The 50 Year Success Story – Evolution of a European Interconnected Grid

23 May 1951
Foundation of UCPTE in Paris.

27 May 1952
France, Italy, the Federal Republic of Germany and the Benelux countries sign the agreement to form a European Defense Community.

09 December 1952

NATO announces the defence principle of "massive retaliation".

28 February 1953

Greece, Turkey and Yugoslavia sign a Treaty of Friendship.

01 July 1953

The European Organization for Nuclear Research (CERN) is founded by twelve European states.

PREFACE

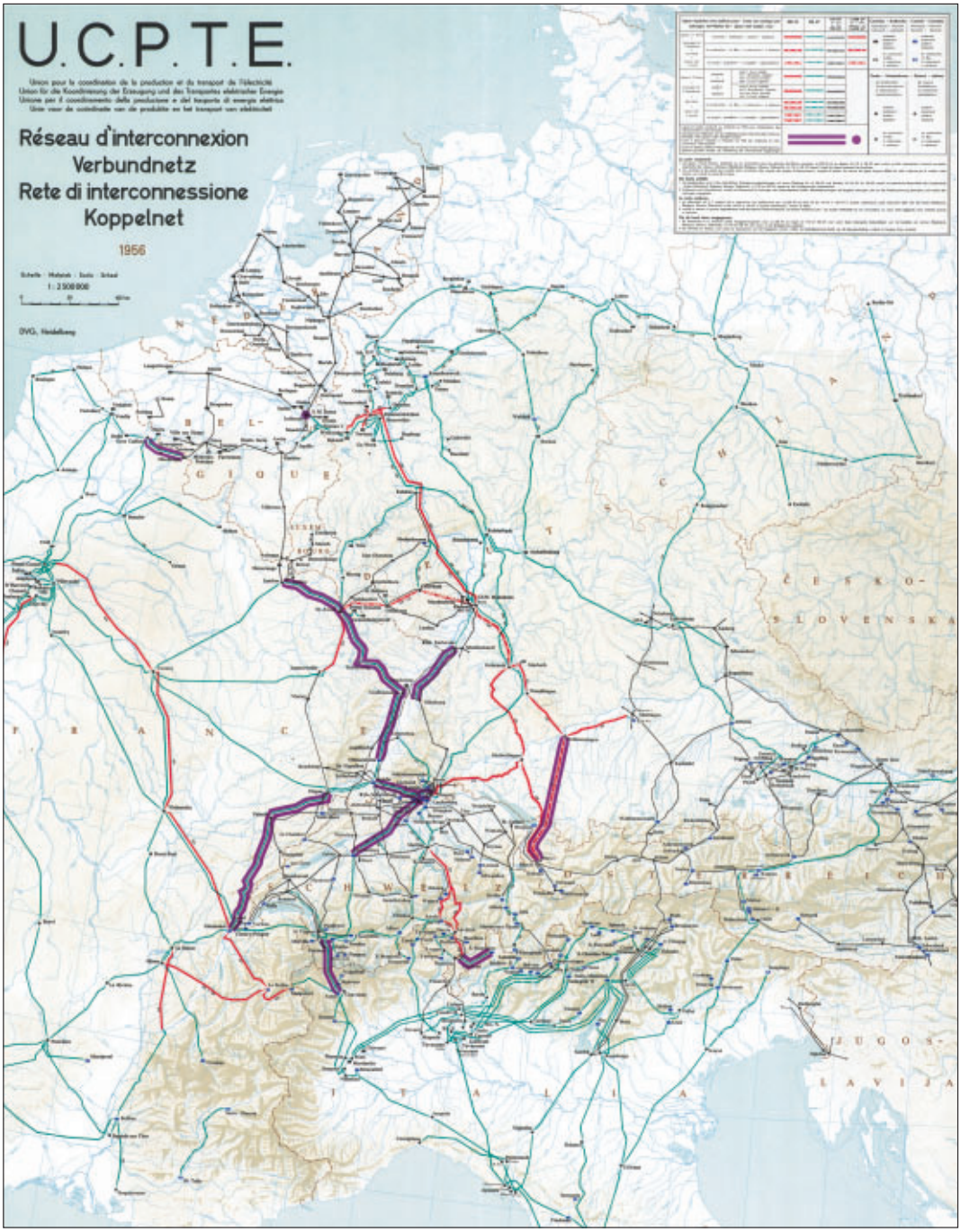
The very fact that an organisation can celebrate a very intensive history of nearly 60 years legitimates the publication of an overview of its emergence, its development, its operations and its successes. But when the 58th birthday at the same time marks the breakup of the celebratee, the composition of a historical reflection becomes absolutely mandatory!

In this book please read about the important facts and figures in the history of UCPTE and UCTE until its transition into ENTSO-E (European Network of Transmission System Operators for Electricity) which on 01 July 2009 took over all operational tasks of the 6 existing TSO associations in Europe, including UCTE, the Union for the Coordination of Transmission of Electricity.

The timeline at the bottom of the pages sets the development of the organization into the frame of the political developments in Europe, using some probably less known examples of events bringing the countries of a continent closer together. Please note that the linear timeline can not exactly correspond to the events described in the chronolgy of UCPTE and UCTE.

25 March 1954
The USSR grants the GDR full sovereignty.

05 October 1954
Trieste is returned to Italy after being under the control of Yugoslavia.



05 May 1955
The FRG accedes to NATO.

15 May 1955
Austria reclaims full sovereignty by signing the Austrian State Treaty in Vienna.

21 March 1956
Disarmament talks are held between the USA, UK, France, Canada and USSR in London.

Infrastructures, such as roads and electricity networks, are among the largest and most important technical artefacts that exist today. They are omnipresent, pervasive, entrenched in the socio-economic landscape and increasingly taken for granted. They are also considered an important precondition for modernity. According to electrical engineers, rationalisation was one of the fundamental elements "strongly associated with the techniques and devices of modernity, especially those that could be seen as challenging physical and conceptual boundaries". Among infrastructures, electricity and road networks have a special position in modern history as they can be regarded as epitomising technological infrastructures of the 20th century. During that century both networks underwent profound changes and they themselves changed everyday life significantly.

This book will provide an overview of how the producers and distributors of electrical energy in the countries of Europe developed, making it possible to meet the growing demand for electricity around Europe safely and reliably.

25 March 1957

The European Economic Community is established (Treaties of Rome signed by Belgium, France, Italy, Luxembourg, the Netherlands and the Federal Republic of Germany).

THE START OF THE EXCHANGE OF ELECTRICITY BETWEEN COUNTRIES

From 1921 onwards, it was possible to transmit electric power from Nancy, France, via Switzerland to the area around Milan, Italy, representing a distance of roughly 700 km. The start of the exchange of electricity between countries created several hurdles and challenges, meaning that coordination was vital. The International Union of Producers and Distributors of Electrical Energy (UNIPEDE) was subsequently established in 1925 by the electrotechnical industries of Italy, France and Belgium and many more members joined soon after.

Although in earlier decades, starting roughly in the 1920s, a few Western European countries had cross-border electricity connections, there was no coordinating body. Some international cooperation did, however, take place between 1910 and World War II, most notably in Scandinavia, Switzerland, and between France and some of its neighbours.

The first proposal for a Europe-wide electricity network was made in May 1929. George Viel, the director of "Compagnie électrique de la Loire et du Centre", put forward a proposal for a European 400 kV network at a meeting of the Groupe du Sud-Est de la Société française des Electriciens. "To be able to exchange electricity on a seasonal basis with neighbours, and to provide emergency assistance, France should consider the use of 400 kV lines", stated his proposal. Viel's ideas were not put into practice, but he had set the ball rolling. At such a voltage, electric current could be transmitted over 1,000 km with less loss of energy.

During World War II

World War II imposed heavy burdens on the electricity supply industry. Power plant maintenance fell behind schedule and operating conditions deteriorated, while destruction due to fighting and bombardment adversely affected the general situation. According to records, the potential power demand in 1945 was 50 % higher than in 1937. The capacity that still existed, however, was in disarray. Without a sound reconstructed electricity supply, European economic growth would prove hard to achieve and planned coordination of Europe's capacity to produce electricity, in the short and long term, was deemed indispensable. The existing capacity needed to be expanded and also had to be operated with a higher degree of efficiency. For the foreseeable future, new production capacity had to be planned to achieve the most efficient result possible.

02 October 1957
The Polish foreign minister, Adam Rapacki, presents his plan for a nuclear-weapon-free Europe to the United Nations General Assembly.

25 January 1958
First meeting of the Council of the European Economic Community (EEC) and the European Atomic Energy Community (EURATOM) in Brussels.

03 February 1958
The treaty establishing an economic union between the Netherlands, Belgium and Luxembourg is signed.

After World War II

After the war, the power plants and electrical grids first needed to be repaired and new building programmes had to be drawn up. This work was made easier by the establishment of the "PANEL". This organisation, the "Public Utilities Panel", met regularly and represented the managers of the electricity supply companies in Western Europe and the United Kingdom. Some members of the "PANEL" also came together later on the Electricity Committee of the Organisation for European Economic Co-operation (OEEC), which was established in 1948. At the initiative of the American agency responsible for administering the Marshall Plan, the "Economic Cooperation Administration (ECA)", the Electricity Committee organised a trip to the United States of America for experts from the European electricity supply industry so that they could study the advances that had been made in the area of interconnected operation in the United States during the war. This trip, the first technical study trip in the context of the Marshall Plan, and therefore known as the "Tecaid Mission", took place in the spring of 1949.

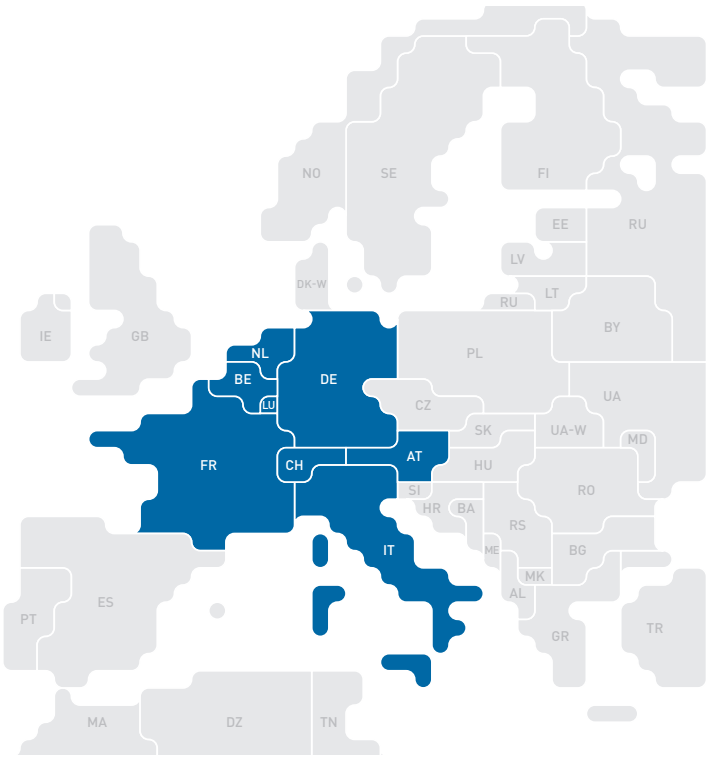
The French foreign minister, Robert Schuman, was to propose a new scheme; one based on a plan drawn up by Jean Monnet. Jean Omer Marie Gabriel Monnet was regarded as a chief architect of European unity, but was never elected to public office. He worked behind the scenes of American and European governments as a well-connected pragmatic internationalist. In essence, the idea was that a High Authority would be made responsible for the control of steel and coal production in France and Germany, but that it should also be open to other European countries. "The solidarity in production thus established will make it plain that any war between France and Germany becomes not merely unthinkable but materially impossible", Schuman declared on 9 May 1950. Within weeks of Schuman's announcement, Monnet was heading an international group which was to conclude an agreement for a European Coal and Steel Community (ECSC). Belgium, the Netherlands, Luxembourg and Italy all joined France and Germany (the Six) in signing the ECSC Treaty in April 1951. By the summer of 1952, the Treaty had been ratified and the High Authority, the first of the modern-day European Community institutions, had begun its work.

At this time, coal was still by far the dominant energy source in Europe, accounting for 70 per cent of primary energy within the six members of the Community, for example. Hydro power still occupied a greater share of the electricity matrix than thermal generation in France and Italy (as well as in Austria, Norway, Sweden and Switzerland), but, overall, coal and lignite were to remain the major fuel sources throughout the 1950s. In a time of persistent shortages, the intended liberalisation of the coal market through the ECSC was undoubtedly of significance to the generators.

11 May 1959
The Foreign Ministers' Conference of the four victorious powers starts in Geneva on the issue of Germany and Berlin.

20 November 1959
The European Free Trade Association (EFTA) is founded by the UK, Denmark, Sweden, Norway, Austria, Portugal and Switzerland.

After World War II a closely intertwined process of both increased interconnection and institutionalisation took place. The start of what was to become one of the greatest European integration projects ever was realised on 23 May 1951. Amidst the ashes left by World War II, a powerful idea was born as a consequence of the Marshall Plan to set the Old Continent back on its feet. The first step was unavoidable. Initially, the purpose of this was to make the most effective use of the limited energy resources remaining after the havoc of war. Western Europe gradually became more interconnected, with more exchange taking place. The governments of 8 countries (Belgium, Federal Republic of Germany, France, Italy, Luxembourg, the Netherlands, Austria and Switzerland) each appointed representatives, who met on 16 February, 17 March and 11 April 1951 under the chairmanship of Mr Crescent, the Vice-President of the Electricity Committee of the "Organisation for European Economic Co-operation (OEEC)".



04 January 1960
The Convention on the formation of the European Free Trade Association (EFTA) is signed in Stockholm.

16 August 1960
Archbishop Makarios III declares the independence of the Republic of Cyprus.

10 February 1961
Closer political cooperation is agreed at a meeting in Paris of the six heads of state of the countries of the EEC.

1960 JAN FEB MAR APR MAY JUNE JULY AUG SEPT OCT NOV DEC 1961 JAN FEB MAR

Together the representatives worked out the articles of association of the Union for the Coordination of Production and Transmission of Electricity (UCPTE) in accordance with the guidelines enclosed with the recommendation of the Council. These articles of association were accepted at the inaugural meeting of the UCPTE, held on 23 May 1951 at Chateau de la Muette, the headquarters of the OEEC, in Paris. The founder members were also listed in the articles of association. As the tasks of the UCPTE related primarily to operational management, the group of founder members was different from the group that had developed the articles. In 1954, the articles were amended slightly to ensure that extraordinary members could also be admitted.

The UCPTE's original role was to contribute to the development of economic activity through the more effective use of energy resources that was enabled by the interconnection of electricity networks. Its members were selected from the management authorities of electricity production and transmission systems in the eight countries. In some respects, the UCPTE was born out of the process of reconstruction in the immediate post-war years. The grids of the eight founder members Belgium, Federal Republik of Germany, France, Italy, Luxembourg, the Netherlands, Austria and Switzerland were substantially extended eastwards and to the west by the grids of Greece, Yugoslavia resp. Portugal and Spain later on.

One can therefore state that the objectives of the UCPTE at the time of its foundation were obviously different from those today. Fuel economy was the central focus of the joint work undertaken during the first phase of reconstruction, which was still marked by the effects of the war. The main objective of the UCPTE was to ensure the optimum operation of electric power plants. For example, a surplus of production in countries where generation was based mainly upon hydroelectric facilities might be used to balance a shortfall in production beyond the frontiers of those countries, thereby allowing savings in coal consumption to be achieved in the neighbouring countries concerned. Preventing the loss of surplus production of this kind was one of the first major successes of the UCPTE.

01 October 1961

The Organisation for Economic Co-operation and Development (OECD) is founded in Paris by eight European states, the USA and Canada.

14 January 1962

The member states of the EEC decide to integrate agriculture into the Common Market.

1962 | The Grids in Northeastern Germany/Netherlands

It was not only Western Europe that became more integrated. The coordinated effort within the COMECON framework also bore fruit. Between 1959 and 1962 an electricity grid was developed through bilateral links coordinated by the Central Dispatch Organisation of the Interconnected Power Systems (CDO/IPS) in Prague.

The Council for Mutual Economic Assistance (abbreviated in English to COMECON, CMEA, or CAME) which existed between 1949 and 1991, was an economic organisation of states under Soviet Union leadership and a kind of Eastern Bloc equivalent to the European Economic Community, although it was less geographically inclusive than the latter. The military equivalent to COMECON was the Warsaw Pact, though COMECON's membership was significantly wider. COMECON was the Eastern Bloc's reply to the formation of the OEEC.

And still, between the two sides interconnections were lacking. 24 HV-lines between countries in Eastern Europe were nevertheless lagging. The East-West connection between the Soviet zone and the Western zone of Berlin – a city at the 'heart' of the Cold War – was shut off in 1952.

The efforts made since the foundation of the UCPTE to make the best possible use of energy, to improve the security of supply and to use plants economically quickly proved successful. Some of the results achieved are listed below:

- Information on the energy available in the individual UCPTE countries was systematically compiled and made accessible to all;
- Losses of possible additional production by hydroelectric plants were avoided through international cooperation;
- The exchange of electricity between countries was liberalised and the allocation of the necessary foreign currencies was regulated; this happened at a time when international trade as a whole was still subject to restrictions and strict controls;
- The regional high-voltage grids were initially connected to one another bilaterally, but soon they were connected multilaterally using rings and close meshes. At that time, the regional grids of twelve countries already formed a high-voltage grid with a uniform voltage level;
- Parallel to the further development of the exchange of electricity the grid technology evolved, too – in particular the means of communication between the partners. The many tasks involved here were spread equally amongst the partners.

10 December 1963
The Nobel Peace Prize is awarded to the International Committee of the Red Cross on its centenary.

23 March 1964
The UN World Trade Conference opens in Geneva.

OCT NOV DEC JAN FEB MAR APR MAY JUNE JULY AUG SEPT OCT NOV DEC

1964

By 1957 the OEEC reported that it had cooperated with the UCPTE in studying certain problems: "The liberalisation of occasional exchanges of electricity has been achieved by joint effort; in case of need a country may obtain emergency supplies from neighbouring countries, with a minimum of delay. That occurs merely by putting through a telephone call." Remarkably, this informal system was to survive for the rest of the century.

A range of other organisations also played a role in trying to promote the development of the electricity industry, not least the United Nations Economic Commission for Europe (UNECE), which had a committee on electric power, the World Energy Council, the International Commission for Major Dams, the International Conference on Large High Voltage Electric Systems (CIGRE) and the International Federation of Industrial Self-Consumer Producers of Electricity (FIPACE) formed in 1952.

There was some overlap between the organisations; in the field of electric power, for example. However, with regard to the search for a more optimal exploitation of energy resources, the biggest divergence between the UNECE and OEEC lay in the geographical scale of both their members and solutions. While the OEEC was composed of 16 mainly Western European states, the UNECE also included Central and Eastern European members.

After 1954, Eastern European countries started to collaborate in the UNECE, culminating in their admission to the UN in 1955. Other changes also helped to improve contact between East and West, which encouraged the establishment of interconnections. A process of change had been sparked by the Moscow Economic Conference of April 1952. There, Moscow announced renewed interest in trading with Western Europe. As a result East-West trade increased significantly – for instance in electricity, too. Another crucial development in the late 1950s and early 1960s was the development of an interconnected power system in Eastern Europe, the CDO/IPS. After all, this meant that both East and West had their own regional synchronous electricity supply networks.

01 January 1965
Tariffs within the EEC are reduced by 10%.

16 July 1965
The Mont Blanc Tunnel between France and Italy is officially opened.

21 Febuary 1966
France announces its withdrawal from NATO.

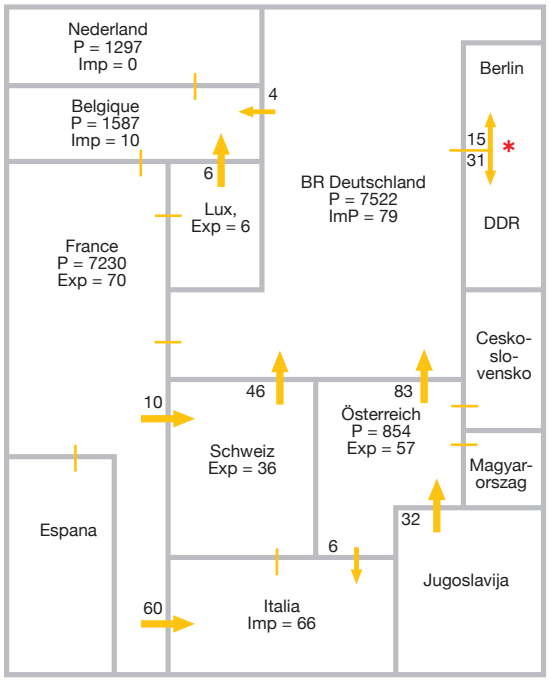
1965 JAN FEB MAR APR MAY JUNE JULY AUG SEPT OCT NOV DEC 1966 JAN FEB MAR

LIBERALISATION OF ELECTRICITY SUPPLIES

To ensure that countries that urgently needed free energy from other countries were also able to import it, it was necessary to make sure as soon as possible that such supplies were not restricted by national foreign exchange allocations. In the early 50's, the UCPTE turned to the OEEC and also provided it with the necessary documents. Thanks to the joint effort of the UCPTE and OEEC, the Council of the OEEC decided to recommend to governments that electricity supplies be liberalised. This liberalisation took place in three stages on the basis of three decisions made by the Council of the OEEC. In 1953 occasional electricity supplies were liberalised, i.e. supplies which were used to avoid water being lost or to help out a country whose operation was disrupted by failures in the grid. In 1956, seasonal supplies were liberalised, i.e. supplies with an obligation of less than six months, and 1959 saw the abolition of foreign exchange allocation in this area and consequently the extension of liberalisation to all electricity supplies.

Besides seemingly political objections, technical issues as well hampered East-West interconnections. Synchronous operation between the UCPTE and Central Dispatch Organisation (CDO/IPS) grids was not possible at that time, despite a similar but not synchronized grid frequency of 50 Hz. The grids were not operated with the same precision, thus ruling out exchange without extensive adjustments being made. The operation of such a large grid was another major problem at the time.

Electricity exchanges 1955 (in GWh)



* Exchange East/West Berlin

In 1955 the supply of electric power was primarily a national task. Cross-border exchange had not been developed as a business at this time. However, it was considered to be a welcome opportunity that enabled a country to improve its own situation. Exchange was feasible in this period and was realised up to a capacity of 100 MW. Some countries were not involved in a regular exchange of electricity. Exchange was only possible within the UCPTE countries. No cables existed from the UCPTE area to other synchronous areas.

17 January 1967

The Eurocontrol Experimental Centre (European Organisation for the Safety of Air Navigation) is officially opened in Brétigny near Paris.

The brochure "Nature, functions and success of the UCPTE", published in 1959, contained the following remarks: "In the field of electricity production and distribution, the UCPTE – largely unnoticed and without any supranational institution – has already achieved the ideal of the Common Market and the European Economic Community. The forging of closer links between Western European countries in a move towards economic union will increasingly become a practical reality. When the history of this process comes to be written, the UCPTE will be numbered among those organizations who were the originators of economic union and who have promoted its realisation over a period of years." The currency of this passage is such that it might have been written today.

An eventual breakthrough would either require political reconciliation or technical adjustment. In the end it turned out that both would play a role, aided by a worsening economic climate. The combination of a phase of détente between the superpowers and improvements in high-voltage direct current (HVDC) connections, together with a slumbering economic and financial crisis in Eastern Europe and fuel crises in Western Europe, led to the extension of East-West connection and an increase in the trade in electricity.

From the early 1960s onwards, following the repair of damage caused by the war and the restoration of normal conditions on the electricity market, electricity consumption in the eight UCPTE member countries showed substantial growth, which was to last for the next ten years. Nevertheless the most effective possible use of power plants featured only occasionally on the agenda of system operators – given that this factor was generally entrusted to self-regulating market forces.

Meanwhile, the uniform 380 kV grid extended across the majority of Western and Central Europe. This created an effective mutual aid in the event of failures. On the one hand, through primary control, it ensured that the entire power plant capacity combined within the grid was available immediately to each partner as a frequency aid, directly and automatically. On the other hand, the load-frequency control was decentralised and restored the production/consumption balance regionally. The uniform frequency within the entire interconnected grid was the common reference value.

Long-term exchange lost significance in favour of short and medium-term mutual assistance. Because storage power plants and pumped-storage power plants were being used increasingly to balance shortages and surpluses in production, the tasks of hydroelectric plants broadened. Critical events not only occurred in the winter time, but could arise at any other time too, e.g. in the event that several thermal blocks inconveniently suffered failures at the same time.

01 July 1967

The EEC, EURATOM and ECSC combine to form the European Communities with a single Council of Ministers in Rome.

20 August 1968

Troops of the Warsaw Pact occupy Czechoslovakia, thus ending the "Prague Spring".

JULY AUG SEPT OCT NOV DEC 1968 JAN FEB MAR APR MAY JUNE JULY AUG SEPT

The grids in Spain and Portugal | **1970**

17 June 1969

Belgium, Luxembourg and the Netherlands sign an agreement with Yugoslavia on the abolition of the obligation for tourists and transit passengers to hold a visa.

As the interconnected grid was closely meshed, the regional load distributors who were responsible for operation not only had to have complete control of their own grid, but also needed to be very familiar with the neighbouring grids with which their own was connected. Only with very precise details from the neighbouring grids, for example regarding the operating status of the key lines and the characteristic data of these grids, could they satisfy themselves at all times as to whether their own grid was correctly incorporated into the European grid.

In order to be aware at all times of the influence that the UCPTE high-voltage grid was having on a grid in a certain region, there was no need for any headquarters for coordination or operation. It was sufficient if the load distributors of neighbouring grids kept each other constantly informed about the main operating values of their grids, e.g. using diagrams of their grids which were confined to the exchange of the most important information. To be effective, this system required the load distributors of the various regions to update each other frequently and regularly. For this reason the members of the UCPTE continued to improve the reliability of their telecommunications systems and the provision of information to each region. The load distributors used this data responsibly. As they had been working together over a long period of time and personal relationships - even friendships – had grown amongst them, the essential element of trust had developed.

In this way the UCPTE found an effective middle way between centralisation, which was necessary for interconnected operation, and decentralisation, which was vital for the efficiency, security and reliability of the supply at regional level. This middle way gave each partner full responsibility for the operational management of its grid both in times of normal operation and in the event of a failure, because, on account of the high volume of information exchanged, it was able to assess the situation regarding both its own grid and that of the neighbouring grid. Even if a large number of regional load distributors with a great deal of independence were put under its control, a central load distributor would not have been able to command a sufficient overview of the various interests of the different regions in order to take their needs into account adequately. The partners could not therefore avoid taking responsibility themselves for supplying their region.

The organisation, as built up by the UCPTE, led to the best efficiency overall. Use was made of free capacity in the power plants by means of long-term contracts or agreements of varying durations. Due to the constant exchange of information, the load distributors knew the situation across the entire grid and were able to take this into account. Via the interconnected grid they were therefore able to accommodate free capacity usefully, even at short notice, and make sure that the power plants with the lowest incremental costs were used at European level.

The working method and cooperation of the regional load distributors developed continually and the structure of the UCPTE ensured that this creative process did not stop. Through their own collaboration, the members of the UCPTE who were responsible for interconnected operation within the companies constantly enjoyed the benefits arising from cooperation within the union.

12 August 1970
The USSR and FRG sign the "Treaty of Moscow" in order to preserve the peace and for détente.

15 December 1970
On the occasion of the aviation conference in The Hague, the 76 participating countries pass an international Convention against aircraft hijackings.

15 February 1971
The decimal system is introduced for currency in the UK.

The aim of the union was to contribute towards optimising the use of pre-existing or as yet unconstructed plants for the production and transmission of electrical energy in the countries of its members. Above all, it endeavoured to ensure the utilisation of water that would otherwise run over weirs without being used. Members informed each other about the available production of hydroelectric plants, about storage reserves and about the available capacity of thermal power plants. The union worked to facilitate and expand the international exchange of electricity. Essentially, it therefore dealt with issues regarding operation and addressed the problems that could arise through the use of new plants, although only once the decision had been made to construct these plants, as expressed by the formulation "pre-existing or as yet unconstructed plants for the production and transmission of electrical energy". Discussing investments did not fall within the UCPTE's area of responsibility. The articles of association also stipulated that the UCPTE was not permitted to practise any commercial activity; article 2 of the articles of association ends with the sentence: "The union is not entitled to conclude any contracts for the supply or exchange of electricity that could arise from its investigations." The work carried out within the UCPTE was based on the following guidelines:

- guaranteeing continuous operation
- maintaining the quality of the supply
- improving the efficiency of electricity production.

The aim was to allow the customers of the companies supplying electricity in all UCPTE countries to be supplied as if there were no national boundaries between the individual grids.

The UCPTE achieved its goals with a management structure that was organised as simply as possible. For a long time there was not even a defined office with a permanent base. Instead, each country in turn took on the presidency and the role of secretariat for a period of two years. The country that fulfilled these duties also bore the costs of managing the union. The union did not therefore need its own budget. The president led the general assembly, which was composed of all the members and met twice yearly in one of the countries of the union. The adjoining and overlapping associations, the UFIPTE (France, Spain and Portugal) and SUDEL (Austria, Italy, Yugoslavia and Greece), sent delegates to the general assemblies and were therefore also able to find out about the union's work. Very quickly after the UCPTE was founded, its members recognised how important it was to inform each other about extraordinary operating statuses, long-term power plant failures, delays in the commissioning of new power plants and about extraordinary changes in the consumption of electricity. This mutual exchange of information at the meetings of the extended committee took the form of presentations by the representatives setting out the situation with regard to the supply of electricity in their countries. These presentations supplemented the numerical statistical information that was summarised in a standardised form.

05 June 1972
The first UN conference on environmental issues starts in Stockholm.

PROGRESS AND TECHNICAL IMPROVEMENTS DUE TO UCPTE FOUNDATION

Mutual assistance – primary control

Control equipment opens and closes the water/steam inlets of the water/steam turbines depending on their speed of rotation, which corresponds precisely to the frequency of the alternating current. This frequency is the same in all the grids of the Western European interconnected grid. Any fault which results in the failure of one or other power plant in the grid influences the balance between production and consumption in the entire Western European interconnected grid. If production is too low, the joint frequency will fall. The turbines of all power plants in the interconnected grid will therefore run a little slower. Their controllers detect this and subsequently increase the supply of water or steam so that the speed of rotation rises again and the grid frequency once again approaches its target value. All the power plants of all partners work together in this way in order to restore the status that prevailed before the failure, irrespective of whether this failure occurred at a power plant in Lisbon, Palermo or Hamburg, or in Le Havre or Vienna. This control system is called primary control.

Coordination and available capacity of thermal power plants

Since the early years of the union, the UCPTE had compiled information for each month of the coming year and for all countries regarding how much thermal power plant capacity would be undergoing maintenance. Checks were then carried out to see whether some of the maintenance work could be rescheduled so that the capacity in all the countries together could be adjusted more effectively to the expected load. The following were forecast for the third Wednesday of every month: the maximum load of total consumption, the net maximum capacity of the thermal power plants, the capacity of the units undergoing maintenance, the necessary reserve capacity and the capacities made available from hydroelectric plants, by industry or from abroad. The forecasts were drawn up each spring and published in the annual report of the following year, where they were compared with the actual values. In addition, this forecast drawn up in the spring for the 12 months of the calendar year was adjusted in the autumn for the last three months of the year and the forecast was expanded to include the forecast for the first three months of the following year. A forecast was therefore available in the autumn for the 6 months of the coming winter.

28 October 1972
Maiden flight of the Airbus A 300 developed by the European Community takes place in France.

03 February 1973
17 European trade unions establish the European Trade Union Confederation (ETUC).

03 July 1973
The Conference on Security and Cooperation in Europe (CSCE) starts in Helsinki.

JULY AUG SEPT OCT NOV DEC JAN FEB MAR APR MAY JUNE JULY AUG SEPT

1973

Precautionary measures for the commissioning of new thermal power plants

A summary of the experiences exchanged in relation to the commissioning of new power plant units was provided in a pamphlet in 1958. This publication was intended to help reduce the faults experienced shortly after the commissioning of new units.

Measures to prevent major failures and damage at thermal power plants

The experts had been informing each other about any damage that had occurred at the thermal power plants. To simplify this exchange of information, fault statistics were drawn up with 37 headings. These statistics were intended to draw attention to the faults that occurred most often and that restricted the availability of the plants the most. In this way the experiences of individuals were to be made available to everybody, so that the damage caused by and the consequences of faults could be reduced. Fault statistics and the exchange of information, which were originally confined just to conventional power plants, were later extended to include nuclear power plants and gas-turbine plants.

Measures to avoid chain reactions

A certain production reserve was usually held in readiness at the power plants and a transmission reserve on the lines. It was highly improbable, although not ruled out entirely, that several faults could occur simultaneously. In such a case, the production reserves and transmission reserves would presumably not have been sufficient. It had to be expected that such faults would occur and, therefore, measures had to be taken to prevent a fault from spreading and causing a greater drop in frequency that would lead to the failure of thermal power plants and, ultimately, to the collapse of the entire grid.

Load shedding is one of the most important safety measures for guaranteeing grid stability. It is the last possible action that can be taken to prevent an imminent failure of the interconnected grid or large sections of it. The reasons why load shedding is necessary mainly lie in the occurrence of underfrequency or undervoltage as a consequence of regional overloading of the power grid. As an unplanned event, not only does the emergency disconnection of supply areas result in local power outages, but, in the event of major incidents, such intervention also has to be coordinated across borders. Grid control centres have automatic equipment that triggers disconnection in the event that certain measured values are reached. Following load shedding, the initial and direct consequence of which is a regional power outage, the resulting lack of consumers can also have repercussions for generators and therefore lead to load shedding by power plants.

The increasing amalgamation of the interconnected grid in Western Europe brought with it economic advantages. However, it also required precautionary measures to be taken and constantly monitored. In 1962, the UCPTE investigated what precautionary measures could be used to prevent chain reactions that could lead to a major failure.

13 December 1974
Malta abolishes the monarchy and becomes a republic.

Protection facilities for interconnections

As already emphasised with respect to primary control, the interconnected grid brought advantages. This grid could only be operated properly, however, if the way in which the protection facilities were set up was coordinated. It was their task to disconnect a line if there was a short circuit and to connect it again automatically.

Monitoring of short circuit currents

Interconnections were equipped with circuit breakers which disconnected the lines in the event of a short circuit. The circuit breakers therefore had to be able to interrupt the short circuit current. Due to the increase in short circuit currents, circuit breakers with higher breaking capacities were needed. The breaking capacity of the equipment therefore acquired great significance.

Securing the supply for own requirements

To ensure that, in the event of a fault in the grid, a power plant was able to help restore normal grid operation, it was essential that the power plant's auxiliary facilities were sufficiently protected against the effects of the fault and that their power supply was safeguarded. There had been cases of power plants failing because the power supply of their auxiliary facilities had failed as the result of a fault in the grid. In the event of a fault, switchgear in the interconnected grid played a particularly important role, as its automatic facilities ensured that a fault did not spread.

Checking operating reliability and forecasting energy flows

In order to monitor the operating reliability of grids working in parallel, a mathematical model was developed. If certain assumptions were made regarding the power fed in and consumption at the various nodal points, it was possible to use this model to calculate the load flows on the lines and the voltages. To ensure that a computer could be used for the model calculations relating to the UCPTE interconnected grid, the diagram of the grids had to be simplified. Checks had to be carried out to make sure that this simplification did not lead to incorrect results. The power fed in, consumption and load flows were checked against actual grid statuses. It emerged that the load flows calculated using the model did not deviate unduly from the actual load flows. Using the model it was even possible to forecast the line loads. This meant that undesirable load flows could be identified in good time and that more favourable loads could be achieved on the lines through different usage of power plants.

28 February 1975
The states of the EC and 46 developing countries conclude the Lomé agreement on economic cooperation.

01 August 1975
The Final Act of the CSCE is signed by 35 states in Helsinki.

Economical supply of electricity without consideration for national boundaries

The UCPTE was characterised by tasks which it had to perform in relation to operational activities. However, these were supplemented by certain economic aspects. Primarily these were:

- Exemption of the exchange of electricity from customs and foreign exchange control
- Introduction of a uniform method of control (load-frequency control, network characteristic method)
- Definition of tariff periods and exchange intervals/programme structuring
- Recording and settlement of the exchange of electricity
- Improvement of the exchange of information
- Coordination of measures in the event of major failures
- Coordination with regard to observing synchronous time
- Coordination of protection of the grid

Water losses by overflow

If at times when a country was benefiting from a good flow of water it was not possible to sell all the electrical energy produced from the water supply, the surplus water had to flow over the weirs rather than through the turbines. This situation is referred to as "water losses by overflow". The UCPTE included the task of avoiding such losses of water through overflow in its articles of association already at the time of its foundation.

Low-load operation of thermal power plants

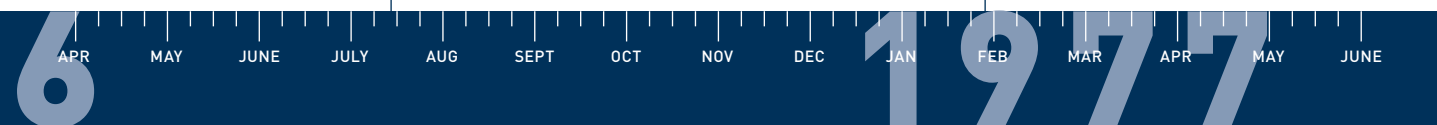
In order to make use of the surplus water, production at thermal power plants was reduced accordingly. This was often also necessary during the off-peak period, particularly at night. Either the loads of the thermal power plants had to be scaled back to a minimum value that was still permissible from the point of view of operation or a number of power plants had to be shut down completely over night and started up again in the morning when the load increased.

12 July 1976

The states of the EC reach an agreement on direct elections for the European Parliament in future.

27 January 1977

In Brussels, 17 of the 19 member states of the Council of Europe sign the anti-terrorism convention for international cooperation in the fight against terrorism.



Secondary control of the individual grids

As soon as production and consumption were no longer in balance, in the event of a fault for example, the primary controllers in the power plants influenced the generators in order to restore the balance. This primary control took effect after just a few seconds. The frequency then quickly approached the target value again, without reaching it entirely. To achieve this, an additional control intervened. This is slower to take effect (in the order of a few minutes) and is known as secondary control or load-frequency control. By means of this secondary control it was possible, on the one hand, to restore the target frequency precisely and, on the other, to achieve a situation where the lost power (which in the meantime had been covered by all the power plants together under the influence of the primary controllers) was made available again by the grid in which the power shortage had occurred.

Settlement of unintentional exchange in the interconnected grid

In practice the actual exchange between partners over a certain hour regularly deviated from the agreed programme of exchange, and this has been a consequence of system, what remains the case up to the present day. The best way to settle this "unintentional exchange" formed the subject of investigations. These concluded that only the programmed exchange should be billed according to the conditions of the contract.

The unintentional deviations should not be settled by monetary means and should instead be settled in kind the following week in the form of the corresponding amounts of energy. To ensure that the varying value of electrical energy at the different times of the day could be taken into account, the hours in a day were divided into five periods and it was agreed that each time period (so-called tariff periods) had to be settled separately.

Nonavailability of thermal power plants

The definitions for calculating the nonavailability rates of thermal production units were specified together with UNIPEDE. Nonavailability rates in the individual countries of the UCPTE were determined and compiled according to these definitions. For this purpose the production units were divided into three power groups: 100 – 199 MW, 200 – 399 MW and 400 MW and above.

Use of computers in operational service

Computers, which were already being used for operational management in various industrial sectors, offered in the 50's and the 60's new opportunities at that time for grid operation. For this reason the following possibilities were examined in more detail: the use of computers for the operation of power plants, for

01 July 1977
The Customs Union enters into force across the whole of the European Community.

09 March 1978
The follow-up meeting of the Conference on Security and Cooperation in Europe concludes in Belgrade.

JULY AUG SEPT OCT NOV DEC JAN FEB MAR APR MAY JUNE JULY AUG SEPT

1978

The grids in France | **1980**

28 May 1979

Greece signs the Treaty of Accession to become the tenth state to join the European Community.

10 June 1979

Start of the first direct elections for the European Parliament.

OCT NOV DEC JAN FEB MAR APR MAY JUNE JULY AUG SEPT OCT NOV DEC

1979

methods of calculating all associated problems, for the optimisation of production in hydroelectric plants, for the calculation of the rotating reserve, for transmission reliability, for the coordination of the maintenance work for thermal units and for the various energy settlement procedures.

Measures to simplify operational management

When two different grids began interconnected operation, i.e. they were connected to one another by more than one line or transformer, care had to be taken to ensure that each of the three phases of the one grid corresponded to the same phase of the other grid. For this reason, the individual phases in the two grids had to be identified in the same way. To prevent errors being made when it came to interconnection, a uniform identification system for identifying the phases was introduced within the UCPTE. If transformers had to be switched on in the course of such a connection, attention had to be paid to the correct phasing.

Grid plan

To make it easier for the load distributors to gain an overview of the grid being operated in parallel, a plan showing the key lines of this grid was drawn up in 1957. This plan was then updated every two years.

Investigations regarding hydraulic production and production capabilities

The production capabilities of hydroelectric plants were represented by the amount of energy that the power plants would have supplied under real waterflow conditions if all machines had been technically operational and the reservoir level had been kept constant. In addition, the average possible production of a country's plants was also investigated. Here, it was assumed that water storage management corresponded to the long-term average.

Information

The UCPTE distributed its information in the form of annual and quarterly reports. The annual reports outlined the Union's activities over the reporting year and included the definitive versions of the key study reports. Quarterly reports included the statistical information relating to the last quarter, explanations of the situation regarding electricity supply and a forecast of the situation for the coming quarter. The quarterly reports also listed the plants that had been newly commissioned and, occasionally, were used to publish special investigations and guidelines.

Until 1989 the annual and quarterly reports appeared in the four languages of the UCPTE countries: French, German, Italian and Dutch. From 1989 onwards only French and German were used for the publications, with the addition of English. Since the year 2000 half-yearly reports have been issued in place of the quarterly reports.

05 September 1980
The Gotthard road tunnel opens.

11 November 1980
The second follow-up meeting of the Conference on Security and Cooperation in Europe opens in Madrid.

Public relations

In order to publicise its work, the UCPTE presented reports at the conferences of other international organisations, namely one report at the meeting of the World Energy Conference in Montreal in 1958 and another at the meeting in Tokyo in 1966. These reports were printed and distributed by the secretariat of the World Energy Conference. The UCPTE also produced pamphlets itself for the purposes of providing information to the public, namely "Nature, functions and success of the UCPTE" in June 1959 and "The UCPTE 1951 – 1971; 20 years of activity" in September 1971. In addition, the OECD published a pamphlet in 1961 with the title "The UCPTE, 10 years of activity, 1951 – 1961".

A period of continuous development

Over the years, the international interconnection of electricity systems and the meshing of networks have been reinforced considerably, thereby increasing the technical interdependence of synchronously interconnected electricity systems.

Crucial for the development of the interconnected grid that exists today were, first and foremost, the bilateral energy relations initiated at a very early stage between neighbouring countries and companies. Longer-term contracts formed the basis for these. The cross-border lines that were required worked in radial operation.

At the end of the 1960s, the grids were connected at so many points that rings were created. After the first 380 kv ring extending across several countries (France, Italy and Switzerland) was formed in 1969, further rings and meshes were created in the 1970s. From the beginning of the 1950s, the transmission capacity of the international interconnections between the eight UCPTE countries had increased more than tenfold and, in 1974, amounted to 32,200 MW. This was around 27 % of the annual maximum load of all eight UCPTE countries. In 1953 the corresponding figure had been 9 %. Around 38,700 GWh was exchanged across these interconnections in 1974. This exchange of electricity represented roughly 5 % of the total energy supply in the eight UCPTE countries (1950: approximately 2 %).

13 April 1981
The first solar power plant in Europe ("Eurelios") is commissioned on Sicily.

18 June 1981
With a large majority, the European Parliament declares itself in favour of abolishing the death penalty in the countries of the European Community.

23 February 1982
The majority of the population of Greenland votes in favour of withdrawal from the European Community.

Such a development of the UCPTE interconnected grid was only possible because various prerequisites had been met and measures worked out and agreed within the UCPTE.

Due to the delays in the construction of new power plants, it was feared, at the end of the 1970s, that there would be gaps in coverage with regard to the electricity supply of the UCPTE countries. In December 1978 it was established in various UCPTE countries that delays in the construction of power plants would reduce the previous surplus resulting from the provision of and demand for energy at low prices.

For a number of years, however, there had been increasing doubts as to whether the construction times for new power plants could be met and the forecasts regarding the development of the demand for electricity had also become ever more uncertain. These uncertainties had a more significant impact on the construction and commissioning of new power plants than had been the case in the past.

Over the years it became apparent that there was a need for an ever greater amount of information to be exchanged between the load distributors of the UCPTE. This related essentially to data on the exchange of electricity between the partners and on operational management (particularly in the event of a failure), as well as for performing grid security calculations.

10 September 1982

The European rocket "Ariane" crashes on its first commercial mission.

12 July 1983

Europe's largest solar power plant starts operation (with 300 kW) on the North Sea island of Pellworm.

SITUATION 30 YEARS AGO

In 1980 there was already a large number of channels of cross-border communication, which were realised primarily by means of specialist radio transmission systems or telex. The systems used were of different types, had limited transmission options and offered no possibilities for standardisation. In addition, several partners had already recognised the need for direct connections to be installed between the computers of load distributors. These were realised from their own telephone connections over PTT lines; the carrier frequency was transmitted via high-voltage lines, radio beams and fibre-optic cables.

As the UCPTE grid is composed of sub-grids with meshes, this led to a dependence between the individual grids of the partners. More serious failures in an individual grid normally affected all the others in the same way, with the closest grids being those most severely affected. It was therefore necessary to use all possible means of coordination and information to achieve the best possible reliability. For this reason, the partners aimed to coordinate the disconnection of major lines. In view of the wide spread of the UCPTE grid, however, it was not possible to achieve general coordination of all the work on the lines within the framework of the UCPTE.

As a result of previous experiences of operating the UCPTE grid, it was possible to define 4 rings within which the opening of a mesh could have repercussions on a large grid area. These rings were:

1. Austria-Federal Republic of Germany ring

2. France-Italy-Switzerland ring

3. Italy-Austria-Yugoslavia ring

4. France-Belgium-Netherlands-Federal Republic of Germany-Switzerland ring.

The radical changes on the primary energy market in the 1970s – as a consquence of the so called "oil crisis" – prompted the interconnected companies to adapt their power plants to the new conditions. By expanding nuclear energy and through the increased use of coal, it was possible for the electricity companies collaborating within the UCPTE to considerably reduce the proportion of oil used in the supply of electricity. The Union also became increasingly aware of the importance of drawing the attention of users across Europe to the need for energy-saving measures. This was with a view to improving the primary energy balances of the individual countries.

17 October 1983
The at this time world's largest wind power plant, GROWIAN, starts operation in Brunsbüttel, FRG.

14 February 1984
The European Court of Justice in Luxembourg declares so-called "butter trips" to be impermissible.

19 December 1984
The UK and China reach an agreement on handing back the British crown colony Hong Kong to China.

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1984

While the economic crisis at the beginning of the 1980s had resulted in a partial decline in growth rates for electricity consumption, an opposite trend had already emerged by the end of 1983. Although a normal situation had temporarily been achieved with regard to the adjustment of the power generation portfolio to demand in the various countries, reducing the dependence on oil and facing up to increasing requirements in the area of environmental protection constituted important new themes.

In January 1985, the supply of electricity in Europe was severely tested as a result of an exceptional cold spell. Energy production from hydro power was greatly restricted and, at the same time, production from thermal power plants could only be maintained with difficulty due to blocked fuel transportation and reductions in gas supplies in favour of other areas of consumption. The simultaneous peak load across Europe turned out to be 14.7% higher than the previous year. By utilising all reserves, and thanks to the cooperative exchange amongst partners, it was possible to supply electricity to customers within the framework of the UCPTE grid with virtually no negative effects, which would have meant load shedding. The commissioning of 8 nuclear energy blocks in Belgium, Germany and France meant that thermal production had reached a new record. In 1985, generation from nuclear power, which had increased threefold since 1980, constituted as much as a third of total production.

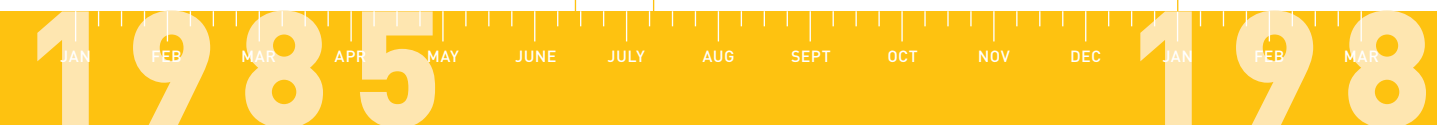
In the mid-1980s, parallel operation of the Western European interconnected grid was not only limited to the 12 countries of the UCPTE region. It also encompassed third countries, including the grid on mainland Denmark, which was constantly in synchronisation with the UCPTE grid. From July 1985, there was a three-phase-current connection with Albania. In addition, Scandinavia, the United Kingdom (from January 1986) and the bordering countries of COMECON were connected via direct-current connections to the UCPTE grid. In 1987, the UCPTE was extended to include four countries, namely Spain, Portugal, Greece and the former Yugoslavia.

In the area of telecommunications, a concept was cropping up more and more at this time, one which 10 years later would not only revolutionise the world of telecommunications but would also gain significance for communication in the field of electricity supply: fibre-optic cables for the high-capacity transmission of data. Several partners in the interconnected grid had already been operating trial stretches for some time. In Spain, a fibre-optic bundle, integrated into the earth conductor cable, was laid on a 380 kV line over a distance of 100 km.

12 June 1985
The Treaties of Accession to the European Community of Spain and Portugal are signed in Madrid.

09 July 1985
20 European states and Canada sign a European protocol in Helsinki on the reduction of transboundary air pollution by means of sulphurous precipitation.

01 January 1986
Spain and Portugal join the European Community.



In a number of European countries this development led to a significant entrepreneurial involvement by electricity companies in the area of telecommunications.

The introduction of the European Single Market, planned for 1992, was a hot political topic. In the debate on this subject, the majority of members came to the conclusion that the organisational form introduced with the foundation of the UCPTE was sufficiently adaptable to successfully cope with the demands and reforms that would arise as a result of the Single Market. In a statement to the European Community in Brussels on the question of the effects of the Single Market on the interconnected grid, the committee of the UCPTE responded cautiously. This statement first explained the specific aspects of the electricity supply industry, followed by a description of the Union's current situation and of the emphasis placed on guaranteeing a reliable and economical electricity supply. Reference was also made to the fact that via the UCPTE grid there had been a competitive situation between the partners for a long time already at wholesale level, which benefitted all consumers. The UCPTE responded negatively to a change that would entail common carrier use of the grids. Opening up the grids in this way, suggestions of which could be heard here and there in political circles, would result in restricted security of supply and price increases, which were not in the interest of consumers. Use of the grid to supply large industrial companies across national borders was not practicable in the area of electricity from the point of view of all UCPTE members at that time.

Due to the imminent commencement of the European Single Market, the expected repercussions continued to form a principal topic within the UCPTE's area of responsibility. To ensure that contacts were maintained transparently with the Commissioner, the Director-General and his colleagues responsible for the energy sector within the European Community, the energy supply companies had established a coordination committee with the name EURELECTRIC. The presidents of the UCPTE, UNIPEDE and NORDEL also had seats on this committee.

One of the major items on the agenda of discussions between EURELECTRIC and the Directorate-General of the EC was the Transit Directive. This took account of the special nature of electricity and acknowledged the priorities regarding reliability, quality of service and environmental compatibility, including the mediation of possible differences of opinion. The Directive was approved by the Council of Ministers of the member states and came into effect without delay on 1 July 1991. It was necessary for the development of a methodology for remunerating exchange services to be linked to the Directive as an important instrument, in view of the issue of Third Party Access (TPA).

06 May 1986

Culture agreement between the FRG and the GDR is signed after twelve years of negotiations.

12 March 1987

The European Court of Justice declares the 471 year old German Purity Law, which affected beer imports, to be impermissible.

Having found the draft report on TPA by the PCCE (Professional Consultative Committee on Electricity) to be inadequate, EURELECTRIC decided to compile its own report on TPA, to be appended to the Consultative Committee's version. The conclusion on the UCPTE's position with regard to TPA was unambiguous: such a system would be detrimental to the reliability and quality of electricity supply.

The UCPTE was also concerned with the opening up of Central-Eastern Europe, which had been a topical issue since 1989. The political union of the Federal Republic of Germany and the former German Democratic Republic necessitated the establishment of a synchronous interconnection between the asynchronous parts of Germany. This had to be achieved quickly, in cooperation with German member companies of the UCPTE. These would assume responsibility to ensure the availability of adequate production capacity as well as primary and secondary control. Furthermore, with regard to the possible extension of interconnections to other Central-Eastern European countries, studies were initiated concerning technical requirements and the respective actions needed for corresponding organisations.

It was of decisive importance that none of the other partners in the UCPTE would suffer as a result of the synchronous zone being extended.

With the subsequent division of the former Yugoslavia into 5 states, the UCPTE network then covered 16 countries. It had already become the largest synchronously interconnected system in the world following the accession of Spain, Portugal, Yugoslavia and Greece in 1987.

While HVDC links became the emergent form of interconnection between the networks of Eastern and Western Europe, the socio-political upheaval opened up perspectives for synchronous connection.

Unlike with HVDC technology, Central- Eastern European countries took the initiative here. Four countries, the Czech Republic, Hungary, Poland and the Slovak Republic undertook the common efforts to reach synchronous connection with the UCPTE by founding an organisation, CENTREL, in October 1992.

17 June 1988

The environment ministers of the European Community decide on measures to reduce chlorofluorocarbons (CFCs).

28 June 1988

In Hanover the states of the EC reach an agreement on preparatory measures for the introduction of a European Community Single Market and a currency union.

The grids in the Alps and in northern Italy | **1988**

17 July 1989
Austria applies for admission to the EC.

09 November 1989
The GDR opens its borders to the FRG.

This allowed a very important step towards integrating the networks of the eastern countries of Central Europe into the Western interconnected system. An agreement to this end was signed in October 1992 and a set of requirements was included into the Catalogue of Measures. Full interconnected operation was activated 3 years later in October 1995 following former German Democratic Republic network synchronisation with UCPTE network completed in September 1995.

Due to the destruction of key 400 kV substations (Ernestinovo and Konjosko) and the associated transmission lines in Croatia and Bosnia and Herzegovina during the Yugoslav wars, the UCPTE synchronous system for interconnected operation, one of the largest and most secure in the world, was split into two zones in autumn 1991.

In 1991 the UCPTE also celebrated its 40th anniversary. It did so in a manner entirely befitting of a highly technical organisation, that is to say soberly and without any celebration, simply with the publication of a brochure entitled "Europe in Communication". This brochure illustrated in particular the close cooperation which made it possible to improve the quality of the electricity supply in each of the systems connected to each other within the UCPTE.

The intense activity involved in standardising relationships within the UCPTE had been continued and all the UCPTE's recommendations which were important for operation and which, up to that point, had been dispersed, were now gathered together for the first time. The first version of an operational handbook was born.

In 1992 the European Commission demanded Third Party Access, which meant a paradigm change in the entire electricity sector. The industry had a rather dismissive attitude towards such a demand, as it saw its activity as a public service. At that time it was noteworthy that the USA, with the adoption of a new Energy Policy Act, explicitly excluded the introduction of obligatory TPA for customers at federal level. TPA was only mandatory for distributors and each State could also impose it on its territory for end consumers.

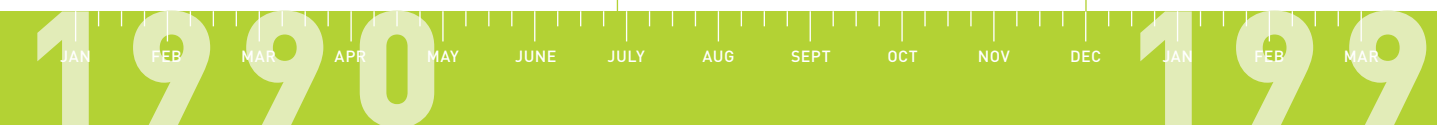
In the West, the voluntarily integration of the Internal Electricity Market as an element of the single European Market as a whole – in which EFTA member countries were also involved, in the context of the European Economic Area – led to the establishment of one of the largest markets in the world, one with the potential to develop in scientific, economic, technical and geopolitical terms. At the same time, the function of the energy sector in general, and of the electricity industry in particular, remained the most obvious core area of the UCPTE's activity. Since its foundation, the UCPTE had always been in a position to establish the fundamental conditions required for European integration, and for the continuing increase in cooperation between member companies, independently of political pressure.

28 June 1990

The environment ministers of 89 nations undertake to stop the production of CFCs, which destroy the ozone layer.

01 December 1990

The two halves of the Channel Tunnel meet under the English Channel.



Through its association with the CENTREL network (Czech Republic, Hungary, Poland and Slovak Republic), with which the Union had been synchronously interconnected since 1995, the UCPTE network represented a homogeneous system on a scale comparable to that of the eastern electricity system in North America.

In 1998 a line crossing the Strait of Gibraltar and interconnecting North Africa with Spain became operational.

Following the adoption of its new articles of association, which came into effect on 1 January 1997, the UCPTE became the operational organisation responsible for defining the technical rules required to ensure the reliable operation of the interconnected systems of its member countries.

From UCPTE to UCTE in 1999

Over the last few decades, the UCPTE had adapted to changes in the European electricity sector, primarily in response to the provisions of European Union Directive 96/92 concerning common rules for the Internal Electricity Market. The 1990s brought highly dynamic regulatory processes, as part of the move towards a Single European Electricity Market, by means of the unbundling of generation, transmission and distribution services to ensure fair and non-discriminatory grid access for all users, and thus a more competitive and viable market. For this reason the UCPTE changed its focus to the transmission grid only and, consequently, changed its name to the UCTE, dropping the "P" for Production, in 1999.

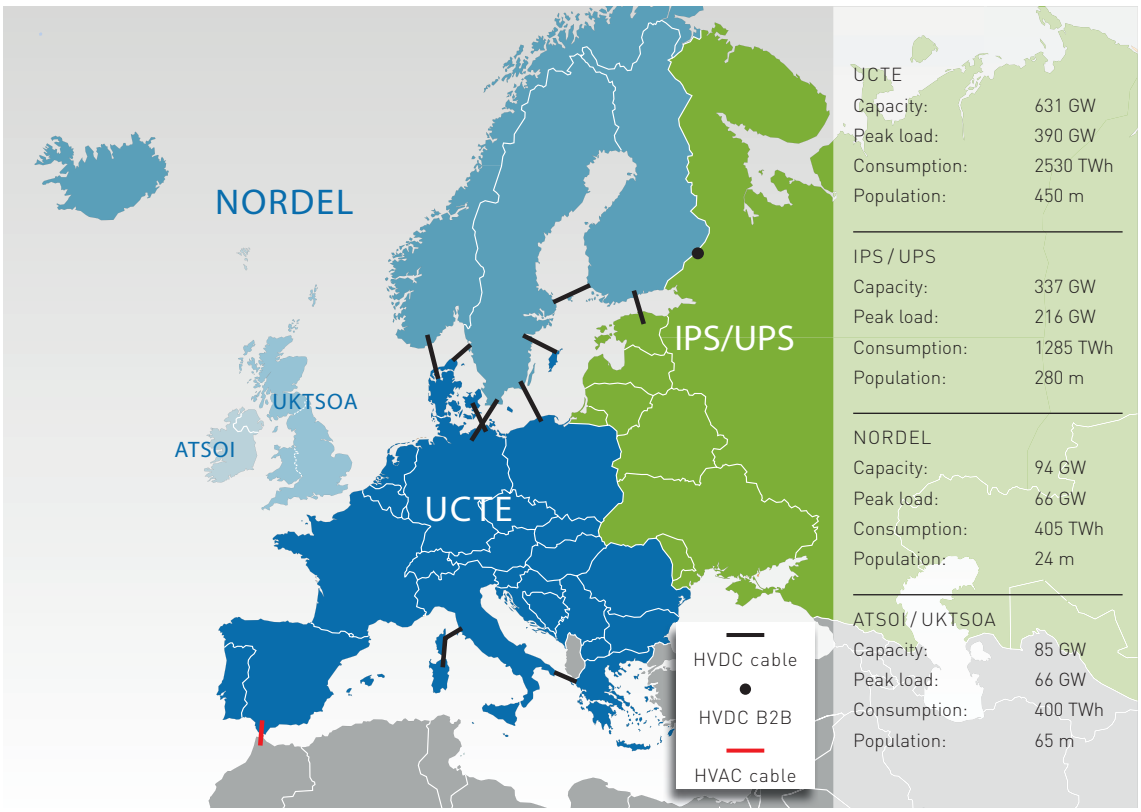
On 1 July 1999, the UCTE was involved in the foundation of the Association of European Transmission System Operators (ETSO) in Frankfurt am Main. In addition to the UCTE, the other members were ATSOI (for Ireland), NORDEL (for Northern Europe) and the UKTSOA (for the United Kingdom). The UCTE focused on technical rules (slogan: "Keep the lights on"), while ETSO developed economic and legal procedures for the completion of international electricity transits and trade (slogan: "Let the market happen").

08 October 1991
Croatia and Slovenia declare their independence.

09 December 1991
A decision is reached in Maastricht on the creation of the European Union (EU).

07 February 1992
The European Union is created (the Treaty on European Union is signed in Maastricht).

1991 APR MAY JUNE JULY AUG SEPT OCT NOV DEC 1992 JAN FEB MAR APR MAY JUNE



IPS / UPS: Armenia, Azerbaijan, Belarus, Estonia, Georgia, Kazakhstan, Kyrgyzstan, Latvia, Lithuania, Moldova, Tajikistan, Turkmenistan, Ukraine, Uzbekistan

ATSOI / UKTSOA: Great Britain, Northern Ireland, Republic of Ireland

NORDEL: Denmark, Finland, Island, Norway, Sweden

HVDC = High Voltage Direct Current

HVAC = High Voltage Alternating Current.

16 January 1993

In Paris 130 states sign the UN Chemical Weapons Convention.

In May 2001 the UCTE was dissolved and a "new" UCTE established as an association of transmission system operators. After using a mix of German, French and Italian, now English was introduced as the sole language of the UCTE.

For the UCTE the liberalisation philosophy meant more than just a change of name. It boiled down to a substantial restructuring of the set of responsibilities. The UCTE was now a forum of TSOs acting independently but without loosing the interface with GENCOs (generation companies) and distributors, consumers and regulators communities. There was a need for the role of member TSOs to become much broader in scope, covering not only technical aspects but, increasingly, intertwined market aspects too. The technical side involved introducing planning and operational standards to achieve reliable and sound synchronous transmission networks that were able to cope with a constantly rising demand trend, also with regard to future extensions of the synchronously interconnected system, whilst market matters were about creating and applying the necessary codes and organisation to ensure an Internal Electricity Market that functioned perfectly. The question then arose of whether competition and security were compatible goals. An operating incident in the Belgian system during July 1999 demonstrated that the problems were not merely theoretical. On 14 July 1999, a power transit of 200 MW was scheduled between France and the Netherlands via the Belgian system, in accordance with published interchange programmes. In practice, the unannounced peak value of the power flow was significantly in excess of 1,000 MW. As a result, the n-1 criterion could no longer be maintained, and a third contract had to be interrupted in order to prevent an increase in the system load.

The issue of electricity transmission from power plants to customers had not been at the forefront of public debate, even though transmission systems had now become the instruments of competition. Competition between European electricity producers would not be possible without international interconnection. This additional function had now been taken over by the networks of companies operating within the UCTE. Now more than ever, though, the operational security of networks in a deregulated market represented a challenge for systems operators.

01 November 1993
The Maastricht Treaty enters into force.

01 March 1994
Accession negotiations between the EU and Sweden, Finland and Austria conclude successfully.

07 June 1994
In Toledo, Spain, the largest solar power plant in Europe is connected to the grid.

OCT NOV DEC JAN FEB MAR APR MAY JUNE JULY AUG SEPT OCT NOV DEC

1994

BEYOND 2000

UCTE Steering Committee

A top priority of the UCTE in 2002 was North-South re-synchronisation, with the re-connection of the second zone, namely Bosnia and Herzegovina, Bulgaria, Croatia, Greece, Macedonia, Montenegro, Romania, Serbia. The process of re-synchronising the second UCTE zone, including parallel operation of Bulgaria and Romania, entered its final phase in 2002. Under the supervision of the Technical Committees constituted by the UCTE, the recommendations specified in the Catalogues of Measures were fulfilled to allow the connection of Bulgaria, Romania and Burshtyn Island (western part of Ukraine) synchronously connected to the UCTE-grid. Large-scale analytical and modernising/restoration work and practical system tests had been performed.

The transmission system operators (TSOs) involved, who were members of the Executive Team, had to develop and establish a basis to preserve the secure and reliable re-connection of the UCTE's transmission grids at the North-South interface. This made it necessary for these TSOs to work together at executive management level in order to coordinate common progress, harmonise the timings of actions and establish common rules, procedures and mechanisms for re-synchronisation. The main principle was to maintain this interface during the synchronisation procedure to assure the other UCTE members of the overall reliability and security of the re-synchronisation process for the second UCTE zone, including the interconnection of new partners – Bulgaria, Romania and Burshtyn Island.

The commissioning tests for the new DC submarine cable between Italy and Greece, Galatina – Arachthos (400 kV, 500 MW capacity), were completed shortly before the end of January 2002. During spring and summer, energy was exchanged on an experimental basis between Italy and Greece. For the following Test Operation Period (T.O.P.) from 23 September to 15 November 2002, capacity on the cable was allocated in both directions to market participants in the two countries. A second allocation procedure covering the period from 9 to 31 December 2002 was effected on 5 December 2002 in Athens.

Hungary

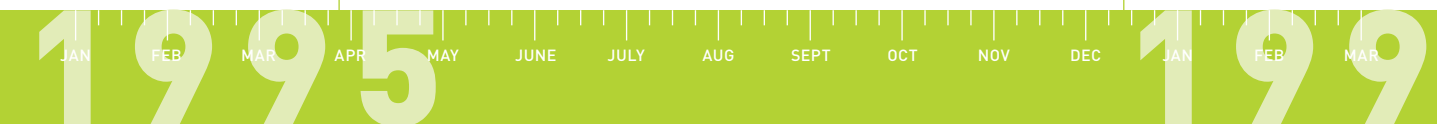
The 750 kV Albertirsa–ZahidnoUkrainska transmission line was put into normal operation again to interconnect the power system of Burshtyn Island to the Hungarian and Slovak power systems.

26 March 1995

The entry into force of the Schengen Agreement sees the end of border controls between seven EU states.

12 December 1995

The EU summit in Madrid agrees on the name "euro" for the future single European currency.



The grids in Yugoslavia, Bulgaria and Turkey | **1997**

13 June 1996

Belgium abolishes the death penalty. It is the last country of the European Union to do so.

06 November 1996

In Strasbourg, Croatia becomes the 40th member of the Council of Europe.

27 May 1997

In Paris, Russia and NATO agree a joint European security partnership.

September 2003 blackout in Italy

An Investigation Committee was set up within the UCTE following a blackout in Italy in September 2003. This blackout is the main incident that the UCTE has faced since its creation in 1951. The sequence of events was triggered by a trip of the Swiss 380 kV Mettlen-Lavorgo line at 03:01 caused by tree flashover on 21 September 2003. Several attempts to automatically re-close the line were unsuccessful. A manual attempt at 03:08 also failed.

Meanwhile, other lines had taken over the load of the tripped line, as is always the case in similar situations. Due to its proximity, another Swiss 380 kV line, Sils-Soazza, was overloaded. This overload was acceptable for a short period in such emergency circumstances, in accordance with operational standards. The allowable time period for this overload was about 15 minutes according to calculations by experts.

At 03:11, a phone conversation took place between the Swiss coordination centre of ETRANS in Laufenburg and the Rome control centre of GRTN, the Italian transmission system operator. The purpose of the call was to request countermeasures within the Italian system from GRTN. In essence, the request was to reduce Italian imports by 300 MW.

But unfortunately, this import reduction, together with some internal countermeasures taken within the Swiss system, turned out to be insufficient to relieve the overloads.

Shortly afterwards, the Sils-Soazza line also tripped after a tree flashover. Having lost two important lines, the resulting overloads on the remaining lines in the area became intolerable. Due to an almost simultaneous and automatic trip of the remaining interconnectors towards Italy, the Italian system became isolated from the European network about 12 seconds after the loss of the Sils-Soazza line. The result was a very low system voltage in northern Italy and, consequently, the trip of several Italian generation plants.

Countermeasures were implemented within Italy in order to deal with the country's disconnection. It was impossible for the Italian system to operate separately from the UCTE network. About 2 minutes and 30 seconds after the country was disconnected, the blackout was an unavoidable fact.

18 March 1998

Under the name "Agenda 2000", the EU Commission puts forward a comprehensive reform package on the agricultural, financial and structural policy of the European Union in Brussels.

01 April 1998

True to the Schengen Agreement, controls lapse at the borders between Germany, Austria and Italy.

AND THEN

January 2004

For the first time in the history of the UCTE, system adequacy reports replaced the former power balance reports. The new report included forecast data up to seven years ahead, four years more than in the past. This was the first step towards extending the time horizon of UCTE forecasts to up to ten years ahead in the future. The UCTE main block, which represented a major part of the installed capacity and up to this point had been exporting towards the surrounding areas, was faced with a decrease in remaining capacity below the indicative adequacy margin by 2010. This block could become a net importer in 2010 in situations where the temperature drops 5°C below normal.

The reliability of the Iberian and Italian blocks is expected to improve thanks to strong programmes leading to the commissioning of new generating plants that will produce many GW of electricity. The ability of these countries to reach these goals effectively will have to be monitored in the next system adequacy forecasts.

Wind power is winning recognition as a valuable option for power generation. With a total of more than 20,000 MW of installed wind power capacity, more than half of worldwide energy production from wind power is located in Europe (mainly in Germany and Spain). The huge success of this renewable and environmentally-friendly energy source and the respective energy output has to be handled by the Continental European transmission system operators (TSOs) in their day-to-day operation of the European interconnected system.

The UCTE's main role is to maintain the security of supply and the quality of the electricity delivered.

In this context, the UCTE and its member TSOs work together on rules of integration to the grid renewable energy sources in accordance with EU and national targets.

The extension of wind power requires a thorough redesign of the power infrastructure in Europe, both on the generation side, due to an additional need for balancing power, and on the grid side. Injecting wind power into the grid not only affects the individual national systems but also the cross-border electricity transits between neighbouring countries. It can also be anticipated that the necessary provision of a wind-related balancing power range will necessitate intervention in cross-border trading activities: transmission system operators may be compelled to introduce the precautionary reduction of import/transit capacities, to allow them to balance out major capacity balance deficits – arising from forecast deviations for wind power injection – by utilising additional power plant capacities from outside their control area. This will require a solid legal basis to prevent disputes between the market players at national and European regulatory level.

01 January 1999
The euro is introduced as an accounting currency.

06 May 1999
Elections for a Scottish parliament take place for the first time in 300 years.

September 2004 – the UCTE presented its first comprehensive "Security Package", which was also presented at the 11th Energy Regulatory Forum in Rome

This package consisted of the **"Operation Handbook"**, which set the technical standards for the operation of the UCTE interconnected system, the **"Multilateral Agreement"**, which ensured the enforceability of those standards among TSOs in the event of standards being infringed, and a **"Compliance Monitoring and Enforcement Process"**, as a permanent preventive process relating to compliance with the UCTE standards. The Operation Handbook composed of 8 Policies was based on the existing Recommendations of the UCPTE/UCTE that were still in force and next reviewed and further developed.

Coming from Northern Germany in November 2006

4 November 2006 saw the most severe disturbance in the history of the UCTE, as far as the number of TSOs involved and the amplitude of the registered frequency deviation were concerned. However, the system of decentralised responsibilities among the UCTE's member TSOs demonstrated its efficiency by avoiding a blackout on the entire European continent. The triggering event started at around 22:10. Some lines in Northern Germany have been heavily loaded. After the first of them tripped, a domino effect started and along a line from the North Sea to the Adriatic Sea all East-West-lines disconnected. Consequently, the UCTE grid – covering 23 countries across Europe – was divided into three separate areas (West, North East and South East). This resulted in significant power imbalances in each area. The power imbalance in the Western area led to a severe frequency drop that caused an interruption of the supply for more than 10 million European households.

01 January 2000
Global celebrations to mark the start of a new millennium.

01 July 2000
The tunnel and bridge link between Sweden and Denmark opens to traffic.

25 March 2001
Denmark, Finland, Iceland, Norway and Sweden join the Schengen Agreement.

2000 JAN FEB MAR APR MAY JUNE JULY AUG SEPT OCT NOV DEC 2001 JAN FEB MAR

In both under-frequency areas (West and South East), sufficient generation reserves and load shedding allowed the normal frequency to be rapidly restored. In the over-frequency area (North East), the lack of control over generation units contributed to the deterioration of system conditions in this area (long-lasting over-frequency with severe transmission-line overloading).

In its coordinating function, the UCTE carried out an investigation on the incident of 4 November in order to ensure the efficient and secure operation of the interconnected electrical "power highways" in the future.

Five critical factors were examined, such as the non-fulfilment of the n-1 criterion and inappropriate inter-TSO coordination before and during the event.

In October 2006 the UCTE was recognised by the European institutions and market parties as the reference centre for the reliability of the synchronous interconnected system and for technical consultancy for UHV system performance and development in order to make the electricity market happen.

01 January 2002

Circulation of euro banknotes and coins begins in 12 European countries.

ENTSO-E

In addition to the UCTE as a technical association, the NORDEL, UKTSOA, ATSOI and BALTSO also existed with the same goals in other parts of Europe. The main focus on market was organised by activities of ETSO (It was becoming quite clear, especially under the rearranged market design, that a shift from a more voluntary to an enforcement-based platform would be needed if a sufficient level of compliance were to be guaranteed. Furthermore, the EU talked much about the so called "20-20-20 targets" (standing for 20% decarbonisation, a 20% increase in the share of renewable energy sources (RES) fed in and a 20% improvement in energy efficiency by 2020) which meant that the share of RES in the generation mix was now rapidly growing favoured by the current legislative climate, and particularly difficult for the grid to catch up. Such intentions voiced by the EU required more co-ordinated action, involving not only TSOs, but all relevant parties, such as generators, legislators, regulators, research institutes and stakeholders. To address these pressing issues, and in anticipation of the 3rd package of energy legislation, all TSO associations embarked on an intensified cooperative commitment which was given a legal foundation through the establishment of the new pan-European body ENTSO-E (European Network of TSOs for Electricity) on 19 December 2008. Among its founding members were all of the UCTE's TSOs.

This reorganisation resulted in the merging of the existing associations, including the UCTE, which was wound up by mid 2009. However, this formal wind-up did not mark "the end of the UCTE's legacy". It is just a novel response to new challenges for which Sir Isaac Newton's memorable line "If I have seen further, it is by standing on the shoulders of giants", seems rather apt.

10 September 2002

At the 57th meeting of the UN General Assembly, Switzerland is accepted as the 190th member of the United Nations.

08 September 2003

The EU Commission decides that, from 1 October 2004, members of the Union may use photographs and graphics as health warnings on cigarette packets.

JULY AUG SEPT OCT NOV DEC JAN FEB MAR APR MAY JUNE JULY AUG SEPT

2003

The grids in the Eastern Bloc and in Russia | **2003**

01 May 2004

The EU is enlarged by 10 states: Estonia, Latvia, Lithuania, Malta, Poland, Slovakia, Slovenia, the Czech Republic, Hungary and Cyprus.

29 October 2004

The heads of government of the countries of the EU sign the Treaty establishing a Constitution for Europe in Rome. It will enter into force once it has been ratified by all member states.

Since all stakeholders agree on the fact that system reliability must be preserved with the highest priority in each existing synchronous system as a pillar for pan-European integration and further development of a pan-European electricity market, the main purpose of the "Continental Europe" Regional Group is to promote the reliable and efficient operation of the TSOs acting within the Continental Synchronous Area of the former UCTE. This includes the following activities:

- All operational issues (including those related to frequency control, scheduling and accounting, and coordination services);
- Regional Technical Network Codes for the different Synchronous Areas;
- Implementation of codes and the procedures in the event of infringements (Multilateral Agreement);
- Compliance monitoring for the Regional Technical Network Codes;
- Interoperability assessments (DC links, underground and submarine cables, integration of renewable energy sources and requested extensions of the synchronous system) within the framework of the ENTSO-E System Development Committee.

The transition from the UCTE to ENTSO-E therefore undoubtedly marks the beginning of a new area of cooperation among all TSOs. This new structure is expected to enable faster and more focused development towards the needs and goals set by the European Union. In the past the UCTE developed through the initiatives of TSOs and their dedicated individuals, without laws and rules imposed by authorities. This spirit of initiative and responsibility should also be preserved in the future.

The new framework of the 3rd Energy Package establishes new roles for all players. Very close cooperation is expected between the Agency for the Cooperation of Energy Regulators (ACER) and ENTSO-E. However, only if this cooperation is built on trust, mutual understanding and respect great achievements will be possible.

The European Union's highly ambitious goals with regard to generating a substantial share of electricity from renewables will demand significant investments and considerably more resources to allow the grid to be adapted to the needs of consumers and generators.

The new era will see the TSO community challenged even more than it was in the past. For this reason, the good old core virtues of sound, reliable technical expertise and judgement – as embodied by the UCTE – will be even more necessary than before.

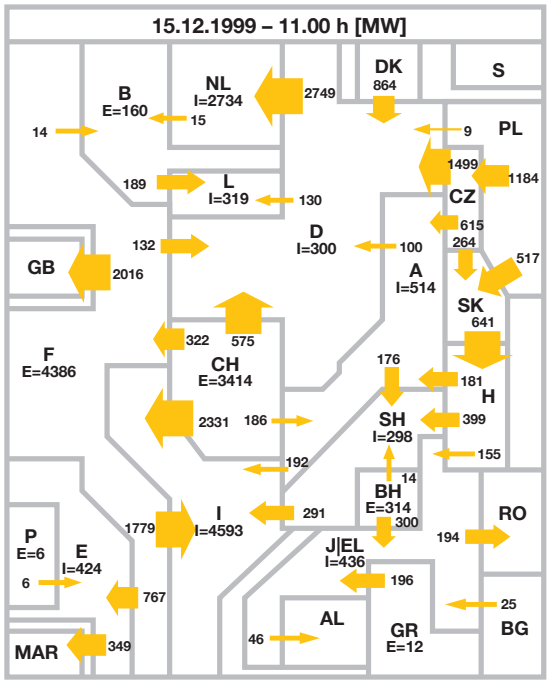
09 April 2005
The European Parliament approves the entry of Bulgaria and Romania into the European Union.

28 July 2005
The Northern Irish terrorist organisation, the IRA, declares an end to its armed campaign.

The concept of Europe has always been an integral element of the work of the UCPTE/UCTE. While, at the time of its foundation, the UCPTE represented the systems of only eight countries, and electricity exchanges were relatively limited in comparison to their present levels, we are now in a situation where, fifty years on, the UCTE encompasses a territorial area stretching from Poland to Portugal via Greece, providing 350 million consumers with secure and reliable electricity supplies.

The UCPTE was defined as a free association of representatives of electricity undertakings and government officials covering the interconnected countries of Western Europe. Although during its early years it embraced working groups on the coordination of maintenance and operational problems in thermal power stations and on indices of hydro conditions, it was the working party on improving general interconnections that was to provide the organisation's main focus for the future.

Electricity exchanges on 15.12.1999 - 11.00 h (MW)



E = Export

I = Import

01 June 2006

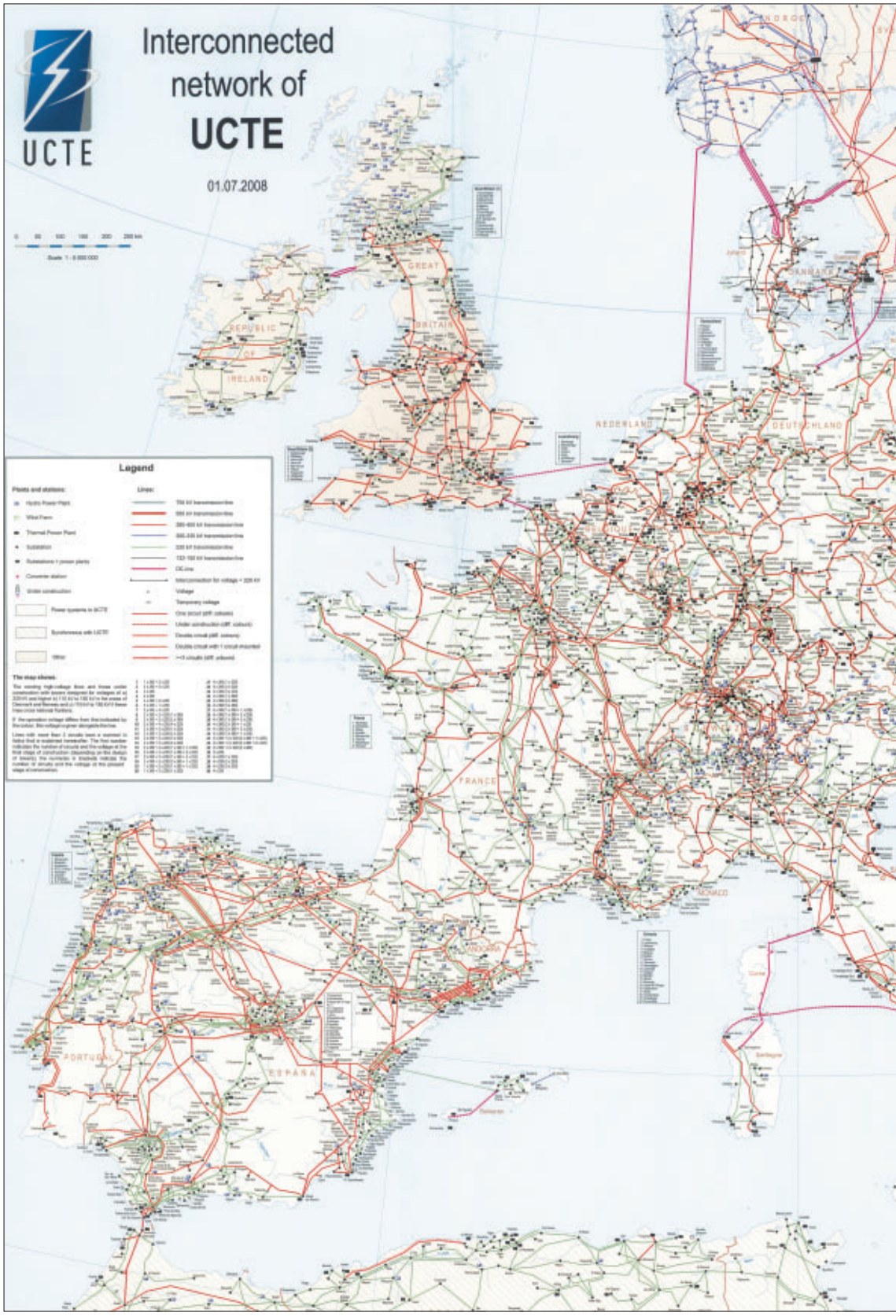
The EU Council and European Parliament designate 2007 as the "European Year of Equal Opportunities for All".

05 December 2006

Finland is the 16th member state to ratify the Constitutional Treaty.

01 January 2007

Romania and Bulgaria accede to the European Union.


Interconnected
network of
UCTE
01.07.2008
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OF
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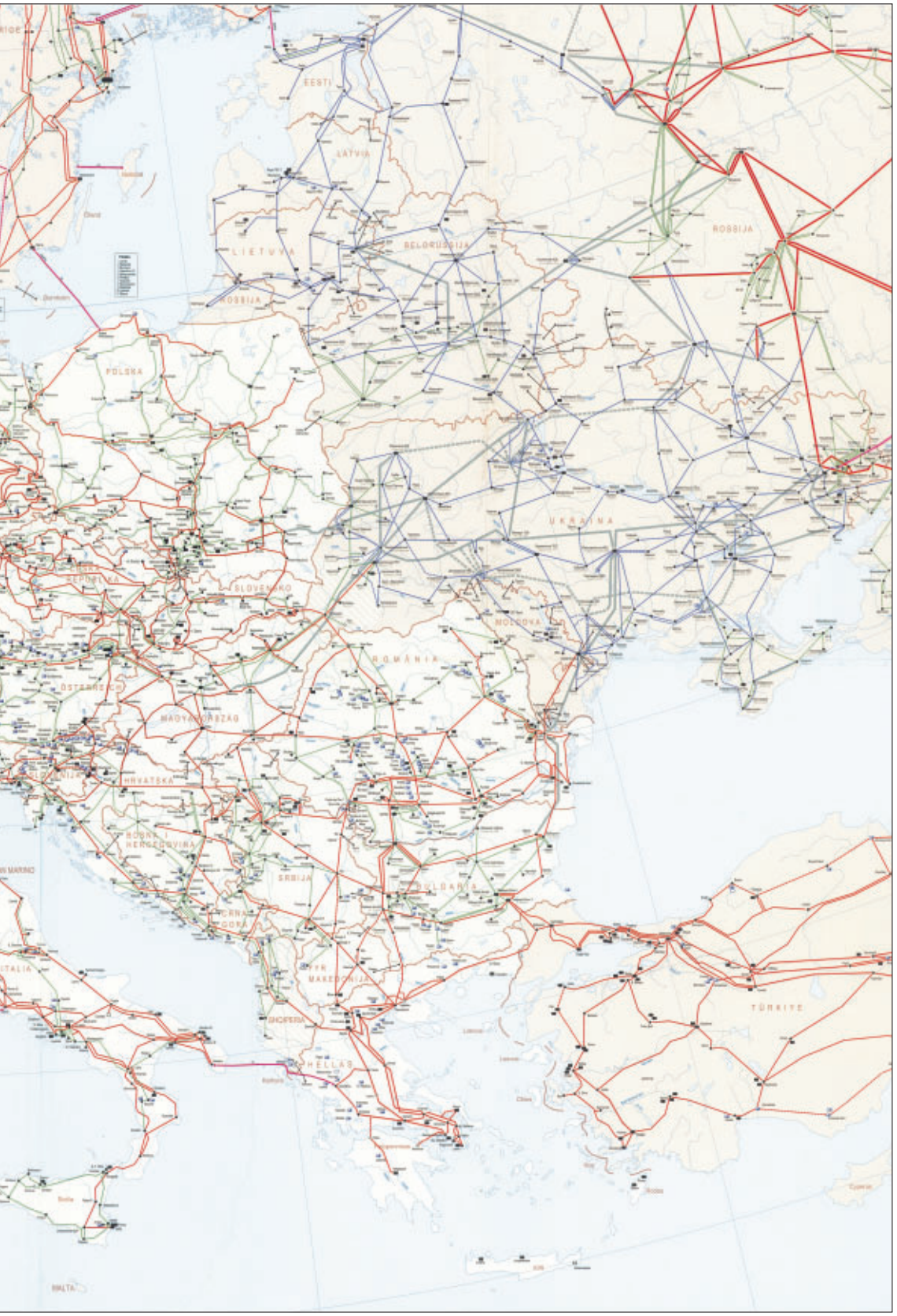
EESTI
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BELORUSSIJA
ROSSIJA
POLSKA
UKRAINA
SLOVENSKO
MOLDOVA
ROMÂNIA
ÖSTERREICH
MAGYARORSZÁG
HRVATSKA
BOSNA I HERCEGOVINA
SRBIJA
CRNA GORA
SHQIPËRIA
ELLAS
TÜRKIYE
MALTA

UCPTE / UCTE PRESIDENTS

Mandate	President	Secretary
1951 – 1953	C. Crescent †	M. Vivert
1954 – 1955	P. Fonthier †	E. Harmant
1956 – 1957	R. Müller	G. Tardini
1958 – 1959	L. Wolf	R. Schaerer
1960 – 1961	R. Hochreutiner	R. Schaerer
1962 – 1963	J.C. van Staveren	A. van Ganswijk / G.A.L. van Hoek
1964 – 1965	F. Hintermayer	W. Koch / G. Winter
1966 – 1967	G. Bardon	J.P. Brutchi
1986 – 1969	L. De Heern	H. Fraiteur
1970 – 1971	P. Facconi	C. Corvi
1972 – 1973	H. Meysenburg	C.H. Mathis
1974 – 1975	R. Schaerer	P. Dusseiller
1976 – 1977	J.H. Bakker	J.F. Zantinge
1.1.78 – 4.11.78	W. Erbacher †	-
1978 – 1979	H. Wagensonner	W. Hönigmann / M. Bial

10 July 2007

The council of EU finance ministers ECOFIN approves the introduction of the euro in Cyprus and Malta as from 1 January 2008.

12 March 2008

Celebrations take place to mark the 50th anniversary of the first meeting of the former European Community.

Mandate	President	Secretary
1980 – 1981	J. Féron	M.J. Pax / L. Pernecker
1982 – 1983	Baron A. Rolin	J.M. Delincé
1984 – 1985	F. Galli	P. Peiser / P. Burelli
1986 – 1987	H. Lichtenberg	D. Schreyer
1988 – 1989	F. Hofer	D. Schreyer
1990 – 1991	G.A.L. van Hoek	J. F. Zantinge
1992 – 1993	J.M. Paz	T. Trindade
1994 – 1995	W. Fremuth	M. Bial
1996 – 1997	M. Albert	J.-Y. Delabre
1998 – 1999	J. Allen Lima	V. Rodrigues
2000 – 2001	J. Stotz	T. Roggenbach
2002 – 2003	M. Fuchs	M. Bial
2004 – 2005	M. Fuchs	M. Bial
2006 – 2007	J. Penedos	M. Bial
2008 – 2009	J. Penedos	M. Bial

12 December 2008
At the Brussels summit, agreement is reached on climate and financial packages, as well as on the next steps to be taken with regard to the financial crisis.

19 March 2009
EU leaders agree to use EUR 5 billion of unspent funds on upgrading energy and IT connections.

16 July 2009
The Icelandic parliament votes in favour of applying to join the EU.

OCT NOV DEC JAN FEB MAR APR MAY JUNE JULY AUG SEPT OCT NOV DEC

2009

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