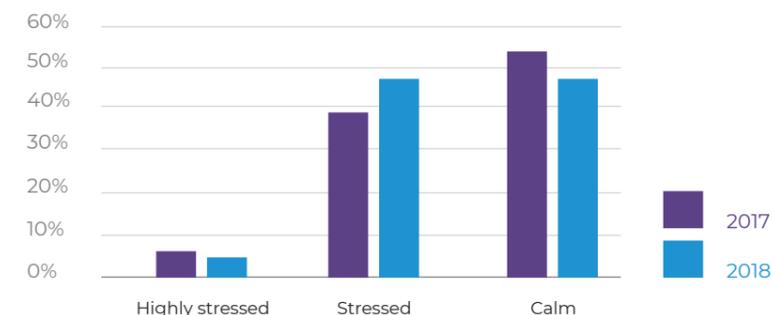


Figure 2 Evolution of D-1 stress Level CWE 2017-2018

Security forecasts for Central Southern Europe (CSE)



D-1 Stress Level CSE in 2018

Compared with 2017, 2018 saw an increase in highly stressed grid situations. One of the reasons for this rise in highly stressed situations was the combination of increased volumes of volatile generation and long-lasting, forced outages on the Swiss-Italian borders which required the coordination of exceptional remedial actions.

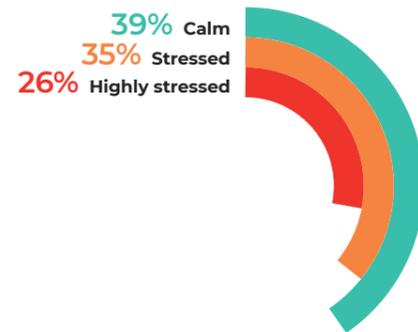


Figure 3 D-1 Stress level CSE 2018

Evolution of D-1 Stress Level CSE 2017-2018

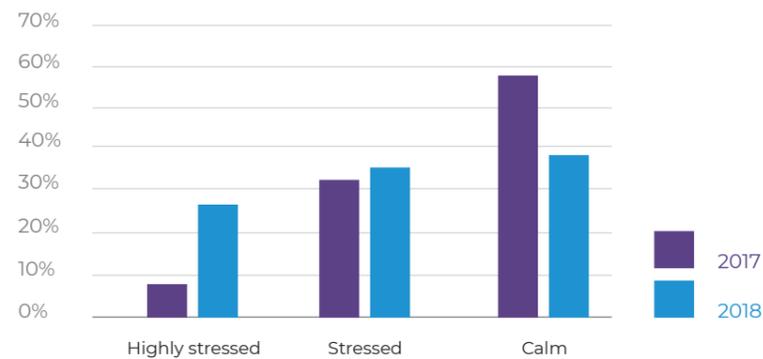
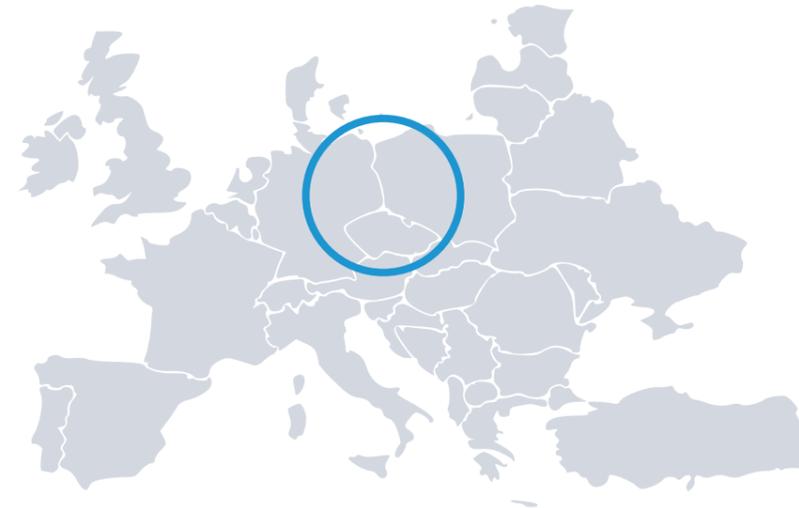


Figure 4 Evolution of D-1 Stress Level CSE 2017-2018

Security forecasts for Central Eastern Europe (CEE)



D-1 Stress Level CEE in 2018

Compared to 2017, 2018 saw a gradual decline in stress. One of the reasons for this decrease in stressed situations was the coordinated implementation of preventive (prior to day-ahead) generation re-dispatching.



Figure 5 D-1 Stress Level CEE 2018

Evolution of D-1 Stress Level CEE 2017-2018

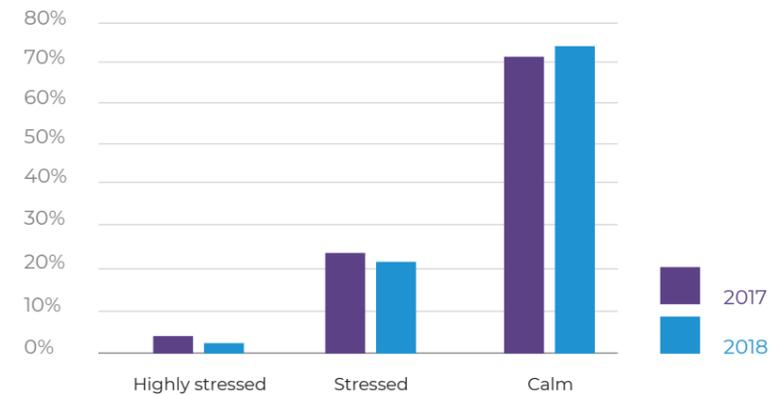


Figure 6 Evolution of D-1 Stress Level CEE 2017-2018

Service 3

Coordinated Capacity Calculation

Optimising cross-border energy transfer capacities to ensure the efficient use of available resources

In a society with growing renewable integration, decreasing conventional production and a stronger open market structure, cross-border energy exchanges play a vital role in the daily management of the interconnected energy

system. The import and export of energy enables an efficient use of the available generation resources, increases European economic welfare and can be crucial to maintaining security of supply in the event of local scarcity.

The volume of cross-border energy trading capacity is limited by the operational strength of the electrical grid. This operational strength is a dynamic value which is influenced by parameters such as:



Daily maintenance planning



Grid topology



Seasonal limits



Local stability restrictions

The precise determination of the threshold value ensures efficient and safe operation of the European Transmission system. An overestimation can lead to excessive trading volumes causing unacceptably high flows and security constraints. If the limit is set too low,

the number of trades is restricted and price divergence can lead to unnecessary economic losses. ENTSO-E has defined the calculation of these trading limits as one of the mandatory services provided by RSCs.

FACTS

CWE area:

The Flow-Based Market Coupling mechanism is implemented in the CWE area as the methodology used to precisely determine the

trading volumes for the day-ahead market. Coreso, in collaboration with TSCNET Services, has been responsible for the daily operation of the process since it started in 2015.

2018 milestones:

26/04/2018, Go-live of the 20% MinRam process:

To increase the available trading capacities for CWE market participants, a new methodology was implemented which guarantees that a minimum volume of 20% of the cross-border line capacity will be available for commercial energy trades.

01/10/2018, Go-live of the German – Austria market split:

After a successful parallel run over the summer period, a new market border was integrated in the CWE area. While before, Germany and Austria were considered a single market hub, this new border allows a more precise allocation of CWE energy transfer capacities.

CSE area:

Economic market trends and the geographical lay-out of this area require a specific regional approach to market organisation and the determination of trading capacities in the area. Coreso plays a major role as the entity responsible for the determination of day-ahead market capacities.

2018 milestones:

01/01/2018, start of the operational parallel run of the CSE Intraday capacity calculation:

Since the start of 2018, the CSE intraday capacity calculations, as an extension of the day-ahead calculations, are performed on a daily basis in an operation parallel run (execution of the process during business hours).

Channel region:

The area is characterised by the use of high-voltage DC interconnectors between two independent synchronous areas, with the United Kingdom on one side and continental Europe on the other. With the support of Coreso, the TSOs of the Channel region have developed a specific capacity calculation methodology. Over the course of 2018, Coreso performed the functional test of the Channel capacity calculation prototype, according to the business scenarios of the TSOs. The results were presented to the Channel experts' group.

2018 milestones:

29/11/2018, Approval of the Channel Capacity calculation methodology:

The proposed methodology for the Channel capacity calculation was approved by the national regulators of the Channel TSOs following successful test and experimentation results.

SWE area:

In 2016, a tailor-made project was launched between Coreso and the concerned TSOs for daily capacity calculation on the Iberian Peninsula. Within the scope of this project, a new methodology was developed to be able to handle certain region-specific challenges such as voltage limitations and angle constraints.

2018 milestones:

01/08/2018, start of the operational parallel run of the SWE D-2 capacity calculation:

The SWE D-2 capacity calculations entered the operational parallel run stage in the second part of 2018. The operational process was performed every weekday during the first stage, which ran until the beginning of 2019. Coreso provided a quality assessment of the results to further optimise the process.

Core region:

The Core region covers the whole CWE and CEE region and spans an area in which 16 TSOs are active. The aim is to extend the use of the Flow Based Market Coupling methodology, already successfully implemented in the CWE area, to the whole Core region and use this methodology as the single market coupling mechanism in the area.

2018 milestones:

15/10/2018, Core TSOs, in cooperation with RSCs active in the Core region (Coreso and TSCNET Services), launched an Internal Parallel Run:

the start of the internal parallel run followed the work of the Core TSOs and RSCs on the implementation of the Core region D-2 Flow Based Capacity Calculation methodology. During the Internal Parallel Run, Core TSOs and RSCs closely analysed the capacity calculation and market coupling results. During the first phase of the Internal Parallel Run, Coreso's experts supported frequent experimentation by providing the results of the Remedial Action Optimisation and the resulting Capacity Calculation.

Short Term Adequacy Maintaining the security of supply

Service 4

Service 5

Outage Planning Coordination Preserving the optimal condition of the interconnected grid

Given the increasing volumes of volatile generation, the frequent monitoring of generation adequacy plays a key role for the security of supply. Through the STA service, Coreso can anticipate lack-of-adequacy situations and determine, in cooperation with the TSOs, which mitigation actions on outages, load or generation will be most effective in

maintaining the security of supply.

In early 2019, the old acronym SMTA, for Short- and Medium-Term Adequacy, was renamed STA for Short Term Adequacy. To be coherent in formal documents, the M for Medium was deleted as medium-term adequacy refers to studies over a longer timeframe (1 to 10 years).

The regular and thorough maintenance of all grid assets is essential to ensure the high reliability of the interconnected power system. During maintenance periods, more commonly referred to as outage periods, a grid element is taken out of service and is temporarily unavailable for the transportation of energy. Every outage thus has a direct impact on the transport capacity and operational strength of the interconnected area. It is therefore vital to carefully plan and align all outages, in order to anticipate bottlenecks and assess the compatibility of outages.

The planning of each individual outage lies within the area of responsibility of the TSOs. However, because local actions in one area can have significant and possibly problematic effects on neighbouring areas, there is a significant need to share the information between all affected parties and assess the overall compatibility of the outages. This role is defined by ENTSO-E as Outage Planning Coordination and is one of the mandatory services of the RSCs for the European TSOs.

FACTS

Since the first go-live of the STA service in December 2017, Coreso has successfully delivered 52 weeks of service with a back-up RSC in cooperation with TSCNET Services, Nordic RSC, Baltic RSC and SCC.

In October-November 2018, the STA studies detected lack-of-adequacy situations in Belgium which were confirmed by the TSOs involved. In this case the STA was the trigger for the ENTSO-E Critical Grid Situation Communication process.

FACTS

The official and operational go-live of this service for Coreso's shareholders in the CWE, CSE, CEE and SWE areas was announced in 2018.

The coordination process was operationally implemented in two timeframes, a yearly and a week-ahead assessment.

FOSTERING DEVELOPMENT

ENTSO-E committed to fully implementing the STA methodology during 2018. Coreso guided and supported ENTSO-E, the RSCs and tool developers in the following tasks:

Integration

The integration of the following cross-regional elements in the STA methodology, which were welcomed by ENTSO-E and expected to be commissioned by 2020:

- daily calculations
- inflexible generation
- hydro generation
- tripping of HVDC links
- tripping of generation

Development

Development of the cross-regional industrialised tool, focusing on the needs of European TSOs, expected to be commissioned by 2020.

Development

The development of the Regional Adequacy Methodology, defining four working packages (Triggering actions, Regional process, Reporting and Business needs) in cooperation with TSOs and RSCs.



Go-live weekly assessment: **January 2018**

The weekly process provides a thorough week-in-advance assessment of all the planned outages together with a forecast of the operational circumstances and needs of energy consumers. The results of this study are

shared and discussed on a weekly basis with the TSOs and RSCs during a weekly teleconference, the WOPT or Weekly Outage Planning Teleconference.



Go-live yearly assessment: **November 2018**

The year-in-advance assessment aims to analyse all 52 weeks of the upcoming year in order to identify major outage incompatibilities at an early stage and enable the optimisation of individual outage plans.

Critical grid situation coordination

Leading coordination in times of crisis

Service +

Financial
Report

The interconnected power system can be confronted with impacting events at any time, which can lead to a critical grid situation. This is a state of the power system in which urgent,

swift and coordinated action is required in order to maintain operational safety and the security of supply.



A Critical Grid Situation is a potential emergency state identified in the operation planning phase. During a Critical Grid Situation, the regular countermeasures available are exhausted and therefore TSO(s) are required to take extraordinary regionally-coordinated countermeasures

Source: ENTSO-E

When faced with a tense situation, communication and alignment are essential as the consequences of these events could extend beyond the control area of the TSO. RSCs play the role of information propagator to all TSOs and lead the coordination by conducting studies

and proposing mitigation measures such as review of cross-border capacities, topological remedial actions and load flow re-dispatching.

As the process is only performed under critical situations, this service is defined as a + service.

FACTS

A critical grid situation was declared during the tense winter situation in Belgium resulting from possible adequacy issues following the unavailability of multiple nuclear production units. Coreso worked closely with Elia and acted as the RSC leader to tackle the situation. By coordinating with the neighbouring TSOs and RSC, a sufficiently high import level could always be guaranteed and no adequacy problems occurred in real time.

Due to the particularity of the CSE area, i.e. the peninsular structure of the North Italian border region, this area is sensitive to critical situations when one of the TSOs is confronted with adequacy issues. An operational crisis procedure was created in 2018, in alignment with all the impacted TSOs and in collaboration with TSCNET Services, in order to swiftly handle these risks. The procedure has not been triggered since its development, but it ensures the awareness of all involved parties.

A TSO

is confronted with a critical situation

The TSO warns its own RSC

The RSC aligns with the TSO concerning possible actions and a plan of approach

The RSC spreads the message to all other RSCs and its other shareholder TSOs

Each individual RSC informs its shareholder TSO

Note: a CGS can also be triggered by the ENTSO-E or an RSC based on the results of the coordinated adequacy processes.

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1.1 Board of Directors

The Board of Directors has the following members:

- Mr Pier Francesco Zanuzzi, Chairman of the Board of Directors, as of 19 April 2018;
- Mr Fintan Slye, Vice-Chairman of the Board of Directors, as of 19 April 2018;
- Mr Duncan Burt, director, as of 19 April 2018;
- Mr Dirk Biermann, director, as of 19 April 2018;
- RTE Réseau de Transport d'électricité SA, with Mr Sébastien Henry as its permanent representative, director, as of 19 April 2018;
- Mr Olivier Arrivé, director, as of 19 April 2018;
- Mr Enrico Maria Carlini, director, as of 26 October 2018;
- Ms Maria José Clara, director, as of 19 April 2018;
- Mr Patrick De Leener, director, as of 19 April 2018;
- Ms Pascale Fonck, director, as of 19 April 2018;
- Mr Tomás Domínguez Autrán, director, as of 19 April 2018;
- Mr Emilio Cerezo Diez, director, as of 19 April 2018;
- 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 2020 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 2021 Ordinary General Meeting that will be asked to approve the annual accounts as at 31 December 2020.

The directorships of Mr Philip Sheppard (who was also Vice-Chairman of the Board of Directors) and Mrs Brigitte Peyron expired at the Ordinary General Meeting of 19 April 2018. On 22 June 2018, Mr Pier Francesco Zanuzzi was reappointed as Chairman and M. Fintan Slye was appointed as Vice-Chairman, both for a period of 2 years. Mr Carlo Sabelli resigned as a director with effect as from 5 September 2018.

The Board of Directors met five times in 2018 (on 2 February, 19 April, 22 June, 26 October and 14 December 2018) 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 Jan Van Roost was appointed Chief Operating Officer, effective from 1 August 2017.

1.3 Auditors

The Ordinary General Meeting of 19 April 2018 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 Ordinary General Meeting to approve the annual accounts for the year ending 31 December 2020. 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 €13,430.00 per year, to be indexed annually in line with the consumer price index.

2.1 Coreso in a nutshell

Coordination of Electricity System Operators (Coreso), founded in 2008, encompasses nine European operators¹ 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 manage operations both in the short term and the long term. Coreso's mission is to proactively support TSOs to ensure security of supply on a European

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 joined and became a shareholder in Coreso on 15 December 2017.

² TSOs throughout the rest of the document.

regional basis. Coreso focuses its coordination activities and thus provides the highest added value from a year ahead until Intraday (a few hours before real time). Coreso, like the other RSCs, is a service provider of nationally regulated TSOs. The System Operation Guideline (European Commission) has defined recommendations for RSC activities since 2017.

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. Coreso has demonstrated a significant level of reliability and expertise in this field. 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 five mandatory services: Coordinated Security Analysis

In 2018, Coreso was able to provide D-1 (Day-Ahead, i.e. one day before real time) analysis and coordination services every day for the tenth 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's expectations.

In the longer term, some changes may have to be implemented, based on the SOGL's 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	The scope and timeline of the project to implement processes have been agreed with the concerned TSO, considering synergies and dependencies with the Common Grid Model Exchange Standard Program.
South Western Europe	Coreso and SWE TSOs have agreed on a plan to implement the Security Analysis process. It is foreseen that Coreso will start providing the process in the first half of 2019.

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

2.3.1 Capacity calculation on the Italian border (CSE³ area)

CALCULATION DATE	COMMENTS
Two Days Ahead (D-2)	D-2 capacity calculation ¹ service was launched in June 2016 ² . As a coordination centre (on behalf of APG ³ , Eles ⁴ , RTE, Swissgrid ⁵ 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)	Coreso currently delivers eight computations a day. The increase to 12 timestamps computed daily (technically feasible on Coreso side) is postponed giving additional time to assess the impact of the migration to CIM format related to the Common Grid Model Exchange Standard Program.
Intraday	Coreso started the operational parallel run early 2018. The CSE intraday capacity calculations, as an extension of the day ahead calculations, are performed daily in an operation parallel run (execution of the process during business hours). The Internal Parallel run was operated throughout the year 2018 with good quality results. Following CSE TSOs decisions, both algorithms (CORESO and TSCNET) will be used to perform TTC computations in parallel for the external parallel run and Go Live. External parallel run is in preparation for March 2019 Go-Live is foreseen in April 2019

¹ 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 which is geared towards a technically and economically optimised D-2 capacity system compared to the annual capacity calculation process. ² 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. ³ Austrian TSO ⁴ Slovenian TSO ⁵ Swiss TSO.

³ The CSE (Central South Europe) area comprises Italy, Slovenia, Switzerland, Austria and France.

2.3.2 Activities linked to the market coupling mechanism (CWE⁴ area)

Since May 2015, Day-Ahead market coupling within the CWE area has been based on the flow-based method⁵ 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 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 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	In 2017, 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. In 2018, due to the delays of the Common Grid Model Exchange Standard Program, the project planning was initially delayed. Finally, the CWE TSOs Steering Group decided in Q4 2018 to put the project on hold in the wait of the CGM program needed deliverables.

2.3.3 Day-Ahead capacity calculation using the flow-based method in the CORE area⁶

Following the European regulator ACER's⁷ 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, was formed by merging the CWE (Central West Europe) and CEE⁸ (Central East Europe) areas. CoreTSOs launched a 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.

The Internal Parallel Run started in 2018 as planned. Coreso has also established RSC data exchange (IT infrastructure), provides RAO results and operates the CC-tool on an alternating basis. An additional service is under preparation with Net Position forecasting. Coreso also supported the drafting of the Redispatching & CounterTrading methodology.

2.3.4 Day-Ahead Capacity Calculation in SWE⁹ region

The SWE platform was set up in Q2 2018 and was used for tests and the Internal Parallel Run. The Internal Parallel Run started in August calculating two timestamps four days a week. Since the fall of 2018, the SWE D-2 capacity calculations have entered the Operational Parallel Run stage. The next step, to calculate two timestamps seven days a week, started at the end of February 2019. The External Parallel Run is planned for May 2019, without angle and voltage monitoring.

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

Over the course of 2018, Coreso performed the functional test of the Channel capacity calculation prototype, according to the business scenarios of the TSOs.

⁴ The CWE (Central West Europe) area comprises the Netherlands, Germany, Belgium and France.

⁵ 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.

⁶ 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.

⁷ Agency for the Cooperation of Energy Regulators.

⁸ The CEE (Central East Europe) area comprises Germany, Austria, the Czech Republic, Hungary, Poland, Slovakia and Slovenia.

⁹ The SWE (Southern Western Europe) area comprises Spain, Portugal and France.

2.4 The five mandatory services: Short and Medium-Term Adequacy at the 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's capacity to transmit it to the country in need of energy.

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

Since the first go-live of the SMTA service in December 2017, Coreso has successfully delivered 52 weeks of service with a back-up RSC in cooperation with TSCNET, Nordic, Baltic and SCC RSCs.

In October-November 2018 the SMTA studies detected lack of adequacy situations for Belgium which were confirmed by the TSOs involved. In this case the SMTA was the trigger for the ENTSO-E Critical Grid Situation Communication process. In 2018, Coreso also contributed to the:

- Design of common principles for all TSOs for Regional Adequacy Assessment,
- Design of New Cross-Regional Methodologies to be implemented following requests from TSOs: outage rate, must-run generation, impact of DC tripping on adequacy and rolling window.

Finally, Coreso also supported ENTSO-E in the development of the industrialized Cross-Regional Tool.

2.5 The five mandatory services: Outage Planning Coordination (OPC)

This service consists in the alignment and optimization of the TSOs individual outage schedules in order to avoid major grid disruptions.

The official and operational go-live of this service took place in January 2018 for the week-ahead evaluation and in November 2018 for the year-ahead evaluation.

The year-in-advance assessment aims to analyse all 52 weeks of the upcoming year in order to identify incompatibilities of major outages in an early stage and enable optimization of individual outage plans.

The weekly process provides a week-in-advance assessment of all the planned outages together with a forecast of the operational circumstances and needs of the energy consumers. The results of this study are shared and discussed on a weekly basis with the TSOs and RSCs concerned during a weekly teleconference, the WOPT or Weekly Outage Planning Teleconference.

2.6 The five mandatory services: Improved delivery of the Individual/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 Operational Planning Data Environment (OPDE) exchange platform, and the quality assessment, merging and alignment Functions to build the Common Grid Model.

This represents major challenges:

- Implementation of a new IT architecture,
- Expertise and investment,
- Need for an agile approach with regard to projects, tools and processes to guarantee that future developments are fully compliant with the future format.

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

Significant steps were taken at Coreso to reinforce and put the appropriate organization in place in order to support testing tools (significant support of operators, structural organization of testing and documentation and individual feedback to the shareholders). This structure allows building of the needed documentation. Training was organized (internally and externally) and regular knowledge-sharing sessions are now in place.

2.7 Operational Services implemented for winter 2018-2019 preparation

Coreso, in collaboration with ENTSOE and the other RSCs, contributed to the implementation of a common approach within the ENTSO-E "Critical Grid Situations"¹⁰ Task Force.

As a leading RSC, Coreso has been actively involved in the Adequacy Risk for Elia for winter 2018-2019. Coreso launched a potential/likely critical grid situation message following the announcement by Elia and the government of the adequacy risk from mid-October on. This process will be managed based on the SMTA and the existing CGS process.

2.8 2019 Growth plan

To cope with the extension of its services and to manage related projects, Coreso organized two workshops with its shareholders. The workshops provided the opportunity to jointly identify the Coreso roadmap and validate the changes to the company structure to be put in place within Coreso to tackle the upcoming growth in FTEs resulting from the implementation of the activities embedded in the five mandatory services.

The growth plan and corresponding business plan were approved by shareholders in late 2018.

2.9 Organigram chart, job creation and reorganization of teams

Coreso continues to strengthen professionally.

- The organisational 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.

2.9.1 Operations

The new Shift Organization was implemented in 2018 (the operations teams are split into two equal groups of operators with a neutral budgetary impact). A follow up and feedback round is planned after six months. Providing options for the future shift organisation is part of the objectives.

2.9.2 Organization of the project team

In view of the application of European guidelines (the CACM guideline and the System Operation Guideline (SOGL)) and the expected rapid growth in activities, Coreso has prepared a roadmap of the needs identified for a period of three years. A new organization is being defined, taking into account these needs, such as the setting up of the adequate structure, the feedback of shareholders and a benchmark with other organizations.

2.9.3 IT reinforcement

A new Chief Information Officer joined Coreso on 3 September. Their first objective is to improve the maturity and professionalism of Coreso's IT Department with clear goals and structured IT processes.

The IT department was extended to be able to implement and maintain the different projects and platforms within the planned schedule. IT functions were added in 2018.

2.10 EISec 2018 – Conference on regional cooperation

The Conference on Electricity Security Coordination, the #PowerCoordinationEurope conference, took place on October 16th. The overall feedback confirmed that this event was a real success. More than 250 participants from policy, industry, academia and civil society attended the conference, contributing to the lively discussions throughout the day.

¹⁰ 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. [...]"

Outlook

3.1 Provision of coordinated services

In late 2015¹¹, European TSOs took up the commitment to establish five regional services and to appoint RSCs to perform the coordination services. Since then, two European Union regulations (guideline on electricity transmission system operation or System Operation Guideline¹² and guideline on Capacity Allocation & Congestion Management¹³) have been published to define recommendations and further describe the five mandatory services to be delivered by RSCs.

To summarise, the services can be described as follows:

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

The official roles and responsibilities of Coreso as RSC are now totally formalized within both these regulatory and contractual frameworks. It must be pointed out that Coreso fulfils its role in preparing full implementation of the five mandatory services but also acts as the 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 illustrated the extension of the five-services scope related to the implementation of network codes (Long-Term Capacity Calculation and Coordinated Security Analysis methodology).

Some discussions are also taking place regarding implementation of additional services. The upcoming legislative changes such as Clean Energy Package might have an impact on the future need for European coordination.

3.2 Cooperation between the five RSCs

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 illustrated the beginning of cooperation actions with other RSCs with the creation of the five RSCs' working table.

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 **coordinated work by RSCs and the TSOs**: a significant adaptation of certain processes and/or tools will be essential to cope with System needs and 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

Coreso has contributed to the "ENTSO-E inter-RSC coordination" and "Coordinated Security Analysis" Task Forces which aim to define the requirements needed for efficient operational coordination between RSCs and TSOs.

The company has no subsidiaries.

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

Subsidiaries

Events after the end of the year

¹¹ The multilateral agreement for RSC-based TSO cooperation was approved and signed by the TSOs at the ENTSO-E Assembly of 10 December 2015.

¹² The guideline on electricity transmission system operation entered into force on 2 August 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 are more and more interconnections and cross-border competition has been considered in the System Operation Guideline.

¹³ The Guideline on Capacity Allocation and Congestion Management entered into force on 24 July 2015. It sets out the methods for calculating how much space market participants can use on cross-border lines without endangering system security. It also harmonises how cross-border markets operate in Europe to increase competitiveness and renewables' integration. CACM is the cornerstone of a European single market for electricity.

6.1 Key figures

IN € THOUSANDS	2018	2017
EBITDA*	2,030.8	1,369.8
EBIT*	612.3	474.0
Net result (before tax)	603.5	470.6
Net result (after tax)	344.6	245.8
Solvency ratio	33.15%	43.06%
Liquidity ratio	52.50%	79.19%

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

6.2 Balance sheet

6.2.1 Assets

IN € THOUSANDS	2018	2017
Intangible fixed assets	3,154,0	1,522,6
Tangible fixed assets	2,254,4	1,560,5
NON-CURRENT ASSETS	5,408,4	3,083,1
Trade & receivables	2,658,7	1,207,1
Cash & cash equivalents	207,2	1,207,0
Deferred charges	91,5	117,4
CURRENT ASSETS	2,957,4	2,531,6
TOTAL ASSETS	8,365,8	5,614,7

6.2.2 Equity & Liabilities

IN € THOUSANDS	2018	2017
Capital	1,000,0	1,000,0
Reserves	88,1	70,9
Retained earnings	1,674,4	1,347,1
EQUITY	2,762,5	2,418,0
Current liabilities	5,472,8	3,147,8
Accrued charges/ deferred income	130,5	48,9
LIABILITIES	5,603,3	3,196,7
EQUITY & LIABILITIES	8,365,8	5,614,7

6.2.3 Notes

6.2.3.1 Fixed assets

Fixed assets include the following:

IN € THOUSANDS	2018	2017
Intangible assets	4,397,6	2,010,2
Depreciation intangible assets	(1,243,6)	(487,6)
Tangible assets	7,071,0	5,714,6
Depreciation tangible assets	(4,816,5)	(4,154,0)
TOTAL FIXED ASSETS	5,408,4	3,083,1

An amount of €3,743,8k was invested in 2018, of which €2,387,3k in software, €1,223,2k in hardware and the remaining €133,2k for the workspace reorganisation.

The net book value of fixed assets was €5,408,4k and includes the depreciations booked in 2018 totalling €1,418,4k.

6.2.3.2 Current assets

'Trade debtors' totalled €2,180k, compared to €789k at the end of 2017. The increase is due to the accrual for the settlement of operational services fees for 2018 (total invoices to issue: €968k), according to the 'cost-plus' mechanism.

'Other amounts receivable' consists mainly of recoverable taxes and VAT totalling €81k and a total of €397k in reimbursable social security contributions.

At year-end, the cash and cash equivalents amounted to €207k compared to €1,207k at the end of 2017.

6.2.3.3 Deferred charges and accrued income

This item comprises operating expenses to be deferred to accounting year 2018 (€91,5k).

6.2.3.4 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.

5% of the distributable profit (€344.6k) has been attributed to the legal reserve (€17.2k) and the remaining amount carried forward.

Equity amounted to €2,762k after appropriation of the 2018 result.

6.2.3.5 Debts

In 2018 Coreso subscribed a straight-loan (€1,600k) that can be renewed if necessary. 'Trade debts' at year-end 2018 totalled €2,881k. They relate to invoices not yet due totalling €941k and invoices to be received totalling €1,940k.

Social security liabilities cover many provisions such as holiday allowances, bonuses and personnel insurance. The total amount for this item is €922k.

An amount of €69k is recorded under 'Tax debts' and relates to corporate income tax payable on the results of accounting years 2016 and 2017.

6.2.3.6 Accrued charges and deferred income

This item mainly comprises deferred income totalling €130,5k.

6.3 Income statement

IN € THOUSANDS	2018	2017
Turnover	12,858,9	9,954,8
Other operating income	841,4	561,3
OPERATING INCOME	13,700,3	10,516,1
Services and other goods	(6,097,3)	(4,808,0)
Remuneration, social security & pensions	(5,571,7)	(4,338,3)
Depreciation	(1,418,4)	(895,8)
Other operating expenses	(0,5)	
OPERATING CHARGES	(13,088,0)	(10,042,1)
OPERATING RESULT	612,3	474,0
FINANCIAL INCOME	0,7	0,0
FINANCIAL CHARGES	(9,5)	(4,0)
TAXES	(258,9)	(224,3)
NET RESULT	344,5	245,7

6.3.1 Operating income

Operating income can be subdivided as follows:

IN € THOUSANDS	2018	2017
Service fees	12,858.9	9,954.8
Other operating income	841.4	561.3
Total	13,700.3	10,516.1

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

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

6.3.2 Services and other goods

Services and other goods totalled €6.097k in 2018 (compared to €4.808k in 2017) and relate mainly to the costs of IT maintenance and consultants. The increase is due to greater Coreso activity.

6.3.3 Personnel expenses

Remuneration and social security costs are broken down as follows:

IN € THOUSANDS	2018	2017
Remuneration	4,228.5	3,252.3
Social security costs	1,284.3	1,049.6
Other social security expenses	58.8	36.4
Total	5,571.7	4,338.3

The increase is due to the increase in full-time equivalents from 35.3 in 2017 to 44.7 in 2018.

6.3.4 Depreciation

Depreciation of property, plant and equipment totalled €1.418k. It 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 €-9k was recorded for 2018, mainly due to interest on the new loan.

6.3.6 Taxes

Profit before tax amounted to €603k in 2018. After applying notional interest and considering disallowed costs, Coreso's corporate income tax amount for 2018 is €259k.

6.3.7 Net profit

In 2018 Coreso realized a net profit after tax of €345k.

6.4 Appropriation account

At the Ordinary General Meeting to be held on 11 April 2019, the Board of Directors will propose the following appropriation:

IN € THOUSANDS	2018	2017
Profit of the accounting year	344.6	245.8
Profit carried forward from the previous year	1,347.1	1,113.6
Appropriation to the legal reserve	17.2	12.3
Distribution of the dividend	0.0	0.0
Result to be carried forward	1,674.4	1,347.1

Description of the risks and uncertainties facing the company

6.5 Financial instruments

Coreso does not use financial instruments.

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 ICT¹⁴ 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 for the ICT infrastructure is also backed up by uninterruptible power supply systems in Brussels and Lomme (France).

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 four business plan scenarios regarding the future organizational structure of Coreso. After internal discussion, it has been decided to initiate the actions related to the most robust scenario to meet Coreso's needs in an evolving environment.

This scenario for the 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 focus on proactively addressing shareholder requests as well as on finance, governance and staffing additions 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.

¹⁴ Information and Communication Technologies.

Glossary

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 over the next years as cooperation between RSCs and the provision of new services such as Short and Medium-Term Adequacy at the European level create conditions for an increase of shared activities Europe-wide.

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 Coreso's ability to maintain high-quality service for 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.

Coreso has its own "Development Unit" to define calculation methodologies, develop tools and implement new services and it collaborates with, among other partners, the 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 11th, 2019

Robin Mc Cormick
Director

Emilio Cerezo Diez
Director

Research and Development

50Hertz: One of the German TSOs. Visit the website at www.50hertz.com/en.

Baltic RSC: The RSC of the Baltic region. Visit the website at www.baltic-rsc.eu

CEE: Central Eastern Europe

CGM: Common Grid Model

CGMES standard: Common Grid Model Exchange Standard

CIM: Common Information Model

CSE: Central Southern Europe

CWE: Central Western Europe

D-2: Two days in advance of the target date

EirGrid: The Irish TSO. Visit the website at www.eirgridgroup.com.

Elia: The Belgian TSO. Visit the website at www.elia.be/en.

EISec conference: Electrical Security Coordination Conference

ENTSO-E: European Network of Transmission System Operators for Electricity. Visit the website at www.entsoe.eu

HVDC: High-Voltage Direct Current

IGM: Individual Grid model

National Grid: The United Kingdom TSO. Visit the website at www.nationalgrid.com/uk.

Nordic RSC: The Nordic region RSC. Visit the website at www.nordic-rsc.net.

OPC: Outage Planning Coordination

OPDE: Operational Planning Data Environment
RAO: Remedial Action Optimisation

REE: Red Eléctrica de España. The Spanish TSO. Visit the website at www.ree.es/en.

REN: Redes Energéticas Nacionais. The Portuguese TSO. Visit the website at www.ren.pt/en-GB.

RES: Renewable Energy Sources

RSC: Regional Security Coordinator

RTE: Réseau de transport d'électricité. The French TSO. Visit the website at www.rte-france.com.

SCC: Security Coordination Center. The South Eastern European region RSC. Visit the website at www.scc-rsci.com.

SMTA: Short- and Medium-Term Adequacy

SONI: System Operator of Northern Ireland. The Northern Ireland TSO. Visit the website at www.soni.ltd.uk.

STA: Short Term Adequacy

SWE: South Western Europe

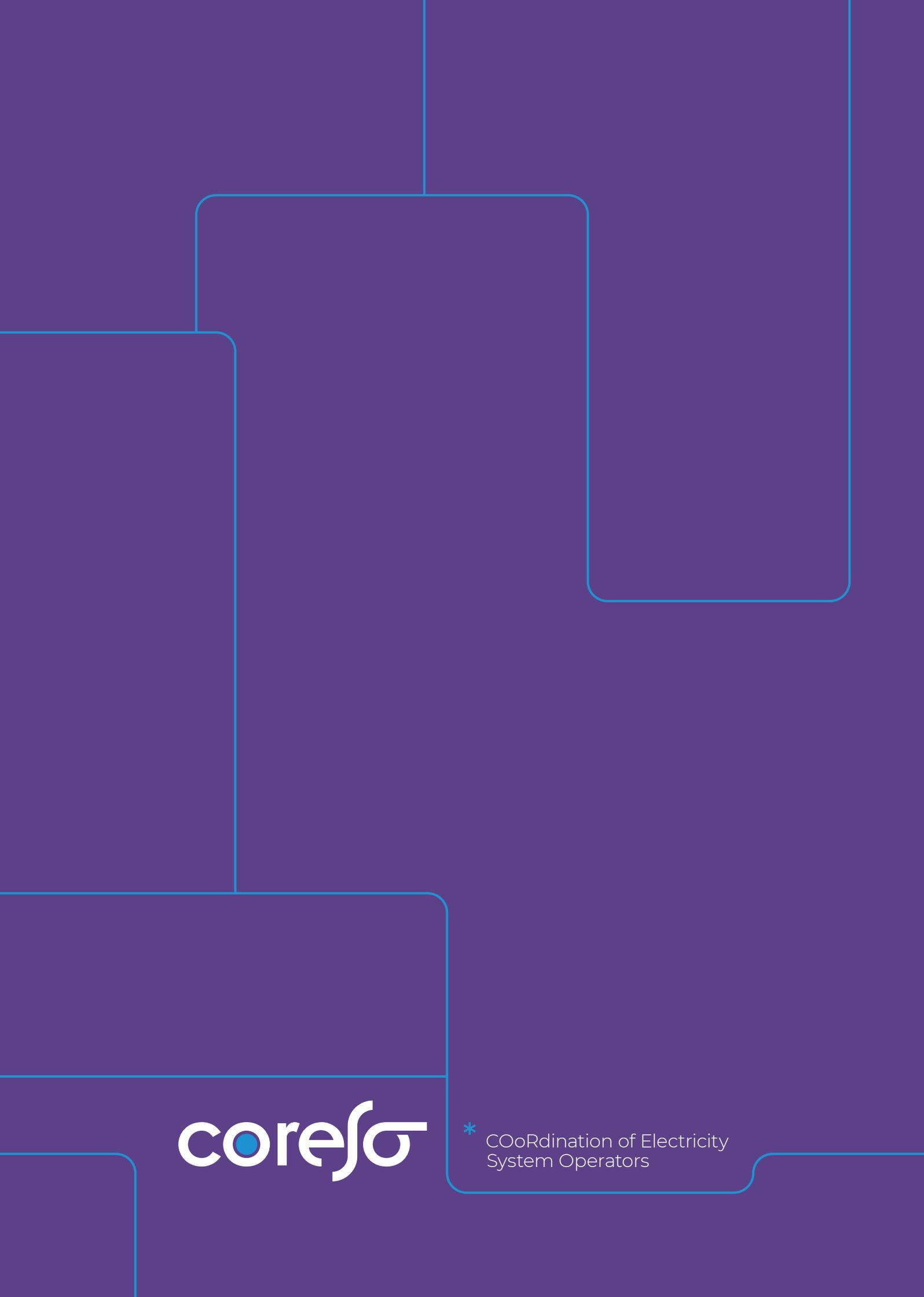
Terna: The Italian TSO. Visit the website at www.terna.it.

TSCNET Services: The RSC of the 13 TSOs that are TSC (TSO Security Cooperation) members. Visit the website at www.tscnet.eu.

TSO: Transmission System Operator

WOPT: Weekly Outage Planning Teleconference

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