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European Interconnection: State of the Art 2002
(SYSTINT Annual Report)

WG SYSTINT

UCTE

UNION OF THE ELECTRICITY INDUSTRY
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State of the Art 2002
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Its mission is to contribute to the development and competitiveness of the Electricity Industry and to promote the role of electricity in the advancement of society.

As a centre of strategic expertise, the **Union of the Electricity Industry - EURELECTRIC** will identify and represent the common interests of its members and assist them in formulating common solutions to be implemented and in coordinating and carrying out the necessary actions. To that end it will also act in liaison with other international associations and organisations, respecting the specific missions and responsibilities of these organisations.

The **Union of the Electricity Industry - EURELECTRIC** is also the association of the Electricity Industry within the European Union representing it in public affairs, in particular in relation to the institutions of the EU and other international organisations, in order to promote the interests of its members at a political level and to create awareness of its policies.

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[1] International Union of Producers and Distributors of Electrical Energy
[2] European Grouping of Electricity Undertakings

What is UCTE?
The "Union for the Co-ordination of Transmission of Electricity" (UCTE) is an association of transmission system operators in continental Europe, providing a reliable market base by efficient and secure electrical »power highways«. The interconnected system ensures the technical condition for the reliable operation, and provides benefit for all market participants because they guarantee market access.

For more than fifty years UCTE has been co-ordinating by a variety of technical rules and recommendations the international operation of high voltage grids that all work with one »heart beat«: the 50 Hz UCTE frequency. UCTE is committed to the development of the system to meet all new market requirements, but without losses in terms of reliability for the existing system. The UCTE network brings a safe electricity supply for some 400 million people. Therefore UCTE handles one of the biggest electrical synchronous interconnections worldwide. This technical solution provides the possibility of the free market operation.

Key figures

35	Transmission System Operators (TSO)
21	European Countries
400	million Customers served by the represented power systems
516 GW	Installed capacity
2100 TWh	Electricity consumption in 2001
230 TWh	Sum of electricity exchange between member TSOs under rules of UCTE
200.000 km	Length of high-voltage transmission lines managed by the TSOs

Principles
- UCTE is convinced that the reliability of the biggest electric European synchronous interconnected area and the development of stable conditions for flourishing electricity markets in this area are inseparable and mutually interdependent issues.
- UCTE is responsible for the security of the UCTE system, which is the ability of the system to withstand major or sudden disturbances, such as the loss of production units, grid elements, but also accidents or attacks.
- UCTE is responsible for the adequacy of the UCTE system, which is the structural ability of the system to balance actual power and energy demand.
- Each member TSO in UCTE is responsible for the quality of its own transmission system services, and together, all UCTE members will keep up the technical basis for a sound market development.
- UCTE ensures the quality of international transmission services, and also an early alert in case of declining generation and/or transmission capacities that might lead to sudden restrictions or adverse impacts on competitive electricity markets.

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Introduction

The electricity industry across the globe is witnessing sweeping change. Markets are rapidly becoming regional, coupled with the increasing economic and energy interrelations between the EU Member States and the neighbouring regions. Against this background, EURELECTRIC (the Union of the Electricity Industry) continues to support development of an open pan-European energy market based on sound market and environmental principles and is of opinion that realisation such a vision has several components: market structure, environment and interconnections, which should complete each other.

EURELECTRIC is profoundly involved in addressing all these issues and the first SYSTINT Annual Report entitled ***"European Interconnection: State of the Art 2002"*** should be seen as a practical contribution to the ongoing discussion on interconnection development.

This first Annual Report of the joint EURELECTRIC-UCTE Working Group "SYSTINT" is aimed at providing an up to date overall picture or snapshot of interconnection development on the European continent and beyond, including 30 country contributions. In most cases, the data and figures refer to the year 2001. It is intended to update the report on a regular basis in future. The report is prepared as an information aid to all parties in the wider European space involved with the challenges of interconnection development.

The first chapter of the report starts with a short introduction of the history of interconnections and explains the main factors that produced the current frame of interconnection development. The main part of this chapter focuses on giving an overview of the current status of the European electric system. Thus, information is provided on UCTE, NORDEL, United Kingdom, Turkey, North Africa, the Unified Power System and the Baltic States. Individual country contributions are presented in Annexes of the report.

The driving forces underpinning ongoing *development* of interconnection and the current and potential new projects themselves are presented in the second chapter of the report. Overall conclusions and recommendations are summarised under the third and final chapter of the report.

The report was developed by members of the working group SYSTINT. This group was set up in 1990, originally as a UNIPEDE group of experts – jointly with the former UCPTE - to study the possibility of interconnecting the Western and Central European systems. Today, however, the functioning of this working group is conducted in the frame of the Memorandum of Understanding between EURELECTRIC and UCTE, signed in October 2000, according to which SYSTINT is a joint working group of both associations.

To recall briefly the respective mission of these organisations, EURELECTRIC focuses on the Electricity Industry as a whole. Where transmission issues are concerned, in view of the specific mission of ETSO (the European Transmission

System Organisation), EURELECTRIC represents the transmission *network user's* point of view in matters concerned with the functioning of the EU electricity market. UCTE on the other hand is responsible for the co-ordination of technical and operational matters, including especially system security and adequacy, of the synchronously interconnected system. In order to ensure co-ordination between other concerned associations and activities, NORDEL is also permanently represented in SYSTINT, and the working group closely follows the SYSTMED working group (which itself is concerned with the development specifically of the Mediterranean electricity ring).

The joint working group is dedicated to the subject of system development, with an emphasis on European, Near Asian and Mediterranean electric systems. It aims to achieve the following purposes:

- It is a forum of information on on-going, planned or foreseen developments of systems.
- It deals with the technical, organisational and economical aspects of these projects.
- It assesses development strategies; and supports related studies.
- It monitors ongoing studies, through the reports of the experts in charge; it follows also the technical solutions implemented in other projects through its permanent links with the regional associations and with CIGRE.
- It issues periodical reports on the progress of interconnection topics and describes possible evolution of interconnection. The main conclusions are made public by various means, including through seminars or symposiums organised for this purpose.
- It acts as an interface with the EU Commission; it facilitates exchanges for non-EU representatives and promotes studies on interconnections involving their systems.
- It proposes, when desirable, adaptation of the EU policy regarding system development.

The membership reflects the objectives of the Working Group and the members comprise representatives of non-EU countries, EU country representatives, representatives of UCTE and a representative from NORDEL and finally representatives from the generation and supply/trading businesses, nominated by EURELECTRIC.

With a view to added-value, invitations to participate in SYSTINT meetings can also be addressed to EU Commission representatives, representatives of other regional unions, COMELEC, experts from parties in charge of studies, representatives from national electricity regulators.

1. THE INTERCONNECTED ELECTRIC SYSTEMS: PRESENT STATUS

1.1 A long process

For the continental part of Europe, the development of cross-borders lines has started by 1920, mainly as a way of taking advantage of the Swiss hydropower. Surprisingly cross-border interconnections took place before the national interconnections, since in most of European countries the national networks where not yet interconnected, and the process of interconnection slowed down and restricted itself to radial operation of power plants from one country to another.

After the second world war the process of cross-border lines restarted, resulting in 1949 in 3 main systems, isolated form each other, with exchanges districted to radial operation, with lines a 220 kV, France, Spain, Portugal; Italy; Netherlands, Belgium, Germany, Austria and Czechoslovakia; Switzerland was divided between the three blocks.

In 1958 synchronous operation for two blocks was achieved with a common point in Switzerland and moved towards a full synchronous operation in the first years of the sixties. Former Yugoslavia joined in 1975, followed by Greece (with Albania) in 1985. In order to assist and promote the process of integration UCPTE was founded in 1951. Later in 1997 UCPTE changed into UCTE and is now the organisation of Transmission System Operators.

Due to obvious geographical reasons, the Northern part of Europe has started the process of integration of their national systems later. The first noticeable tie-lines have been put into operation in the beginning of the sixties, but developed strongly under the aegis of NORDEL. Numerous undersea cables, mainly DC, interconnect these Nordic systems with neighbouring countries (Germany, and Poland very recently).

The central part of Europe is the UCTE system. It comprises today the transmission systems of 21 European countries *(see Figure 1)* and meets the electric energy demand of 400 million people (over 2 000 TWh). 35 transmission system operators (TSO) have agreed upon a strong common regime of frequency control in order to maintain a stable 50-Hz-frequency even in the case of a loss of generating capacity of 3 000 MW. With the permanent interconnection of the CENTREL-System (the systems of Poland, Czech Republic, Slovakia and Hungary) to the UCTE system in 1997, some 60 GW were added to the 400 GW of UCTE. Apart from many other preparatory measures, the "Maßnahmenkatalog" required remedies (e.g. power system stabilisers, PSS) against inter-area oscillations within the enlarged system (the longest distance covered is about 3,000 km from Portugal to the eastern boarder of Poland).

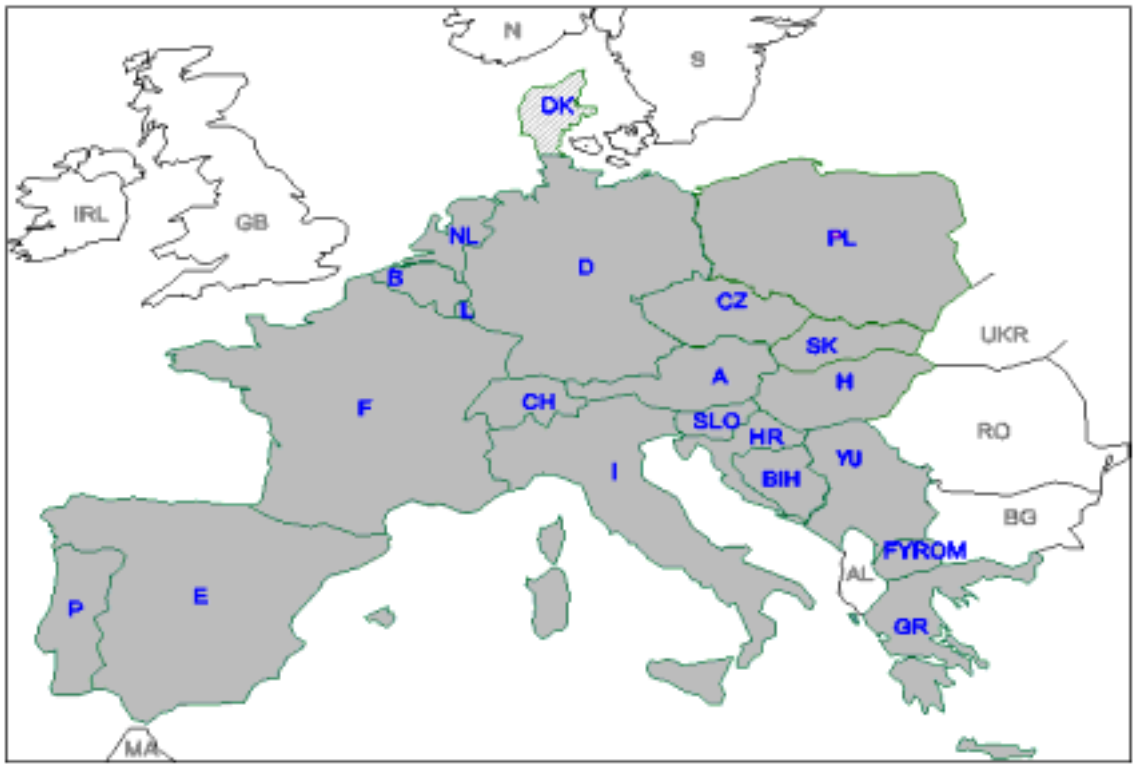

Fig. 1: ***European countries represented in UCTE***

As a consequence of the war in ex-Yugoslavia the greater part of the Balkan peninsula (including the Greek system) has been disconnected from the central UCTE system since 1991.

In addition, there exist already some AC interconnections beyond the border of the UCTE system. For a long time, the continental part of Denmark has been running synchronously with the UCTE. In 1997, an AC submarine cable was put into operation to connect Spain with Morocco across the Straits of Gibraltar. As there are further interconnections between Morocco, Algeria and Tunisia, this part of Africa is now synchronously connected to the UCTE System. This large synchronous zone, operating at the same frequency, is often referred to as TESIS (Trans-European Synchronously Interconnected System).

Even within the UCTE system there are some smaller networks (the islands of Sardinia and Corsica) which are connected to the main system via DC cables. Between Italy and Greece, a DC cable link across the Adriatic Sea will support the interconnection between these two countries (starting commercial operation in 2002).

While the UCTE system is mainly based on thermal production capacities (51 % conventional, 35 % nuclear out of 516 GW installed capacity), the four Nordic countries Norway, Sweden, Finland, Denmark, and Iceland rely mainly on hydro production (61 % hydro out of 89,000 MW installed capacity). The Nordic TSOs co-operate within a similar organisation like UCTE, called NORDEL. The NORDEL

system is connected to the UCTE system (including the continental part of Denmark) via powerful DC submarine cables. DC back-to-back converters (1 400 MW) also exist between Finland and Russia.

Since 1986, The British system, comprising the supply systems of England, Wales and Scotland has been interconnected with France (UCTE) via a 2 000 MW DC submarine cable link. The Republic of Ireland operates an isolated system with a weak connection only to Northern Ireland. Northern Ireland is now interconnected with Scotland via 500 MW HVDC "Moyle" link.

1.2 The main driving forces

The interconnection of the networks that led to the UCTE present system has been driven through a step by step process, where the procedures, tests and studies were standardised, and where the new connecting countries adopted the UCTE standards.

The growth of the system has been realised to satisfy the following motivations:
- to increase the security and reliability of the system and
- to allow commercial exchanges between vertically integrated utilities.

This process has been very successful; it has led to the creation of one of the biggest synchronous system in the world, having the highest level of security and reliability. The system has reached such a size and has developed so detailed common standards that very few improvements can be expected from the interconnection of new systems. However, new geographical extensions of the synchronous areas will be considered and investigated for the benefits of all electricity market participants. For many countries, the synchronous interconnection of their electricity system to the UCTE area presents significant economic and technical advantages. UCTE will pursue its efforts at developing the synchronous area while observing objective criteria and procedures in order to maintain the whole system on the present high level of reliability and stability.

1.3 The main blocks

The European electric power system of today comprises a variety of different supply systems – regional, national and supranational. Some of these systems are operated synchronously under the same frequency control regime, and they are interconnected by a great number of AC links, thus forming in reality a single, densely meshed system. Other systems are interconnected by one or more powerful DC interconnectors, which lead to clear manageable structures. Some others have to be operated as isolated systems due to geographical borders of Europe.

In the following subchapters, the main European regional interconnection systems are presented and their current status is debated *(see Figure 2).*

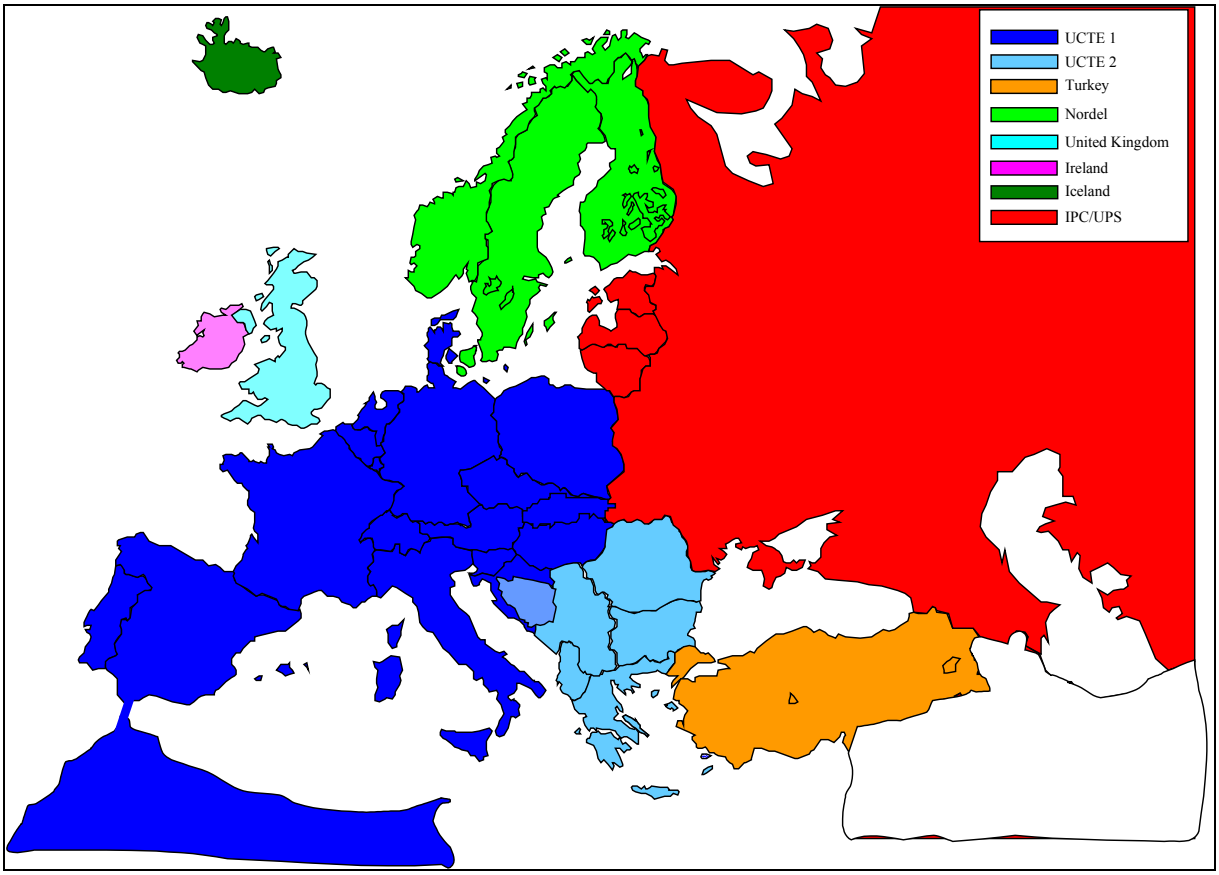

Fig. 2: ***The synchronous zones in 2002***

1.3.1 UCTE 1

As shown on the map of the synchronous zones, the UCTE system is composed of two areas often named UCTE1 and UCTE2.

The UCTE1 area is the western continental part of the system and represents the interconnection of the following countries (from West to East):

- Portugal
- Spain
- France
- Belgium
- Luxemburg
- Netherlands
- Switzerland
- Denmark
- Germany
- Italy
- Austria
- Czech Republic
- Slovenia
- Poland
- Slovakia
- Hungary
- Croatia

- Bosnia and Herzegovina (Federation of BiH)

This system is also interconnected synchronously to the three Maghreb countries:
- Morocco
- Algeria
- Tunisia

1.3.2 UCTE 2

The UCTE2 area is composed of the following countries:
- Bosnia and Herzegovina (Republic of Srpska)
- Federal Republic of Yugoslavia
- Former Yugoslav Republic of Macedonia
- Greece

Bulgaria and Romania are interconnected synchronously to the UCTE2 area as well as Albania *(The reconnection process of this area is described in the chapters 2.2.3 and 2.2.5 of the report).*

1.3.3 NORDEL

Nordel is a body for co-operation between the transmission system operators (TSOs) in the Nordic countries (Denmark, Finland, Iceland, Norway and Sweden), whose primary objective is to create the conditions for, and to develop further, an efficient and harmonised Nordic electricity market.

The organisation adopted new bylaws in June 2000, formalising Nordel's changed status as an organisation for the TSOs in the Nordic countries.

Nordel also serves as a forum for contact and co-operation between the TSOs and representatives of the market players in the Nordic countries in order to develop an efficient electricity market. A Market Forum has been set up within the new Nordel organisation in order to pursue this dialogue.

Nordel's tasks fall mainly into the following categories:
- System development and rules for network dimensioning
- System operation, operational reliability, security of supply and exchange of information
- Principles of transmission pricing and pricing of ancillary services
- Internal co-operation
- Maintaining and developing contacts with organisations and regulatory authorities in the power sector, particularly in the Nordic countries and Europe
- Preparing and disseminating neutral information about the Nordic electricity system and market

Nordel's highest decision-making body is the Annual Meeting, whose participants are drawn from representatives of the TSOs. The Annual Meeting elects the chairman of the organisation for a term of two years. The chairmanship rotates between the Nordic

countries. The chairman appoints Nordel's secretary and is responsible for the secretariat and for the related costs. The organisation has no budget.

Nordel's executive body is the Board, composed of one representative from each of the Nordic TSOs. The Board of Nordel makes initiatives and decisions on topical issues, and implements the decisions taken at Nordel's Annual Meeting. The Board is also responsible for the organisation's external information activities.

Most of Nordel's work is carried out by committees and working groups. Nordel's Operations Committee, Planning Committee and Market Committee are made up of the managers responsible for the corresponding sectors in the TSOs. The working groups are composed of technical specialists drawn from the various sectors involved in co-operation within Nordel.

		Nordel	Denmark	Finland	Iceland	Norway	Sweden
Population	mill.	**24.3**	5.4	5.2	0.3	4.5	8.9
Total consumption	TWh	**401.0**	35.4	81.6	8.0	125.5	150.5
Maximum load (measured 3rd Wednesday in January)	GW	**64.6**	6.1	11.5	0.9	21.0	25.1
Electricity generation	TWh	**395.4**	36.0	71.6	8.0	121.9	157.8
Breakdown of electricity generation							
Hydropower	%	**55**	0	19	82	99	50
Nuclear power	%	**23**	*	31	*	*	44
Other thermal power	%	**20**	88	50	0	1	6
Other renewable power	%	**2**	12	0	18	0	0

** Data do not exist, "0" Less than 0.5 %*

Table 1: Key figures 2001

Due to the high amount of hydropower and the variation in inflow rates over the year, the energy balance for the Nordic system features wide variations. These variations are reflected in variations in the market prices for Nord Pool.

The Nordic transmission system with the high number of HVDC interconnections is shown in Figure 3. There is a one-way HVDC interconnection from the UPS system to Finland, and normal HVDC interconnections between Poland and Sweden, Germany and Sweden and Germany and the eastern part of Denmark.

The western part of Denmark is a separate TSO area. This area is a member of the Nordel co-operation and also an associate member of the UCTE as this area is in synchronous operation with the rest of the UCTE. For historical reasons, there is no electrical interconnection between the eastern and western part of Denmark.

Fig 3: ***The Nordic transmissions system***

1.3.4 United Kingdom

Liberalisation of the UK electricity industry, which began in 1990, has created a competitive market in which suppliers can sell electricity nationwide and all consumers can choose their supplier.

Privatisation was carried out in stages beginning with England and Wales, then Scotland and lastly in Northern Ireland. This has resulted in three separate electricity markets for the three regions *(Characteristics of the UK electric system are described in the country file in the report annexes).*

England and Wales

In England and Wales transmission and distribution have been completely separated from supply and generation.

National Grid is the transmission network owner and system operator. It has a duty to develop and maintain an efficient, co-ordinated and economic transmission system and facilitate competition in supply and generation. National Grid also ensures that the system is balanced at all times.

There are 38 major players in the generation market. Under the New Electricity Trading Arrangements (NETA), bulk electricity is traded between generators and suppliers through bilateral contracts and on power exchanges. A small volume of energy is traded through the Balancing Mechanism, through which National Grid balances output with demand. Generation is in effect self-despatching.

Any company holding a supply licence can sell electricity, however distribution and transmission companies may not hold supply licences. Suppliers may supply customers nationwide using the transmission and distribution networks.

Distribution is a monopoly and there are 9 distribution companies operating 12 authorised distribution areas.

Scotland

Scottish Power and Scottish and Southern Electricity cover the full range of electricity provision from generation, transmission and distribution through to supply. Each company has its own geographical area where it operates. The third company operating in Scotland is British Energy a nuclear generator whose output is fully contracted to Scottish Power and Scottish and Southern until 2005. Recently both the supply and generation businesses have been separated from the transmission and distribution arms and are managed separately to increase competition in generation and supply. Prior to the management separation competition in supply was made possible by non-discriminatory third party access.

Northern Ireland

Northern Ireland Electricity is the regulated provider of transmission, distribution and procurer of energy for Northern Ireland.

There are only four major power stations: Ballylumford, Kilroot, Belfast West and Coolkeeragh with a total generating capacity of 2082MW.

A framework for competition in supply has been established through the introduction of second tier licences to enable other licensed suppliers to sell electricity to final customers in Northern Ireland. Up to July 1999 all suppliers had to buy their power from NIE's Power Procurement business.

1.3.5 Turkey

Turkey is another candidate having already applied for interconnection to UCTE zone and UCTE membership. Two 380 kV interconnections exist between Turkey and Bulgaria and today are only used for pocket operation *(The Turkish power system is described in the country file in the report annexes).*

1.3.6 North Africa

At the end of the eighties the idea of a sub marine connection between Spain and Morocco emerged and both DC and AC techniques were analysed. The decision was taken in favour of an AC connection and the cable was put in operation in October 1997.
This cable connects synchronously the three following countries:

- Morocco
- Algeria
- Tunisia

The maximum transmission capacity of the cable is 700MW, but the cable is operated with an ATC (Available Transmission Capacity) of around 350MW.

The electric systems of the three countries have the following characteristics:

Country	Installed capacity	Peak demand	Annual consumption
Morocco	4280 MW	2394 MW	11.4 TWh
Algeria	6080 MW	4617 MW	24.4 TWh
Tunisia	1940 MW	1500 MW	8.4 TWh

Table 2: Characteristics of the electric systems of Morocco, Algeria and Tunisia

1.3.7 Unified Power Systems

The Unified Power Systems (UPS) interconnection includes now all power systems (PS) of the former USSR (the CIS and the Baltic States). Exceptions are the PS of Armenia which is synchronously operating with the PS of Iran and the West PS (Lvov) of Ukraine *(see also Chapter 2.2.4)* which will be soon synchronised with TESIS. The Integrated Power System (IPS) of East (Russia) has very weak links (220

kV) with IPS of Siberia operating in autonomous regime and is not considered as part of UPS.

When considering the interface East-West the interlocutors from UPS are Russia, Ukraine, Belarus, Moldova, Estonia, Latvia, Lithuania all other PS being under the responsibility of Russian UPS (Unified PS).
Following interesting bodies are part of UPS:

- The CIS Electric Power Council with the participation of DC Baltija as observer, which co-ordinates the energetic policy, joint projects etc.,
- Similar Council of Central Asia countries and Kazakhstan power systems representatives,
- PS Council of Baltic states and
- Technical Committee of electric ring: Belarus – Russia – Estonia – Latvia – Lithuania with the participation of DC Baltija.

The installed capacity of the whole system is about 325 GW. The main voltage levels are 330/750 kV in the western part and 220/500 kV in the eastern part up to IPS of Central Asia (Uzbekistan, Turkmenistan, Tajikistan, and Kirghizia). In the IPS of Center all voltage levels are 220/330/500/750 kV. There are five 1150 kV lines Siberia – Kazakhstan – Ural, which now operate under 500 kV. Two of them were for some years in operation only under nominal voltage.

Central Dispatching Office of UPS (CDO UPS) of Russia is responsible for the co-ordination of the active power balance of the whole block and for the frequency control.

Power/energies exchanges in UPS are taking place on the basis of bilateral contracts and transit problems are only negotiated. Electricity markets are different in each PS of UPS and so far no common market rules are available inside of UPS.

1.3.8 Baltic states

The current total installed capacity of Baltic IPS is 11,490 MW and it includes a wide spectrum of generation types – nuclear plant (Ignalina NPP), CHP's, thermal, hydro and pumped storage power plants. Hence electrical energy is generated from many fuel types, for example, oil shale, gas, oil, peat, water and nuclear. In the year 2000 (25th January), the annual peak demand of the Baltic IPS was 4551 MW (Lithuania 1910 MW, Estonia 1469 MW and Latvia 1172 MW).

The transmission network of the Baltic IPS consists mainly of 330kV transmission lines having a total length of 4136,9 km (2571 miles) with the reference to January 2001. Historically, the Soviet Union's northwestern regional planning strategy led to the concentration of the thermal power plants in Estonia while in Latvia more than 70% of the installed capacity was hydropower. The installed capacity of the Ignalina Nuclear Power Plant in Lithuania produces the majority of the State's power requirements.

The regional operational control allows taking into account the generation structure of each country, to deal efficiently with demand or generation deviations from planned

values. In order to improve operation control, the GE HARRIS SCADA systems were installed in Lithuanian and Estonian National Control Centers and during 2002 will be fully installed in DC Baltija and Latvian National Control Center.

The Ignalina NPP currently generates energy from 2 - 1300 MW RBMK type reactors manufactured in the Soviet Union. The Lithuanian Government has already decided to shutdown the first reactor in 2005 and the second reactor in 2010. This decision will lead to serious changes in the power balance in Lithuania as well as in whole Baltic IPS. This is due to the fact that the Ignalina NPP produced 35% of the total Baltic IPS electricity production (in the year 2000 it was 8419 million kWh).

The effect of the Ignalina NPP decommissioning on the Baltic States is the subject of the Report *"Baltic Regional Energy Development Program"* prepared by Latvian, Estonian and Lithuanian power systems in cooperation with Electrotek Concepts Inc., USA. This regional development analysis confirmed that to re-establish the energy balance of the Baltic States after decommissioning of the Ignalina NPP would require the construction of the new power plants having a total generation capability of 700 MW. The location of these power plants will have to take into account economical and political considerations in addition to ensuring that they are situated in close proximity to the existing 330kV transmission network of the Baltic IPS. Furthermore, the possible future development of power system connection with UCTE and NORDEL systems will need to be taken into account as well.

2. THE DEVELOPMENTS

2.1 The driving forces

The creation of the internal market of electricity

The European Directive 96/920EC[1] has changed the electricity sector in Europe. However there is not yet a single market in electricity. The European market of electricity is in fact composed of sub markets separated by interconnection lines whose capacities are limited. The demand is much higher than the offer on these lines and the transmission system operators have to put in place congestion management methods as well as capacity allocation procedures.

As a consequence, the internal network, especially the tie lines have to be reinforced. This has led to the communication from the commission to the Council and to the European Parliament which is describred in details below *(see Chapter 2.2.1).*

The requests from new countries

As said previously the UCTE system and its existing interconnections with UK, NORDEL and North Africa has reached such a size and such a level of quality that very few improvements can be expected from the connection of new systems. The primary motivation for the growth of the system which was the improvement of security has shifted to other reasons which can be political or commercial or both.

2.2 The projects

2.2.1 EU energy infrastructures

At the December Council of EU Energy Ministers in 2001, the European Commission unveiled a 3-part package[2] designed to boost EU energy infrastructure. The package includes:

1) a Communication from the Commission to the Council and the European Parliament on European Energy Infrastructure;
2) a Proposal for a European Parliament and Council Decision amending Decision No. 1254/96/EC laying down a series of guidelines for Trans-European Energy Networks and
3) a Status Report on Trans-European Networks

The Commission's Communication reveals that present interconnections are insufficient to ensure a properly functioning internal market in electricity and to guarantee supply security. The internal market for electricity is significantly hampered by congestion and missing links, and cross-border trade represented only 7 % of total electricity consumption in 2000.

[1] *The EU Electricity Directive entered into force on 19 February 1997 and in most EU countries had to be transposed into national law two years later (http://europa.eu.int/comm/energy/en/elec_single_market/index_en.html)*
[2] *For more information, please check: http://europa.eu.int/comm/energy/en/elec_single_market/infra_energy_en.html*

A few critical bottlenecks have been identified in the electricity sector, in particular:

- The borders between France and Spain,
- Italy (the borders between Italy and France, Switzerland and Italy and Austria and Italy),
- Belgium/Netherlands,
- West-Denmark and Germany,
- Ireland,
- The interconnection between the UK and continental Europe and
- Greece.

The Commission believes that a reasonable level of electricity interconnection should equate to at least 10 % of the installed power generation capacity in the Member States, with a higher level desirable for key transit countries. The Commission intends to monitor developments on an annual basis and ensure that the minimum targets are achieved within a reasonable timeframe.

The Commission has put forward an action plan aiming to:

- Optimise the use of existing infrastructure notably through transparent congestion management and tarification rules
- Encourage the construction of new infrastructure based on a transparent regulatory framework conducive to investment
- Focus on a new list of Priority Projects by revising Trans-European Network Energy guidelines and concentrating financial support on these 12 electricity projects, which should be declared of European interest, as foreseen in the Green Paper on Energy security of supply. The Commission also proposes to increase from 10 to 20 % the maximum share of possible co-financing for Priority Projects.
- Raise political awareness and commitments at all levels in relation to energy infrastructure

In addition, with a view to improving the use of existing infrastructure, the Commission is calling on the national regulators to improve the existing guidelines on transparency and congestion management and draft guidelines on regulatory control and financial reward for infrastructure. The Communication also asks ETSO to draft common standards for technical/administrative rules for the operation of electricity interconnections. It further urges rapid adoption of the draft Electricity/Gas Directive and the Regulation on cross-border trade and asks CEER and ETSO to have a tarification system up and running by 2003.

In the proposed new TENs guidelines, the Commission has created a new category "priority projects of European interest" – which would enable Community financing of up to 20 % of the costs and also cover the "development phase" not only the preparatory stage.

The guidelines itemise 7 projects for the reinforcement of power interconnections:

1. **France - Belgium - Netherlands - Germany**: electricity networks reinforcements in order to resolve the frequent problems of congestion through the Benelux
2. **Borders of Italy with France, Austria and Switzerland:** increasing electricity interconnection capacities.

3. **France - Spain - Portugal**: increasing electricity interconnection capacities between these countries and for the Iberian peninsula
4. **Greece - Balkan countries - UCTE System:** development of electricity infrastructure to connect Greece to the UCTE System
5. **United Kingdom - continental Europe and Northern Europe**: establishing/increasing electricity interconnection capacities
6. **Ireland - Northern Ireland - United Kingdom:** increasing electricity interconnection capacities
7. **Denmark - Germany:** increasing electricity interconnection capacity

2.2.2 The scheduled projects for the reinforcement of the present system

The European transmission system operators continuously reinforce the transmission network. The list below shows the internal projects for the reinforcement of the present system *(see also Figure 4*).

Austria:		
10 – Lienz (AT) – Cordignano (I)	AC OHL Double 380kV	FP
02 - St. Peter (AT) – Isar (DE)	AC OHL Double 380kV	FP
Südburgenland – Kainachtal	AC OHL Double 380kV	OP
Tauern – Salzach – St. Peter	AC OHL Double 380kV	OP
Belgium:		
05 - (BE) – Moulaine (FR)	AC OHL Double 380kV	OS
Tihange Avernas Tienen	AC UGC Double circuit 150kV	OP (62km)
Avernas Landen Brustem	AC UGC Single circuit 150kV	OP (23km)
Tihange-Courcelles	AC OHL Double 380kV	FP (73km)
Courcelles-Trivières	AC OHL Double 380kV	FP (20km)
Chievres – Trivières	AC OHL Double 380kV	FP (37km)
Avelgem – Chièvres	AC OHL Double 380kV	FP (33km)
Croatia:		
Ernestinovo-Žerjavinec	AC OHL Single 400kV	REC (2003)
06 – Ernestinovo-TPP Ugljevik (BA)	AC OHL Single 400kV	REC (2003)
07 – Ernestinovo-Mladost (FRY)	AC OHL Single 400kV	REC (2003)
08 – Mraclin-HPP Jajce (BA)	AC OHL Single 220kV	REC (2004)
09 – Međurić-Prijedor (BA)	AC OHL Single 220kV	REC (2002)
01 – Đakovo-Gradačac (BA)	AC OHL Single 220kV	REC (2003)
18 – Ernestinovo-Pécs (HU)	AC OHL Double 400kV	OS (2002errection 2006)
Czech Republic:		
Nc		
France:		
13 – Hernani (ES) – Cantegrit	AC OHL Single 400kV	OP (upgrad com 2002)*
12 – Bescano (ES) – Baixas	AC OHL Double 400kV	OP (com 2004-2005)
05 – (Belgium-BE) – Moulaine (FR)	AC OHL Double 380kV	OS
Germany:		
14 – Brunsbüttel (DE) –Farsund (N)	DC UGC Double circuit	FP (550km)
16 - Krajnik (PL)– Vierraden (DE)	AC OHL Double 400kV	FP (existing 220kV)
02 - St. Peter (AT) – Isar (DE)	AC OHL Double 380kV	FP

Hungary:		
Sándorfalva –Békéscsaba	AC OHL Single 400kV	OP (2003)
Paks – Pécs	AC OHL Double 400kV	OP (2004)
17 - Héviz – Cirkovce (SI)	AC OHL Double 400kV	OS
18 - Ernestinovo (HR) –Pécs	AC OHL Double 400kV	OS (2002-com 2006)
35 - Sajoivanka-Rimavska Sobota (SR)	AC OHL Double 400kV	FP
03 - Györ-Szombathely –Südburgenland (AT)	AC OHL Double 400kV	FP
19 – Pécs – Sombor (FRY)	AC OHL Double 400kV	OS
20 – Békéscsaba-Oradea (RO)	AC OHL Single 400kV	FP
Italy:		
Italy – France	AC OHL Double 380kV	OS
Italy – Slovenia	AC OHL Single 380kV	OS
Italy – Austria	AC OHL Single 380kV	OS
Italy – Switzerland	AC OHL Double 380kV	OP
Matera – Santa Sofia	AC OHL Single 380kV	OP (com 2003)
Turbigo –Bovisio	AC OHL Single 380kV	OP
Poland:		
21 - Ełk – Alytus (LT)	AC OHL Double 400kV	OS (2002 com 2005-2008)
22 – Narew – Berezowska or Ros (BY)	AC OHL Double 400kV	OS (com 2005-2008)
23 – Rzeszow Widelka – Chmielnicka (UA)	Activating AC OHL Single 750 kV line + B to B station	OS
15 – Plewiska – Eisenhuttenstadt (DE)	AC OHL Double 400 (380)kV	OS (com after 2015)
24 - Byczyna – Varin (SK)	AC OHL Double 400kV	OS
Dobrzen – Wielopole	AC OHL Double 400kV	UC (2003)
Rogowiec –Ostrow	AC OHL Double 400kV	UC (2006)
Ostrow – Plewiska	AC OHL Single 400kV	UC (2005)
16 - Krajnik – Vierraden (DE)	AC OHL Double 400kV	FP (operating on 220kV)
25 – Elblag - Kaliningrad (RF)	line + B to B station	
Portugal:		
Cartelle-Lindoso	AC OHL 400kV (2x1330 MVA)	OS (instalation of 2nd circuit)
Aldeadávila - Bemposta	AC OHL 220kV (2x1330 MVA)	OS (upgrading line)
Aldeadávila - Pocinho	AC OHL 220kV (2x1330 MVA)	OS (upgrading line)
Saucelle - Pocinho	AC OHL 220kV (2x1330 MVA)	OS (upgrading line)
Cedillo-Falagueira	AC OHL 400kV (1480 MVA)	UC (upgrad. line, 2004)
Balboa-Alqueva	AC OHL 400kV (1330 MVA)	UC (new double circuit overhead line, 2004)
Slovakia:		
35 - Sajoivanka (HU)-Rimavska Sobota	AC OHL Double 400kV	OS
24 - Byczyna (PL) – Varin	AC OHL Double 400kV	OS
04 – Stupava – Wien SO (AT)	AC OHL Double 400kV	OS
Slovenia:		
Krsko – Bericevo	AC OHL Double 400kV	FP
17 – Cirkovce – Heviz (HU)	AC OHL Double 400kV	OS
Spain:		
13 - Hernani – Cantegrit (FR)	AC OHL Single 400kV	OP (upgrad com 2002)
12 – Bescanó – Baixas (FR)	AC OHL Double 400kV	OP (com 2004-2005)
Adrall – Andorra (Andorra)	AC OHL Double 220kV	OP (upgr. 110kV com 2004/5)
26 - Balboa – Alqueva (PT)	AC OHL Double 400kV	OP (com 2004-2005)
27 - Cedillo – Falaguéra (PT)	AC OHL Single 400kV	OS (upgrading existing line)

28 - Cartelle – Lindoso (PT)	AC OHL Double 400kV	OS (upgrading existing line)
36 - Tarifa – Mellousa (Morocco)	DC Submarine 400kV	FP (com 2004-2005)
Bulgaria:		
29 – Chervena Mogila s/s – Stip (FYROM)	AC OHL Single 400kV	OS
30 – Maritza East 3 s/s – Filippi (GR)	AC OHL Single 400kV	OS
Zlatitsa – Plovdiv	AC OHL Single 400kV	UC
31 – Maritza East 3 s/s – Hamidabat (TR)	AC OHL Single 400kV	UC (com 2002)
Greece:		
30 - Maritza East 3 (BG) – Filippi	AC OHL Single 400kV	OS
33 - Filippi – Babaeski (TR)	AC OHL Single 400kV	OS (com 2006)
Florina – Bitola (FYROM)	AC OHL Single 400kV	UC (2003)
Florina – Amyntaio	AC OHL Double 400kV	UC (2003)
Lavrion – Argroupolis	AC OHL Single 400kV	UC (2004)
Korinthos – Patras	AC OHL Double 150kV	UC (2003)
Romania:		
Arad – Oradea	AC OHL Single 400kV	UC
Federal Republic of Yugoslavia:		
Sombor – Subotica	AC OHL Single 400kV	OP
34 - Podgorica – Elbasan (AL)	AC OHL Single 400kV	OS
07 – Ernestinovo (HR) – Mladost	AC OHL Single 400kV	REC (2003)
19 – Pécs (HU) – Sombor	AC OHL Double 400kV	FP
37 - Nis – Skopje (FYROM)	AC OHL Single 400kV	FP
38 – Sremska Mitrovica – Ugljevik (BA)	AC OHL Single 400kV	OS
Denmark:		
Nc		
Finland:		
Finland – Russia	3rd AC OHL 400kV	UC (upgradeAC/HVDC)
Finland – Sweeden	AC/DC 400kV 500MW	FP
UK:		
England – Norway	HVDC 400kV Submarine 1200MW	OS
England – NL	HVDC 400kV Submarine 1000MW	OS
Wales – Ireland	HVDC 400kV Submarine 500MW	OS
Turkey:		
33 – Filippi (GR) – Babaeski	AC OHL Single 400kV	OS (com.2005)*
31 – Maritza East 3 (BG) – Hamidabat	AC OHL Single 400kV	UC (com 2002) *
Birecik – Aleppo (Syria)	AC OHL Single 400kV	UC
Russia:		
Finland – Russia	3rd AC OHL 400kV	UC (upgrade AC/HVDC)*
Lithuania:		
21 - Ełk (PL) – Alytus	AC OHL Double 400kV	OS (2002, com 2005-2008)* Back to Back 600MW station in Alytus

FP *Foreseen Projects*
OS *Ongoing Studies*
OP *Ongoing Projects*
UC *Under Construction*
REC *Reconstruction*
***** *Lines have been mentioned at both sides of concerned countries*

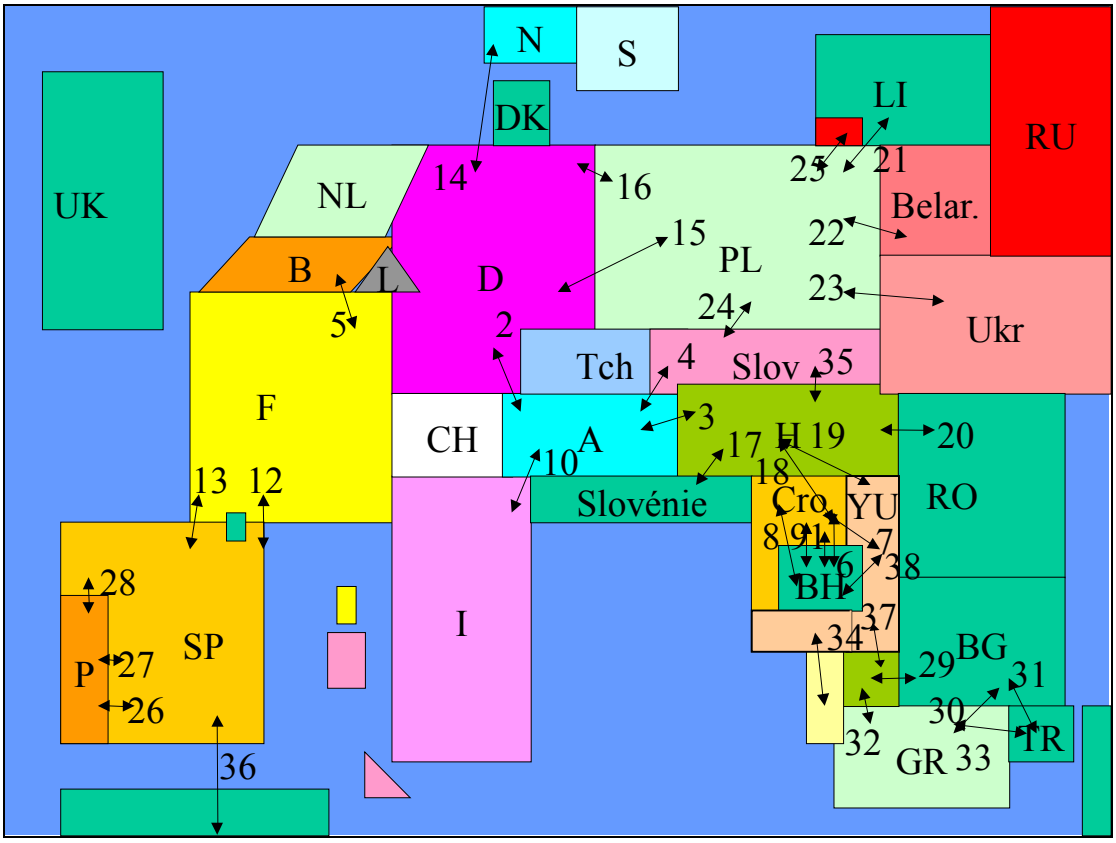

Fig 4: ***Interconnection projects***

2.2.3 Bulgaria-Romania

The process of integration of Bulgaria and Romania into UCTE started in 1997 and has now entered into its final stage.

Bulgaria and Romania finished the winter and summer test through year 2001, which showed that both systems operate under the UCTE rules. These tests showed very good performance of SCADA/EMS system, primary and secondary control, LFC.

The winter test of isolated operation of the electric power systems of Bulgaria and Romania was performed from 8 January to 31 March 2001, according to the relevant decision of Technical Committee UCTE/Romania-Bulgaria and was organised in two phases:

- 1st phase: system operation monitoring within the second UCTE synchronous zone – 10 weeks
- 2nd phase: tests in isolated operation with Bulgarian Power System – 2 weeks

The summer test was carried out from 1 July until 30 September 2001.

Since 1 February 2002 the one-year trial parallel operation within the Second Synchronous Zone of UCTE started. This operation is the next step to connection of Bulgarian and Romanian EPS's to UCTE. This operation is aimed to check the

generating units' technical parameters and the electric power system as a whole under real conditions of operation for a long period of time.

It's foreseen that Bulgaria and Romania will be part of the second UCTE area reconnection process at the end of 2003 *(see Figure 5).*

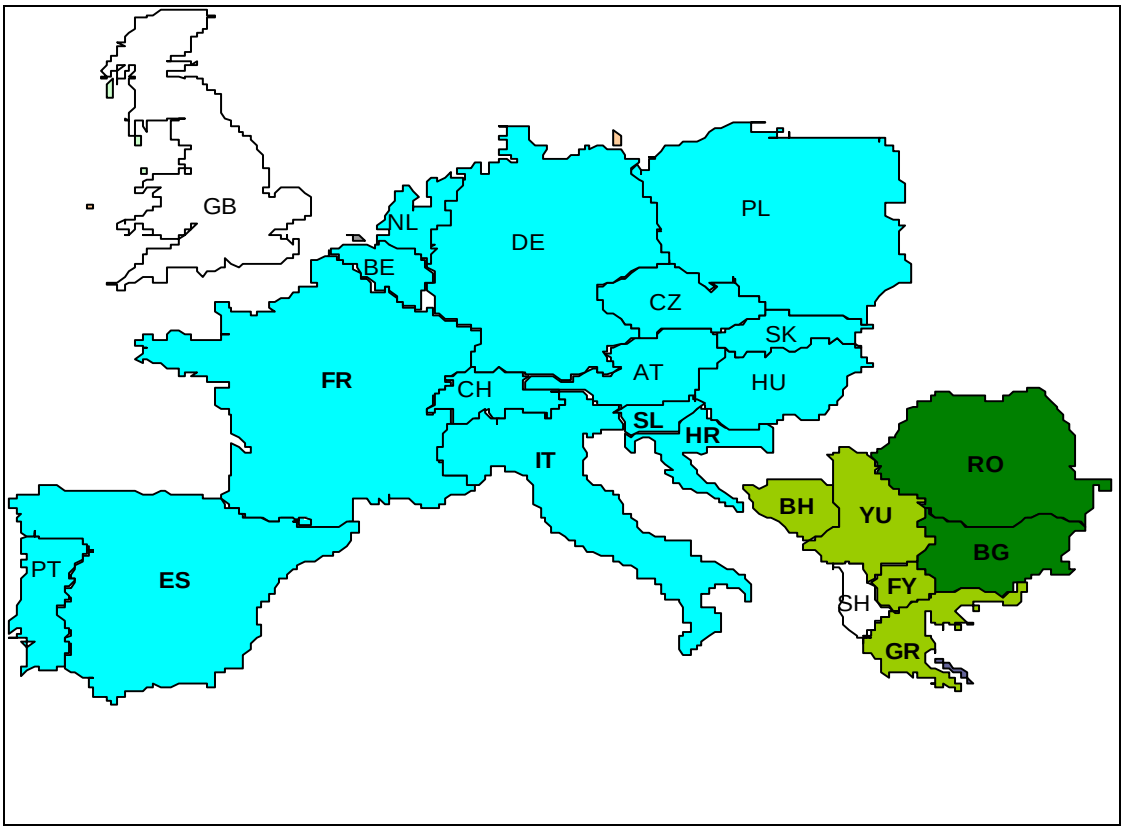

Fig. 5: The integration of Bulgaria and Romania into UCTE

2.2.4 The Bursthyn Island

In connection with the 12 month trial operation (which started in October 1995) of the CENTREL system with the UCTE system, the parallel operation of CENTREL with the island of Burshtyn ceased in September 1995. Since then the TPP Burshtyn island grid, has been connected to the Ukrainian national grid. Radial operation was maintained from units IPP via 400kV and 220 kV lines to Hungary and Slovakia.

In 1995, the Ukrainian Ministry of energy applied for parallel operation between the UCTE network and the Burshtyn Island.

The process that started in 1995 is now in the final stage. The catalogue of measures defined by UCTE has been completely fulfilled, and the parallel operation has started again on the 1st of July 2002. The formal tests in parallel operation will last one year and in 2003 the "island" will be permanently connected synchronously to the UCTE system *(see also Figure 6).*

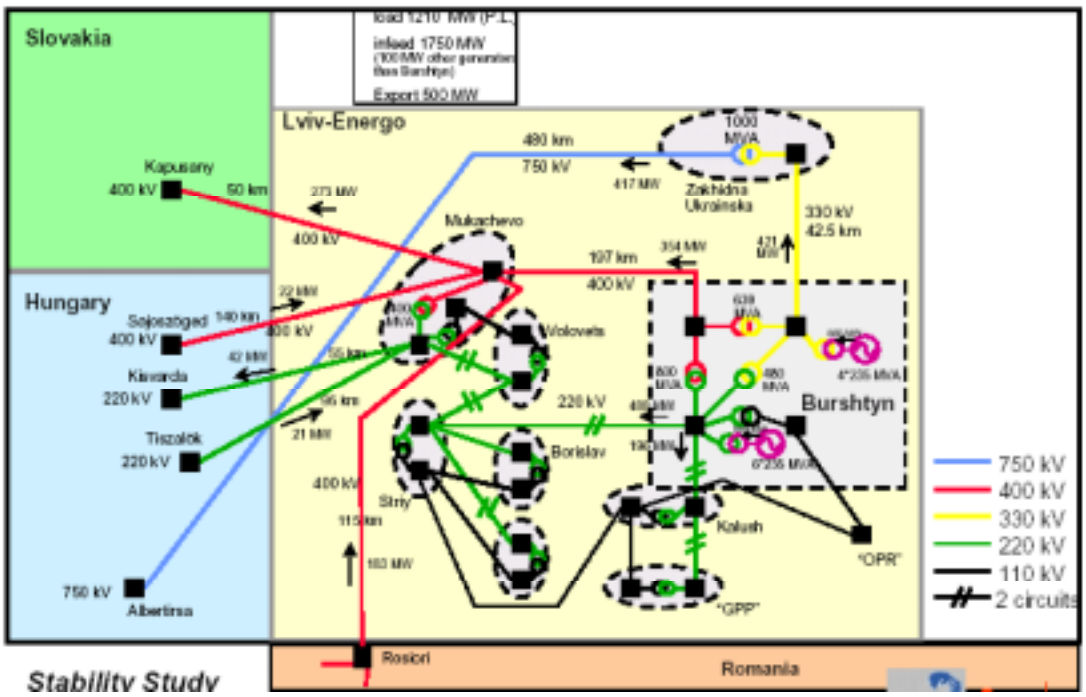

Fig. 6: The Burshtyn Island

2.2.5 Reconnection of the second UCTE area

The process of reconnection of the second area is conditioned by the reconstruction of many transmission facilities, which have been destroyed during the war in this part of Europe.
The reconstruction works are on going especially in the following regions:

- Ernestinovo substation in Croatia and the surrounding transmission lines
- Mostar and Gacko substations in Bosnia Herzegovina and the Adriatic line.

The present schedules show that the reconstruction work will be finished by the end of 2003, so that the UCTE2 area, including the two systems of Romania and Bulgaria will be reconnected in 2004.

2.2.6 South East European Cooperative Initiative

SECI Project Group on "Development of Interconnection of Electric power Systems of SECI Countries for Better Integration to European System" was established to improve the cooperation of the Power Systems in the region. SECI Project group performs joint studies for:

- Teleinformation System among the National Dispatch Centers in SECI Countries (finalised),
- Regional Transmission System Planning (ongoing),
- Teleinformation System and Ancillary Services Market Development in Southeast Europe (ongoing).

These studies are aimed to improve the Power Systems in the region and better operation within UCTE, to study the regional impact of the new interconnection

investments in the region and to support same technical infrastructure aspects for the proposed Regional Electricity Market development in Southeast Europe.

2.2.7 North Africa 1 and 2

Two synchronous blocks exist today in North Africa *(see also Figure 7)*:
- Morocco, Algeria and Tunisia
- Libya, Egypt, Jordan, Lebanon and Syria

The first block is already connected to the UCTE system, as described in the first part of this report.

The second block has asked UCTE to be connected synchronously via already built lines between Tunisia and Libya. These lines are 220kV lines, one being a double circuit line between Medenine (Tunisia) and Abu Kamash (Libya) and the other one being a single circuit line between Tataouine (Tunisia) and Rowies (Libya).
The second block represents an installed generation capacity of 28.600 MW and a peak load of around 20.000 MW.

The transmission system in the Mediterranean region operates at the grid levels of 500 kV, 400 kV, 225 kV, 150 kV, 90 kV and 60 kV. Most electricity generation plants are connected to these voltage levels. Table 3 shows the transmission line lengths in service as of 31 December 2001.

Country	Voltage Level	Lines (km)	Cables (km)
Morocco	400 kV	500	
	225 kV	5,666	
	150 kV	763	
	60 kV	9,218	
Algeria	400 kV	0	
	225 kV	6,952	30
	150 kV	69	
	90/60 kV	6,701	200
Tunisia	400 kV	0	
	225kV	1,236	11
	150 kV	1,490	
	90 kV	964	28
Libya	400 kV	0	
	220 kV	11,711	
	150 kV	-	
	66 kV	12,475	
Egypt	500 kV	2,249	
	400 kV	20	
	220 kV	12,482	
	132 kV	2,536	
Jordan	400 kV		
	225kV		
	150 kV		
	90 kV		
Lebanon	400 kV		
	225kV		
	150 kV		
	90 kV		
Syria	400 kV	687	
	225kV		
	150 kV		
	90 kV		

Table 3: Transmission facilities in each country

In addition, internal reinforcements at 400 kV are foreseen by the year 2005 in Morocco, Algeria and Tunisia, and are being analysed in the ELTAM[3] study.

[3] *A study called ELTAM (the acronym for Egypt-Libya-Tunisia-Algeria-Morocco) will start soon. This study is dedicated to the feasibility of the reinforcement of existing 220 kV interconnections from Egypt to Morocco by a higher voltage transmission system using 500 kV in Egypt and 400 kV from Libya to Morocco*

Interconnections among countries

Several electrical interconnections among these countries are already in operation. Nevertheless, future projects are involving new transmission lines. All the existing and future links are presented in the following Tables *(Tables 4 and 5*).

A)..... In operation

Interconnection	Voltage level	Type	Year of commissioning
Syria – Lebanon	220 kV	Single-circuit OHL	1973
	66 kV	Single-circuit OHL	1977
Jordan – Syria	230 kV	Single-circuit OHL	1980
	400 kV	Single-circuit OHL	2001
Morocco - Algeria	220 kV	Two single circuits OHL	1983 – 1992
Morocco – Spain	400 kV	Single-circuit submarine cable	1996
Libya – Egypt	220 kV	Double-circuit OHL	1998
Egypt – Jordan	400 kV	Single circuit, OHL + submarine cable (500 kV on Egyptian side and 400 kV on Jordan side)	1998
Algeria – Tunisia	90 kV	Two single circuits OHL	
	150 kV	Single-circuit OHL	
	220 kV	Single-circuit OHL	

Table 4: Electrical Interconnections in operation

The Jordan – Syria – Lebanon interconnection operates in two parts: one synchronous in 66 kV and other asynchronous in 230 kV operated as an island system.

B) Planned links

Interconnection	Voltage level	Type	Year of commissioning
Libya - Tunisia	220 kV	Single-circuit OHL	2001*
	225 kV	Double-circuit OHL	2001*
Tunisia - Algeria	400 kV	Single-circuit OHL	2003
Syria – Turkey	400 kV	Single-circuit OHL	2002
Syria – Iraq	400 kV	Single-circuit OHL	2003
Syria - Lebanon	400 kV	Double-circuit OHL	2003
Iraq – Turkey	400 kV	Single-circuit OHL	2003
Algeria - Morocco	400 kV	Double-circuit OHL	2004
Spain - Morocco	400 kV	Submarine cables	2004/5
Libya - Egypt	400 kV	Single circuit OHL	-

** The lines are built but not yet connected (studies and tests are underway before synchronous operation of the two blocks will take place)*

Table 5: Planned links

A 400 kV line between Libya and Tunisia will be decided in the framework of the ELTAM study. Besides, a 2000 MW Algeria-Spain DC interconnection, as well as, a possible 2,000 MW DC link Algeria – Italy are under serious consideration.
Therefore, the total transmission capacities between countries are shown in Table 5.

To / From	Morocco	Algeria	Tunisia	Libya	Egypt	Jordan	Lebanon	Syria	Iraq	Spain	Turkey
Morocco		2x245								730	
Algeria	2x245		267 + 178 + 86 + 76								
Tunisia		267 + 178 + 86 + 76		3x267							
Libya			3x267		460						
Egypt				460		500					
Jordan					500			1135			
Lebanon											
Syria						1135					1135
Iraq											
Spain	730										
Turkey								1135			

Table 6: ***Transmission capacities (thermal capacity) from existing interconnections among countries (MW)***

In addition, a feasibility study for the interconnection of the electrical networks of Tunisia and Italy is under preparation. The link between the two countries would be across a 400 kV submarine cable of 160 km (500 MW DC).

The working group *"System development"* is presently studying the possible interconnection of the two blocks, and in particular the impact of this connection on the present UCTE system. It is expected that UCTE will give its position on this request by the end of 2002.

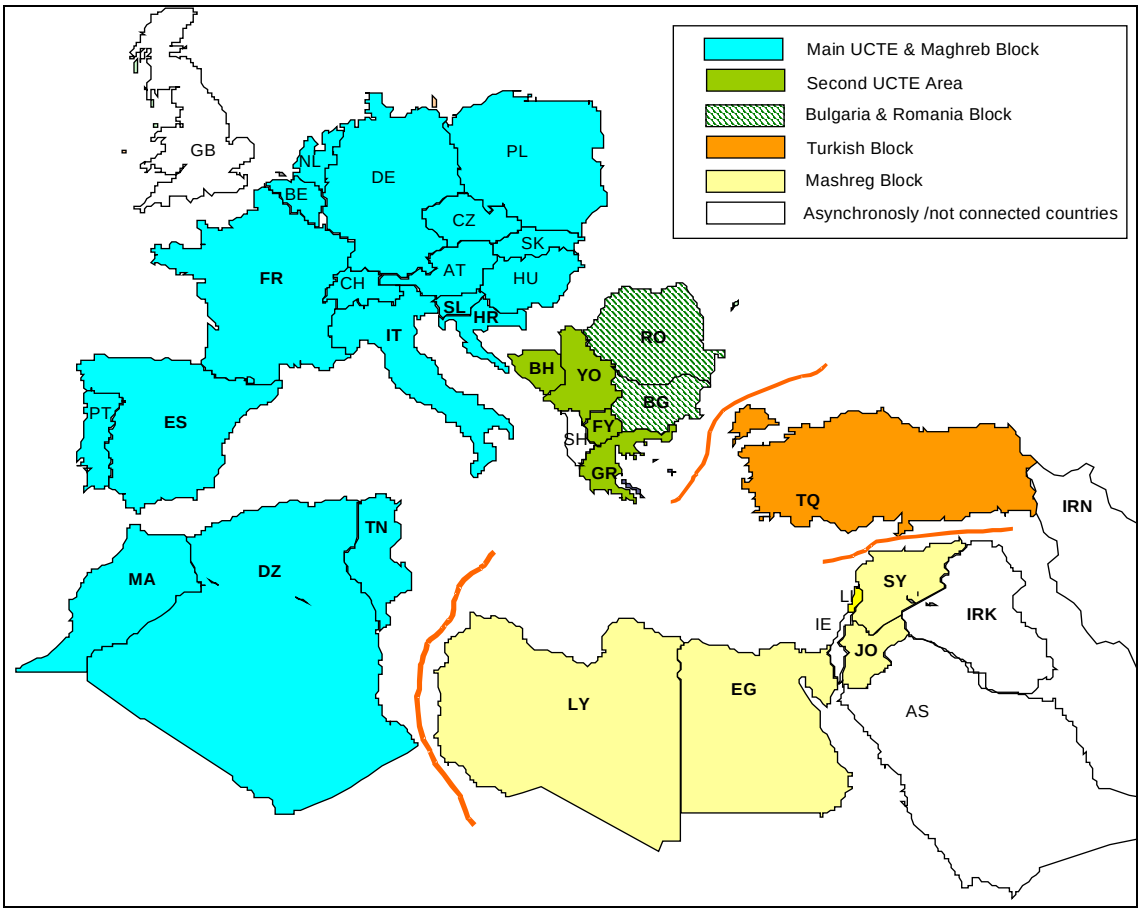

Fig 7: ***Electrical interconnections in North Africa***

2.2.8 Turkey

Following the request of TEAS (The Turkish Elelectric Generation&Transmission Company) to PPC (Greece) and the relevant application made by PPC to UCTE, UCTE has taken the decision to consider all possibilities of interconnecting the electric power system of Turkey to the UCTE network.
A subgroup "Turkey" was formed in the frame of the UCTE working group *"System development",* to tackle the issue of the connection of this new applicant.

Since the early 90ties several studies were performed to investigate the possibilities for connecting Turkish network to UCPTE, at that time via the Greek, and later on via Greek and Bulgarian Networks.

Most recently, 2000-2001, an elaborate set of studies was financed by the European Commission and performed in the frame of TEN (Trans European Networks Programme). The study named *"Feasibility And Evaluation Study of the Electricity Interconnection Greece–Turkey" (Contract No ENERGY/5.7100/Z/99-009*), includes system studies and cost benefit analysis. It was performed by a team of utilities in the area, namely PPC (Greece), TEAS (Turkey), NEK (Bulgaria) and EKC (FRY). In this frame several scenarios were investigated for connecting Turkey via Bulgaria and Greece.

On the basis of this study and DVG study concerning stability issues of the synchronously interconnected operation of the electric network of UCTE/CENTREL and 2nd zone, UCTE decided to carry on a complementary study with two scenarios. Both of them are taking as a basis the fact that the second UCTE area is reconnected to the first one:

- The first scenario corresponds to the status of the network in 2004. In this scenario, it is assumed that all the reconstruction works in UCTE1 and UCTE2 area are finished and that the Turkish power system can be connected through the two existing 400kV lines, namely Babaeski (TR)-Maritsa East 3 TPP (BG) and Hamitabat (TR)- Maritsa East 3 TPP (BG).
- The second scenario corresponds to the status of the network in 2006. In this scenario it is assumed that the 400kV line between Filippi (GR) and Babaeski (TR) is also available.

The terms of reference of this complementary study are under completion as well as some local load flow studies.

2.2.9 Medring

The closure of the Power Ring around the Mediterranean Basin *(see Figure 8)* planned to become a reality in next few years is followed by the SYSTMED WG set up in 1993 by UNIPEDE in agreement with MEDELEC[4].

The major aim of SYSTMED is to define a coherent framework for the development of interconnections among the power systems of the Mediterranean Basin, with a view to improve the security of supply by taking into account the various projects under study or progress in this area.

The SYSTMED WG initiated the actual MedRing study. Between 1993 and 1997, it analysed the feasibility of a Mediterranean Ring with a study carried out by EDF, SONELGAZ and ENEL. The conclusion of this study was that, due to the filiform structure of the South and East Mediterranean networks, the Ring would be weak and the synchronous operation of the Mediterranean Ring would require:

- adequate upgrades of networks;
- installation of reactive compensation systems to improve voltage profile;
- use of appropriate defence plans, co-ordinated among the various countries of the Southern and Eastern blocs, to face possible critical events and
- presence of highly reliable telecommunication systems among all the countries.

On the basis of these conclusions and taking into account that the Mediterranean Ring might be synchronously closed by the horizon 2005, it was envisaged to prolong this SYSTMED study.

In this connection, the MEDRING study, co-financed by the EU MEDA Programme and by four European Partners (CESI, EdF, DESMIE and REE), was launched. Initially, five countries were beneficiaries of the study: Algeria, Tunisia, Egypt, Jordan and Turkey. The relevant contract was signed in December 2000. In 2001, Libya and Syria, upon their request, have been also included in the list of beneficiary countries of the MedRing study.

The consortium identified three main tasks:

- economic analysis (evaluation of the economic benefits of the closure of the Ring)
- steady state analysis (analysis of the load flows)
- dynamic security analysis

The first two tasks of the study are now completed and the dynamic security analysis task officially started in May 2002. Regarding this last task, UCTE has asked to be integrated in the project, in order to contribute to the terms of reference of the study. This will allow to model the whole UCTE system and to check the impact of the Ring on the present UCTE system.

At the end of the MedRing study, in spring 2003, EURELECTRIC will organise a conference to publicise its results.

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[4] *MEDELEC is a Mediterranean Liaison Committee consisting of Electricity Industry Associations (EURELECTRIC, UCTE, COMELEC, UPDEA (Africa), AUPTDE (Arabian)), created in Tunis on October 1991*

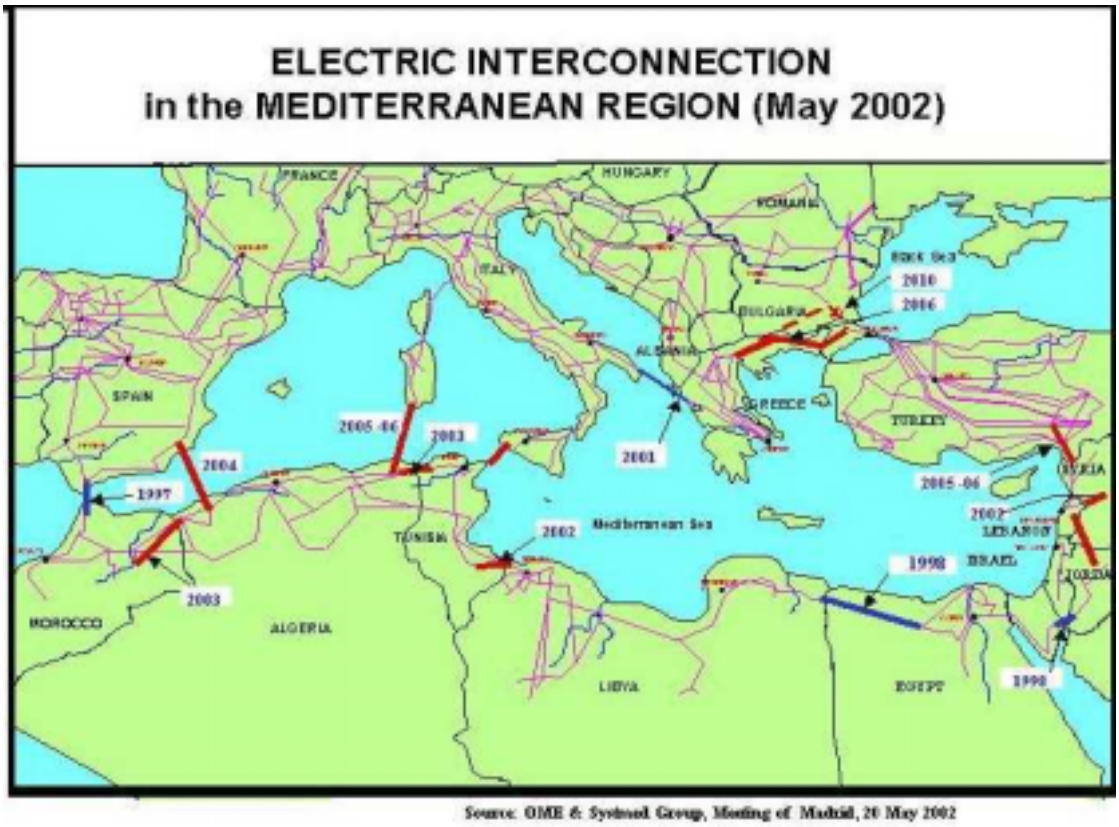


Fig. 8: Electric interconnection in the Mediterranean region (May 2002)

2.2.10 Nordel

The Planning Committee within Nordel has completed its Annual Report for 2001[5]. Apart from energy balance studies, investigations for new interconnections have been made.

The studies for new interconnections are based on cost-benefit studies for a simulated operation of the whole system including part of Poland, Germany and the Netherlands. The studies show the marginal benefits when increasing interconnection capacity at different locations.

Originally planned HVDC interconnection from Norway to Germany has now been cancelled. The planned HVDC interconnection from Norway to the Netherlands is on hold.

A 1,200 MW interconnection between Norway and the UK and an interconnection between Finland and Estonia are under discussion.

The boards of Svenska Kraftnät and Eltra have decided to undertake a lifetime extension of the Konti-Skan 1 interconnection by replacing the original mercury arc rectifiers with up-to-date converter stations.

[5] *The Nordel Annual report 2001 is available on: www.nordel.org*

2.2.11 United Kingdom

England - Norway, North Sea Interconnector

For three years National Grid has, under a Joint Development Agreement with Statnett (the Norwegian grid operator) been developing an interconnection between the east coast of England and the south west coast of Norway. The project is referred to as the North Sea Interconnector (NSI). NSI will have a capacity around 1200 MW, and at around 700km long will be the longest DC subsea cable in the world. Construction is due to start this year and completion is envisaged by 2007.

A seabed survey was completed in October 2000 and a feasible route was identified.

Britain – Netherlands Interconnector, BritNed

Following feasibility studies in 1999 carried out under a joint development agreement, National Grid and TenneT (the grid operator in the Netherlands) established a joint venture company, BritNed Development Ltd., to develop a subsea interconnector between England and the Netherlands. The link will be around 200km long and capacities between 1000 and 1320 MW are being considered. The target date for commercial operation is 2006.

Wales – Ireland

National Grid and ESB NG undertook a feasibility study in 2000/2001 to identify the options for a HVDC sub sea link between the West Coast of Wales and the East Coast of Ireland.

2.2.12 Unified Power Systems

RAO "EES Rossii" has asked UCTE to study the possible synchronous interconnection of the IPS/UPS and UCTE power systems.

The connection of these two power systems is not a new problem and many studies have been carried out on the subject, the last being the TACIS EREG 9601 study.

However, this project is not of the same kind as a mere extension of the UCTE synchronous area, like all other UCTE past and present extensions, but rather to the interconnection of two large electrical blocks that are of similar size. In fact it would be a world "premiere" to interconnect two blocks of these sizes.

For the time being both systems are operated according different technical standards; the UCTE system is based on a decentralised frequency control policy and the UPS system is based on a centralised control system where the peripheral areas are under load control.

Regarding the transmission network, eleven existing lines listed below are potentially available to interconnect the two blocks *(see also Figure 9).*

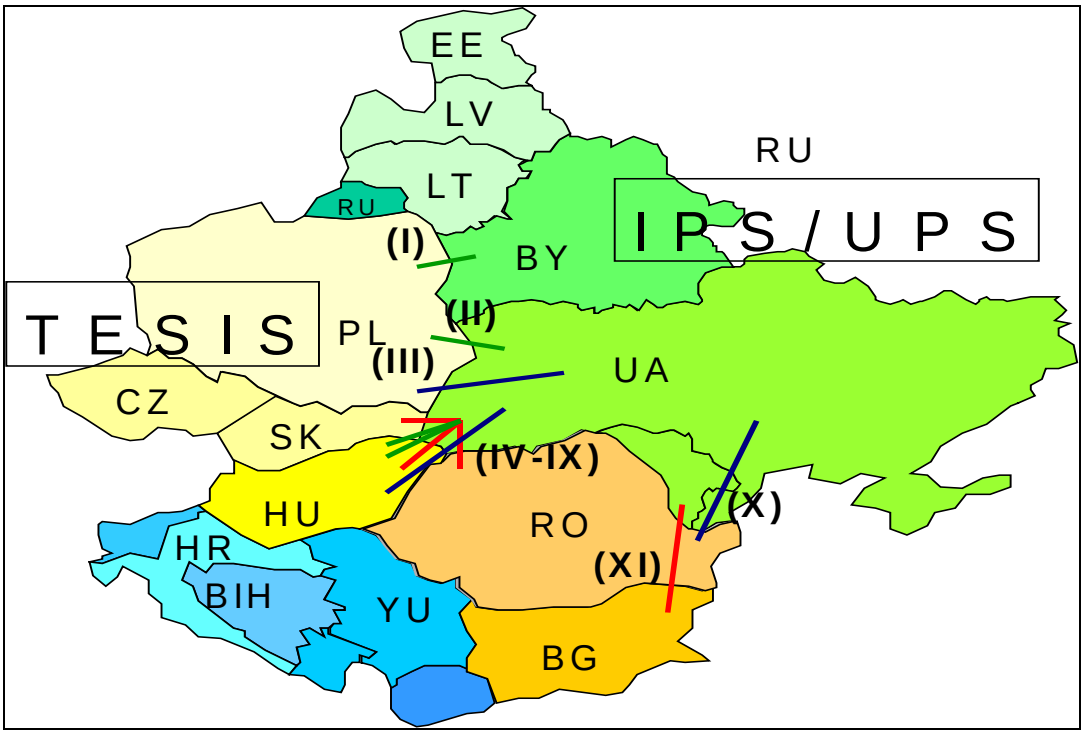


Fig 9: ***Transmission lines between TESIS and IPS/UPS***

Substation on TESIS side	Substation on IPS/UPS side	Voltage [kV]	Status
Bialystok (PL)	Ross (BY)	220	Island operation of small area on PL side
Zamosc (PL)	Dobrotvirska (UA)	220	Radial operation of Dobrotvirska power plant (UA)
Rzeszow (PL)	Khmelnitskaya (UA)	750	Switched off
Velke Kapusany (SK)	Mukachevo (UA)	400	Radial operation of Burshtyn power plant (UA)
Sajoszeged (HU)	Mukachevo (UA)	400	Radial operation of Burshtyn power plant (UA)
Albertirsa (HU)	Zakhidnoukrainska (UA)	750	Switched off *
Kisvarda (HU)	Mukachevo (UA)	220	Switched off *
Tiszalok (HU)	Mukachevo (UA)	220	Switched off *
Rosiori (RO)	Mukachevo (UA)	400	Switched off **
Isaccea (RO)	Pivdennoukrainska (UA)	750	Switched off
Dobruja (BG)	Vulkanesti (MD)	400	Switched off

* *Lines VI – VIII are to be switched on to synchronous operation when Burshtyn Island is interconnected to UCTE power systems*

** *Line IX is to be switched on to synchronous operation when Romanian and Bulgarian grids are interconnected to UCTE power systems*

Table 7: ***Existing links between IPS/UPS and TESIS***

Taking into account the facts that:

- it is a project of a completely new dimension (both systems are of similar sizes),
- the previous studies can be considered as prefeasibility studies,
- improving or at least securing at its present high level the reliability of the present power systems, is a guiding principle underlying each step in the process of interconnection.

UCTE through its working group *"System development"* has decided to proceed in two main steps:

- *Pre-feasibility Study:*

This analysis is to be done under the leadership of the UCTE Sub Group East of CENTREL by a group of experts.
The focus of this investigation is fixed in a corresponding working program taking into account a first priority analysis. The main objective is to study via a steady state load flow analysis how the horizontal network of UCTE can cope with long distance transits in both ways. In addition, a certain amount of stability checks will be performed. The basis is the UCTE Network as it is supposed to be achieved by the end of 2003 (including Romania, Bulgaria, Burshtyn Island as well the reconnected second UCTE zone). First results are expected by the end of 2002.

- *Feasibility Study:*

On the basis of final results of the Pre-feasibility Study and bearing in mind all aspects also from the stakeholders and concerned parties the Assembly decides if a Feasibility Study is engaged. This study shall comprise deeper stability analysis and will be carried out in co-operation with the experts of the two power systems. The expected time horizon for the investigation is about two years, finally depending on the scenarios identified within step 1.
The main goal of this detailed examination is to define the technical conditions, which are prerequisites for the various stakeholders in order to secure maintaining the principles of UCTE in matters of security, reliability and quality of supply.
The study ought to give a clear prospective of financial and time framework for the solution envisaged in the elaborated proposal. Of course all the results depend strongly on the interconnection variant.

2.2.13 Baltic ring

There have been a number of studies on the Baltic IPS each undertaken with different scenarios of possible Baltic IPS development. Presently, it is important to make a selection of the most optimal solution. The gained experiences from Baltic IPS joint operation with neighbouring countries and advanced relations with power companies from North, Eastern, Central and Western European countries will be used by the Governments of the Baltic States in creating a common Baltic electricity market in the near future.

3. CONCLUSIONS AND RECOMMENDATIONS

Interconnection is a driving force like communication. Neighbouring networks can be interconnected for many reasons, such as for the benefit of sharing reserve capacities for the common exploitation of resources, or generally speaking, for the sake of economic and ecological benefits. Up to now the electricity community has mastered the development of the interconnection in Europe, with a quite positive result for the quality of supply.

Conclusions and recommendations derived from this report and agreed among members of the WG SYSTINT have been drawn together under the three following headings concerning:

- Situation in Albania
- Incentives for investing in interconnection facilities and
- Ideas on long-term prospects.

Situation in Albania

WG SYTINT is concerned about the very difficult situation facing Albania's power sector with a lack of power, limited interconnection capacity and other technical and organisational problems concerning the operation of the system. Although Albania is not a formal member of UCTE, it is interconnected synchronously within the 2nd UCTE zone and considering its geographical position it will probably eventually be interconnected to the main UCTE grid together with the other power systems in the region. It needs stronger, better-coordinated and more efficient action by the international community, donors, IFIs (International financial institutions) and others, regarding support and a more efficient solution for the Albanian Power System.

Incentives for investing in interconnection facilities

In so far as the driving forces for the development of interconnections on the European continent and beyond are changing, the incentive mechanisms to help in implementing initiatives resulting from the changed driving forces have to be adjusted as well. The driving forces are presently more and more represented by market rules and economic pressures, while in the past the intention was mainly to improve security and quality of supply in the different systems to be interconnected.

These changes therefore imply that the most commom incentive mechanisms for new investments, i.e. EU or governmental funds, have to be introduced with special care, considering that their costs are socialised.
In particular, easy terms loans and specific financial funds should be set up to finance, at least partly, initiatives aimed at:

- reinforcing the UCTE system in order to create a stable EU electricity market[6],
- connecting isolated systems in order to improve their security and quality of supply,
- connecting the candidate countries and thus facilitate their accession to the EU,

[6] *The European Council, held on 15th-16th March 2002 in Barcelona agreed the target for Member States on a level of electricity interconnection equivalent to be at least 10 % of their installed production capacity by 2005.*

- expanding the synchronous system eastwards and southwards in order to improve system security for the accession countries, to help in integrating these different economies, to enlarge the electricity market and to find new sources for lowering electricity prices.

New mechanisms have to be implemented for investments related to interconnections having today different motivations, such as the development of commercial exchanges between different countries, whose systems are already characterised by high standards of security and quality of supply and an adequate level of interconnection capacity.

In these situations, it doesn't seem to burden communities with the costs of incentives for investments which are aimed at pursuing private interests, such as those of generation companies, traders, etc., even if a price reduction is often implied in the country importing electricity.

Looking at the interconnected systems as a single market, new initiatives for developing interconnections should be driven also by the need to solve congestions due to the power flows resulting from market activity. Therefore, costs for removing such obstacles should be supported by all the market participants (producers, traders and consumers).

A different mechanism is imaginable for initiatives intended to develop the so-called merchant lines. As a matter of fact, the perspective of good earnings is itself an incentive for investors. In these cases, EU or governmental funds could finance such initiatives if:

- a fixed share of the new capacity is reserved for the open market,
- rights to exploit the new capacity are reserved to the investors only for a pre-fixed period of time, after which the capacity is allocated on the open market.

Ideas on long-term prospects

Key mechanisms, which condition the proper functioning of the open electricity market, are:

- Non-discriminatory principles for establishing fees for cross-border transmission of electricity,
- A system for effective management of the limitations of transmission ability,
- Allocation of new transmission capacity.

Current actions concentrate on the search for an appropriate organisation of the exchange of electricity which would allow for maximum reduction of negative effects from the appearance of „bottlenecks" in transmission capacity, without interfering with the principles of safe system operation.

Additionally it should be taken into account that any system extension must also be evaluated under the technical aspects of operational reliability of the whole system: especially, stability problems might create a risk for secure operation, which in return is a prerequisite for the market.

In the implementation of new mechanisms, such methods should be prioritised. On one hand, this would lead to an optimal utilisation of the currently existing potential of the transmission system for the purpose of increasing sales, and on the other hand, this would additionally stimulate further stabilisation of trans-border connections and the necessary development of the internal network.

For the implementation of the first two mechanisms, which would improve the efficiency of utilisation of the current transmission potential, small investment costs are necessary, mainly for the regulatory means and additional transmission infrastructure. They will partly allow together with the currently available resources, the elimination in the near future of „bottlenecks" in transmission capacity, for the development of electricity trade.

Today's historically shaped development of production sources and transmission networks varies significantly between countries and regions. In many cases, the current status may be considered unsatisfactory relative to the needs of the developing electricity market.

A lack of certain trans-border network connections and elements of the internal networks, as well as transmission limitations of the existing connections, are concreate barriers to unrestricted electricity trade.

The future implementation of an open, free of transmission limitations and liberalised European electricity market is a long-term process. It will be the result of the anticipated range of new network investments necessary for achieving this objective, as well as their costs and achievement possibilities.
This in turn depends on:

- the newly identified needs with respect to the projected increase in the international exchange of electricity in different directions,
- defining the conditions of profitability of the new connections, and
- guaranteeing a pay-back for the investment expenses incurred by TSOs and the availability of suitable financial sources.

Draft studies under way concentrate on relevant issues in the perspective of 10 to 15 years into the future.

The view, that the construction of new cross-border connections between member countries will not constitute a problem from the financial standpoint may result from the current status of such countries' transmission networks development. As a result the new and desirable connection between national networks will be rather short and will not require much interference into the internal transmission network of such countries. This will lead to a lowering of investment costs that are much easier to cover from the benefits of the development of the electricity market, even with relatively low cross-border fees.

The search for analogies in the accession countries, especially in Poland, may be misleading, due to the high expectations of its neighbours for future large transfers of electricity in the East-West direction (through new and potential connections of the Baltic Countries with Bielorussia, Russia (Kaliningrad region) and Ukraine) and consequent transmission to the current EU Member countries through inter-system connections, which also require development.

The size of the investments necessary for this goal as well as the expected and realistically possible timescale for their recovery will require special procedures for financial support for these projects.

The resolution of the problem of network investments, which would allow for the elimination of the identified existing and past transmission limitations, is a key issue for the development and proper functioning of the liberalised, fully open electricity market.

The possible means of resolving this problem will depend on the type of investment, or in other words:

- Is it linked with a connection of a new user to the transmission network or with a request of a current user to change the earlier stated connection conditions?
- Does it stem from the planned development of the transmission network for the securing of a safe supply of electricity as well as from the requirements posed by the functioning internal electricity market and the operational safety of the power system and international co-operation?
- Is it linked, and to what degree, with the future long-term transit of electricity for the needs of outside partners?

The methods of covering the costs of various types of investments will differ. It may happen that large investments, necessary for the implementation of defined long-term tasks in electricity transit (in the East-West direction and of Europe-wide character and significance) and also for the needs of outside partners, will not be able to be achieved without significant outside financial support.

If the combined investment costs for the planned transit are not too high, there would exist a possibility to cover these costs from defined transit fees, and partially from the congestion management system. However, in case that these would be maintained at a very low level, there could be a problem with using them to cover a significant part of the investment costs of network development for the needs of larger transits.

The total costs of the new investments as well as the costs of modernising international connections for a particular power transit plus the transmission costs for the internal power network should be carefully evaluated. Potential financial support from EU funds or from other interested parties may be taken into consideration, if these total costs are too high and the timeframe for capital recovery is too long. This financial support for strategic investments will bring new added value and contribute to the Internal Electricity Market evolution within the EU.

There exist projects which for strategic reasons should be developed, regardless of high risk and/or a low financial return. Examples are the East-West lines, which could optimise the growth of the market. These projects could be financed by the sponsors and must be subsidised by the EU.

Part of the costs, in the case of obtaining approval from the Regulator in the transit country, could also be covered by the TSO from local transmission fees. However, it is obvious that the transit country will not be able to fully cover the costs connected with the transit of electricity for the needs of the partners or outside countries.

It is necessary to prepare, involving both the current and the future member states, a financial support system proposal for future network investments of European significance. The choice of method and the range of the offered support would have to be based on the results of technical and economic analyses of the usefulness and long-term cost effectiveness of the new investments for the transit needs.

The system would protect potential members from the necessity of covering the costs of the transit investments in case of a disruption or a change in the power transit conditions. This financial support system might also be a way to total or partially funded projects including incurred investment expenditures.

Without establishing a complex system of financial support, bearing in mind the process of liberalisation of the European electricity market, many investments, especially the ones with the highest investment costs and longest timescale for capital recovery, will simply not be possible to undertake.

ANNEXES

ANNEX 1: The interconnected electric systems - Country reports

UCTE 1
Austria
Belgium
Croatia
Czech Republic
France
Germany
Hungary
Italy
Netherlands
Poland
Portugal
Slovakia
Slovenia
Spain
UCTE 2
Bulgaria
Federal Republic of Yugoslavia (FRY)
Former Yugoslav Republic of Macedonia (FYROM)
Greece
Romania
NORDEL
Denmark
Finland
United Kingdom
United Kingdom
Turkey
Turkey
North Africa
Egypt
Unified Power System
Belarus
The Russian Federation
Ukraine
Baltic States
Latvia
Lithuania
Isolated systems
Cyprus

ANNEX 2: Abbreviations used

ANNEX 3: Useful web-sites

ANNEX 4: Contributors to the report

UCTE 1

AUSTRIA

1. Basic capacity, generation and consumption data (data 2001)

Installed capacity by fuel, MW (values of EURPROG as of 31.12.2000)		
	Thermal	6 000
	Hydro	11 730
	Nuclear	0
	Renewables	170
	Total	18 040
Yearly generation fuel by fuel, TWh		
	Thermal	20.416
	Hydro	41.834
	Nuclear	0
	Renewables	-
	Total	62.250
Annual consumption, TWh		60.470
Annual consumption for pump storage, TWh		1.994
Total annual consumption, TWh		62.464
Imports, TWh		14.467
Exports, TWh		124.252

2. Industry structure

Recent key developments

Liberalisation of the Austrian electrical energy market:
Under the EU Electricity Market Directive, all EU member states have been required to open up their electricity markets gradually starting on February 19, 1999. As a result of the positive experience with market deregulation in Austria, the original incremental plan was accelerated and modified, under the amendment of the Electricity Industry and Organisation Act (ElWOG), so as to allow all customers free choice of supplier, which started on October 1, 2001.

Steps of Implementation:
Legal Unbundling since 19.2.1999; which means the separation of transmission, distribution and generation, regarding accountancy.

Establishing:

- The Elektrizitäts-Control GmbH (Electricity Control Ltd.) was set up in March 2001; Elektrizitäts-Control is responsible for monitoring, supporting and regulating the realisation of the Austrian electricity market.
- 3 control areas, each with one control area manager (independent grid operator) to provide system services
- Settlement Agencies for transactions and price formation with regard to

balancing energy.

- New market model:
  According to the new market model energy transactions are carried out within the framework of balance groups. A balance group is a virtual alliance of a group of market participants such as producers, traders and customers spread over a control area. The control area manager is responsible for the frequency-load control that means the balance of the energy, which is fed into the net and consumed at every time period. If there are deviations which couldn't be settled by primary controlled power plants the control area manager calls up balance energy according to a merit order. The merit order is prepared by the balance group coordinator pursuant to offers for balance energy. After having calculated all deviations from the original schedule for each measuring interval and each balance group respectively, balance energy rates are calculated for all groups and paid by them. The costs for the primary controlled power pants are covered by the tariff.

TSO(s)

- Verbund-Austrian Power Grid AG (APG), control area manager:
  Operator of the extra high voltage grid (380 / 220 kV and parts of the 110 kV grid)
- 9 provincial electricity service utilities including two other control area managers (Tiroler Wasserkraftwerke AG (TIWAG), Vorarlberger Kraftwerke AG (VKW))

Main generators (incl. IPPs)

Maximum electrical capacity > 200 MW	**P [MW]**
Hydroelectric Plants	
Storage power plants	
Malta (Oberstufe + Hauptstufe)	850
Kaprun	333
Zemm / Ziller	936
Sellrain-Silz	781
Kaunertal	392
Kopswerk	247
Lünerseewerk	232
Rodundwerk I	198
Rodundwerk II	276
Run-of-River power plants	
Altenwörth	328
Greifenstein	293
Ybbs-Persenbeug	237
Aschach	287
Wallsee-Mitterkirchen	210
Thermal Power Plants	
Dürnrohr	405
Dürnrohr Block 2	352
Voitsberg 3	330
Theiss	757
Mellach	246
Neudorf-Werndorf	285
Simmering	973
Donaustadt	376
Riedersbach	220

Foreseen/Outgoing projects for new generating units
None

Number of distributors
13 provincial and urban electricity service utilities and other regional distributors at medium voltage level

Main traders & other players (exchanges etc.)
APT Power Trading GmbH
e&t Energie Handelsgesellschaft mbH

3. Interconnection developments

Existing Interconnections

FROM (node) Austria	TO	Type AC/DC Single/Double	U, kV	S, MVA*
Meiningen	Y-Rehag (CH) (Montlingen Sarelli)	AC - Single	220	501
Bürs	Obermooweiler (D)	AC - Double	380	2 x 1210
Bürs	Herbertingen, Dellmensingen (D)	AC - Double	220	390 490
Westtirol	Memmingen (D)	AC - Single	220	760
Westtirol	Leupolz (D)	AC - Single	380	1593
Silz	Oberbrunn (D)	AC - Double	220	2 x 793
St. Peter	Altheim (D)	AC - Single	220	301
St. Peter	Simbach (D)	AC - Single	220	301
St. Peter	Pirach (D)	AC - Single	220	526
St. Peter	Pleinting (D)	AC - Single	220	526
Westtirol	Pradella (CH)	AC - Double	380	2 x1340
Lienz	Soverzene (I)	AC - Single	220	257
Obersielach	Podlog (Slo)	AC - Single	220	351
Kainachtal	Maribor (Slo)	AC - Double	380	2 x 1514
Wien-SO	Györ (H)	AC - Single	380	1514
Wien-SO	Györ (H)	AC - Double	220	2 x 305
Bisamberg	Sokolnice (CZ)	AC - Double	220	2 x 269
Dürnrohr	Slatevice (CZ)	AC - Single	380	1711

Source: UCTE - Statistical Yearbook 1999S

Ongoing studies in international/cross-border interconnections
None

Lines under construction (internal and cross-border)
None

* *S [MVA] - conventional transmission capacity of the connection (thermal) without 110 kV Interconnections*

Future projected interconnections
Lienz (A) – Cordignano (I), AC - Double 380 kV
St. Peter (A) – Isar (D), AC - Double 380 kV

Study needs
Congestion management (internal, external)

4. Other

Link	Companies
www.bmwa.gv.at/org02/sekIV	Federal Ministry of Economic Affairs and Labour
www.e-control.at	Electricity Control Ltd
www.apcs.at	Settlement Agency
www.verbund.at	Important hydro-power producer
www.apg.at	TSO
www.verbund.at/apt	Traders
www.energieallianz.at	Traders
www.veoe.at	Others

BELGIUM

1. Basic capacity, generation and consumption data

			2000 (Official)	2001 (Provisional)
Installed capacity by fuel, MW				
	Thermal (conv. and CCGT)		8 427.9	
	Waste & recuperated waste steam		117.3	
	Hydro		1 404.3	
	Pump storage	*1 307.0*		
	Dams & Run of the river	97.3		
	Nuclear		5 713.0	
	Renewable (wind)		9.9	
Yearly generation fuel by fuel, TWh				
	Solid fuels		11.1	10.7
	Liquid fuels		0.6	1.0
	Gas		20.0	16.9
	Other		1.1	1.4
	Hydro		1.7	1.6
	Pump storage		1.2	1.2
	Dams & Run of the river		0.5	0.4
	Nuclear		45.7	44.2
	Renewable (wind)		0.015	0.026
		Total	80.2	76.0
Yearly demand; TWh			82.8	83.4
Yearly consumption, TWh			79.2	
Imports, TWh			11.6	15.5
Exports, TWh			7.3	6.5

Source: Federation of the Electricity Companies in Belgium
Annual Statistical Report 2000 - Provisional Statistical Data 2001 www.bfe-fpe.be

2. Industry structure

Recent key developments

The Royal Decree of 4 April 2001 lays down the tariff structure that the TSO must comply with; four different tariffs must be identifiable (tariffs for connection to the transmission grid, for using the grid, for ancillary services, for taxes and other additional charges). The tariffs must be submitted to and approved by the Federal regulator (CREG); they must be fixed for each group of customers, for each formula of power subscription and for each year. As a general principle, the Royal Decree provides that the TSO must minimise the cost of electricity transmission

The Royal Decree of 27 June 2001 contains the system and network code ("grid code") of the Belgian transmission grid. It is not yet in force, but clearly contains important technical requirements and rules, procedures and obligations and rights that

will govern the supplier's and customer's relationship with the TSO in the future (connection and access to the transmission grid).

On 15 June 2001 the Flemish Government defined the conditions for any system operator of a distribution grid (financial and technical capacity, property and exploitation rights, managerial and legal independence).

On 13 July 2001 the Flemish Government decided to speed up the eligibility of customers of the Flemish distribution grid, as from 1 July 2003 all end-users will be eligible.

On 12 April 2001 the Walloon Government published the Walloon Decree on the organisation of the regional electricity market in Wallonie; the Walloon Government decided on 4 October 2001 on the timetable for coming into force of the Decree.

The Brussels Decree of 19 July 2001 on the organisation of the electricity market in the Brussels region distinguishes between operating the regional transmission grid (nominal voltage 36 kV) and operating the distribution grid (below 36 kV).

TSO
On 28 June 2001, ELIA (a public limited company under Belgian law) was founded; CPTE transferred to ELIA its transmission activities, including its transmission grid.
ELIA shareholders are CPTE, Electrabel and Public-T (a cooperative company representing the Belgian municipalities via Interregies, Intermixt, Socofe, Société Holding Communale and Vlaamse Energie Holding); Public-T will hold 30% of the shares and 40% will be publicly traded, the remaining 30% will be hold by CPTE and/or Electrabel.

As ELIA has taken over the transmission activities of CPTE, it will benefit from the rights of CPTE under its application for appointment as TSO. ELIA is the only candidate but the federal government has still not officially appointed the TSO. However, the appointment of ELIA is expected shortly.

Main generators *(see map)*

Location	Type	MW
Tihange	NPP (3 units)	2937
Doel	NPP (4 units)	2776
Coo	PSPP	1164
Ruien	TPP	882
Rodenhuize	TPP	654
Langerlo	TPP	638
Kallo	TPP	557
Drogenbos	CCGT+GT	538
Herdersbrug	CCGT	460
Seraing	CCGT	460
Awirs	TPP	416
Vilvoorde	CCGT	380
Saint-Ghislain	CCGT	350
Gent Ringvaart	CCGT	350
Mol	TPP	285
Amercoeur	TPP	259

New generating units 2001

Wind (34 units)	18.7 MW
Cogeneration (29 units ≤ 2.5 MW)	26.1 MW

Ongoing projects in generation

Turbo-jet (Electrabel -Sidmar)	18 MW
Cogeneration ST (Electrabel-TotalFinaElf)	30 MW
Cogeneration CCGT (Electrabel-Usinor Cockerill)	144 MW
Cogeneration CCGT (RWE-Electrabel-BASF - in 2004)	385 MW
Cogeneration (5 units ≤ 2 MW)	5 MW

Trading

Buying, selling, marketing or trading of electricity on the transmission grid does not require a licence or authorisation; suppliers may hence access the transmission grid to supply Belgian eligible clients, without authorisation if the company is established in Belgium, or by showing that its activities are recognised in the Member State of the EU where it is established.

Number of distributors

Private companies	3
Municipality companies	8
Mixed Inter-municipality companies	16
Pure Inter-municipality companies	8

3. Interconnection developments

Existing interconnections

To France:	380 kV AC OHL	2 circ. (1 inst.)	to Avelin
	380 kV AC OHL	1 circ.	to Lonny
To Netherlands:	380 kV AC OHL	2 circ.	to Maasbracht
	380 kV AC OHL	2 circ.	to Kreekrak

Ongoing studies in cross-border interconnections

To France:	380 kV AC OHL	2 circ.	to Moulaine

The regulator (CREG) has asked ELIA to study the installation of the 2d circuit on the line to Avelin (France)

Lines under construction (main internal lines)

Tihange Avernas Tienen	150 kV AC 2 circ. underground cables 62 km
Avernas Landen Brustem	150 kV AC 1 circ. underground cables 23 km

Future projects (interconnection or main internal lines)

Tihange	Courcelles	380 kV AC 2 circ. OHL 73 km
Courcelles	Trivières	380 kV AC 2 circ. OHL 20 km
Chièvres	Trivières	380 kV AC 2 circ. OHL 37 km
Avelgem	Chièvres	380 kV AC 2 circ. OHL 33 km

4. Other – Links

Link	Companies
www.bfe-fpe.be	Federation of the Electricity Companies in Belgium
www.elia.be	Transmission System Operator (TSO)
www.electrabel.com	Private Electricity Company
www.spe.be	Public Electricity Generating Company
www.creg.be	The Electricity and Gas Regulatory Commission (Federal regulator)
www.vreg.be	The Flemish Electricity and Gas Regulatory Commission
www.cwape.wallonie.be	The Walloon Energy Commission CWAPE (Walloon regulator)
www.ibgebim.be	The Brussels Institute for Environment management (IBGE-BIM) (Brussels regulator)
www.mineco.fgov.be	Ministry of Economic Affairs (Belgium)

GRAND RÉSEAU ET PRINCIPALES CENTRALES

Situation au 31 décembre 2000

① Centrales de 380 MW et plus	Pm nette MW
1 Tihange	2.937
2 Doel	2.776
3 Coo	1.164
4 Ruien	882
5 Rodenhuize	654
6 Langerlo	638
7 Kallo	557
8 Drogenbos	538
9 Herdersbrug	460
10 Seraing	460
11 Awirs	416
12 Vilvoorde	380
13 Saint-Ghislain	350
14 Gent Ringvaart	350
① Centrales de 150 MW à 299 MW	
1 Mol	285
2 Amercoeur	259
3 Angleur	158

① Centrales de 100 MW à 149 MW	Pm MW nets
1 Plate Taille	143
2 Gent	128

— Réseau belge à 380 kV : lignes à 380 kV

—·— lignes à 380 kV exploitées à 220 kV ou 150 kV

■ postes à 380 kV

En cours ou à l'étude

Unités de 100 MW et plus (2001-2002)

unités TGV

Réseau belge à 380 kV (2000-2004)

- - lignes en cours de réalisation et lignes décidées

--- lignes futures mises à l'étude

□ postes à 380 kV

■ transfo dans poste existant

CROATIA

1. Basic capacity, generation and consumption data (for the year 2001)

Installed capacity by fuel, MW (including capacity of industrial plants)		
	Thermal	1 875
	Hydro	2 061
	Nuclear	0
	Renewables	20
	Total	3 956
Yearly generation fuel by fuel, TWh (without production of industrial plants for their own use - in the year 2000 ~ 550 GWh)		
	Thermal	4,7
	Hydro	6,5
	Nuclear	0
	Renewables	0,1
	Total	11,3
Annual consumption, TWh		14,5
Imports, (Cross-border exchange) TWh		3,8
Exports, (Cross-border exchange) TWh		0,6

2. Industry structure

Recent key developments

Hrvatska elektroprivreda d.d. – HEP (*Croatian National Electricity*) is still the only electricity company in country with its vertically integrated businesses of production, distribution, transmission and control. Owner of 100 % of HEP's shares is Republic of Croatia. In accordance to schedule for Croatian Energy Sector Reform set by Croatian Government in year 2000, Ministry of Economy published international invitation to bid for consulting services on the restructuring of HEP. In February 2001 consortium led by *Norton Rose* was selected. First phase of its task finished with proposal for implementation of organizational and ownership changes appropriate to market economy and harmonised to Directive 96/92/EC. Subsequently, new energy legislation with five laws (including *Law on Electricity Market* and *Law on Regulation of Energy Activities*) was adopted by Croatian Parliament in July 2001 with beginning of their implementation in the year 2002. At that time the introduction of market competition in production and supply will also start with partial opening of the electricity market for eligible customers (with annual consumption above 40 GWh – that is approximately 10 % of the market). The rest of customers remain, for the time being, tariff customers of HEP with establishing of cost reflective market oriented tariff system. The Energy Regulatory Council has been established pursuant to new laws and the Grid-Code was drafted.

Restructuring of HEP is foreseen in at least three steps (of which first has been already completed):

- Accountancy unbundling of profit centres inside HEP and outsourcing of non-core businesses (district heating, telecommunications, gas supply etc.)

- Forming of HEP-Group with vertical separation and legal unbundling of daughter companies for production, transmission, distribution and supply, and separate ISMO (Independent System and Market Operator).
- Process of changes in ownership structure (probably through limited quotation on stock exchanges) in conformity with *Law on Privatisation of HEP* that is expected in parliament procedure during 2002.

In 2001 HEP succeeded in confirming its international credit rating and making operating profit, in spite various unfavourable conditions. It also continued its activities on reconstruction and modernisation of transmission and distribution network for improving security, quality and reliability of supply and increasing environmental acceptability. Major investment projects on reconstruction of facilities damaged or destroyed during aggression on Croatia (in beginning of 1990's) entered, after commissioning of seven re-constructed 110 kV transmission lines with respective bays in substations, its second phase with international bidding procedures for financing and supply of goods and services on turnkey basis for Ernestinovo substation and surrounding transmission lines.

TSO

HEP - as the operator and owner of the transmission grid (110, 220 and 400 kV) in the year 2001.

Main generators (incl. IPPs)

- TPP Rijeka - 320 MW
- TPP Sisak 1 and 2 - 210 + 210 MW
- TPP Plomin 1 (HEP) and 2 (JV HEP and RWE) - 105 + 210 MW
- TPP-CHP Zagreb-East - 145 MW
- TPP-CCHPP Zagreb-East (new units - in trial operation) - 210 MW
- HPP Zakučac - 2x108+2x135 MW
- Pumped storage HPP Velebit - 2x138/(-120) MW
- HPP Orlovac - 3x79 MW
- HPP Senj - 3x72 MW
- HPP Dubrovnik - 2x108 MW

Additionally HEP owns thermal power plants (or its units) in other countries with total 650 MW (TPP Obrenovac /300 MW/ in Serbia, and TPP Tuzla /200 MW/, TPP Kakanj /50 MW/ and TPP Gacko /100 MW/ in Bosnia - Herzegovina) and half (354 MW) of NPP Krško in Slovenia, which are all temporary unavailable due to various reasons.

Foreseen/Outgoing projects for new generating units

- CCPP (400 MW), by 2007 – alternative locations still under consideration
- HPP Lešće (40 MW), by 2005

Number of distributors

21 regional HEP distribution areas (operating medium voltage networks and exceptionally 110 kV network in larger cities) in the year 2001.

Main traders & other players (exchanges etc.)
HEP as a single buyer in the year 2001

3. Interconnection developments

Existing AC Interconnections *(Voltage ≥ 220 kV);*

FROM (HR)	TO	Number of circuits	U (kV)	P (MW)	*Remark about status*
Tumbri	Heviz (H)	2	400	2600	*Temporary one circuit in operation*
Tumbri	NPP Krško (SI)	2	400	2528	
Melina	Divača (SI)	1	400	1264	
Konjsko	Mostar (BH)	1	400	1264	*Temporary in operation under 220 kV*
Ernestinovo	TPP Ugljevik (BH)	1	400	1264	*Temporary out of operation*
Ernestinovo	Mladost (FRY)	1	400	1264	*Temporary out of operation*
Mraclin	Cirkovce (SI)	1	220	311	
Pehlin	Divača (SI)	1	220	366	
HPP Zakučac	Mostar (BH)	1	220	311	
Mraclin	HPP Jajce (BH)	1	220	311	*Temporary out of operation*
Međurić	Prijedor (BH)	1	220	311	*Temporary out of operation*
Đakovo	TPP Tuzla (BH)	1	220	311	
Đakovo	Gradačac (BH)	1	220	311	*Temporary out of operation*
HPP Dubrovnik	Trebinje (BH)	1	220	492	
HPP Dubrovnik	Trebinje (BH)	1	220	492	*Temporary out of operation*

Internal and cross-border AC lines under re-construction *(Voltage ≥ 220 kV);*

FROM (HR)	TO	Number of circuits	U (kV)	P (MW)	Expected date for commissioning the line
Ernestinovo	Žerjavinec	1	400	1264	2003
Ernestinovo	TPP Ugljevik (BH)	1	400	1264	2003
Ernestinovo	Mladost (FRY)	1	400	1264	2003
Mraclin	HPP Jajce (BH)	1	220	311	2004
Međurić	Prijedor (BH)	1	220	311	2002
Đakovo	Gradačac (BH)	1	220	311	2003

Ongoing studies in international/cross-border interconnections

FROM (HR)	TO	Type AC/DC Single/Double	U (kV)	P (MW)	Date for study completion	Expected date for commissioning the line under study
Ernestinovo	Pécs (H)	AC - Double	400	2600	2002	2006

Future projected interconnections
See previous point

Study needs
Regarding necessary tests and procedures for re-connection of I. and II. synchronous zone of UCTE in order to avoid various problems (voltage and angle stability, frequency problems etc.) that can arise from that process.

4. Other

Link	Company
www.hep.hr	HEP
www.mingo.hr	Ministry of Economy

Figure: Croatian Transmission Grid with Interconnections (status in the year 2001)

CZECH REPUBLIC

1. Basic capacity, generation and consumption data

Installed capacity by fuel, MW		
	Thermal	11 537
	Hydro	2 146
	Nuclear	1 760
	Renewables	2
	Total	15 445
Yearly generation fuel by fuel, TWh		
(gross production)	**Thermal**	57.431
	Hydro	2.467
	Nuclear	14.749
	Renewables	
	Total	74.647
Annual consumption, TWh		58.685
Imports		9.227
Exports		18.766

2. Industry structure

Recent key developments

- Stepwise electricity market opening since 1/2002 (30% in 2002, complete in 2006)
- Energy regulatory office has been installed on 1/1/2001
- Privatisation of the electro-energy sector is going on

TSO

CEPS,a.s. is the transmission system operator of the Czech Republic (400, 220 and part of 110 kV network). CEPS,a.s. is responsible for parallel operation with the power systems of neighbouring countries via cross-border tie-lines according to UCTE rules. It has a duty to maintain, upgrade and develop the transmission system according to Grid Code standard. TSO offers customers the transmission capacity of its facilities, ensures balance in the Czech power system, provides system services, procures ancillary services and standard-quality electricity supply.

Main producers

- CEZ,a.s. (69.2 % of the country electricity generation)
- SU,a.s.
- ECKG-Kladno
- REAS

Main generators (incl. IPPs)

Type	No. of Units	MW/Unit	Total
TPS	1	500 and more	500
	22	200-210	4450
	12	100-200	1360
	30	50-100	1672
	x	up to 50	2854
CCGS+SCGT	2	100-200	370
	3	50-100	232
	x	up to 50	99
NPS	(1	1000	1000)
	8	220	1760
HPS	2	200-500	650
	4	100-200	450
	6	50-100	480
	x	up to 50	566

Number of distributors

8 Regional Distribution Electricity Companies (REAS), operating the grids of up to 110 kV.

Relevant market players

Producers, TSO (CEPS,a.s.), distribution system operators, the market operator, electricity traders, eligible customers.

3. Interconnection developments

Existing Interconnections

FROM (CZ)	TO	Type AC/DC	U,kV	P,MW
HRADEC	ROHRSDORF (DE)	AC	400	1386
HRADEC	ROHRSDORF (DE)	AC	400	1386
HRADEC	ETZENRICHT (DE)	AC	400	1386
PRESTICE	ETZENRICHT (DE)	AC	400	1663
SLAVETICE	DURNROHR (AT)	AC	400	1386
SOKOLNICE	BISAMBERG (AT)	AC	220	269
SOKOLNICE	BISAMBERG (AT)	AC	220	269
NOSOVICE	VARIN (SK)	AC	400	1386
SOKOLNICE	KRIZOVANY (SK)	AC	400	1323
SOKOLNICE	STUPAVA (SK)	AC	400	831
LÍSKOVEC	POV.BYSTRICA (SK)	AC	220	269
SOKOLNICE	SENICA (SK)	AC	220	318
ALBRECHTICE	WIELOPOLE (PL)	AC	400	1386
NOSOVICE	WIELOPOLE (PL)	AC	400	1386
LISKOVEC	BUJAKOW (PL)	AC	220	400
LISKOVEC	KOPANINA (PL)	AC	220	400

4. Other

Link	Companies
www.ceps.cz	TSO (CEPS,a.s.)
www.cez.cz	Producer CEZ,a.s

DENMARK

Note:
Please note that Denmark is part of both UCTE 1 and Nordel and its country paper can be found under NORDEL block.

FRANCE

1. Basic capacity, generation and consumption data*

Installed capacity by fuel, MW [1]		
	Thermal Conventional	27 400
	Hydro	25 400
	Nuclear	63 200
	Renewables	137
	Total	116 137
Yearly generation fuel by fuel, TWh [2]		
	Thermal	46.1
	Hydro	79.3
	Nuclear	401.3
	Renewable	3.8
	Total	530.5
Annual consumption, TWh [2]		425.5
Imports [2]		4.2
Exports [2]		72.6

*[1] Values denote **brute power** at generator mains.*
*[2] Values denote **net energy** at substation –i.e., consumption at power stations are netted-.*

2. Industry structure

Recent key developments

Regulation

- European directive 96/92/CE dated December 19,1996 regarding the common rules for the implementation of the single European Electricity Market.
- From March 1,1999 EDF has arranged to open up the market to competition for eligible customers consuming over 100GWh per year. From that date all requests for network access were directed to a single input point, the BART (Office for Transmission System Access)
- French Act n° 2000-108 dated February 10, 2000 on the modernisation and development of the public electricity service (Promulgation at the Journal Officiel of February 11, 2000).
- Order of the Secretary of State for Industry dated March 24, 2000 (Promulgation at the Journal Officiel of March 30 2000), setting up the Electricity Regulation Commission (CRE). The main task of this independent administrative authority is to monitor the electricity market and to verify the absence of discrimination, cross subsidies or constraints on competition.
- French Decree n° 2000-381 dated May 2, 2000 on the organisation and the functioning of the Electricity Regulation commission (CRE) (Promulgation at the Journal Officiel of may 4, 2000)

* *Data are derived from temporary closure of year 2001*

- French Decree n° 2000-456 dated may 30,2000 on the eligibility of electricity consumers From that date the eligibility level in France drops down from 100GWh/year to 16GWh/year
- July 1st 2000, creation of the single French Transmission System Operator RTE (approved by the French Electricity Regulation Commission) remaining legally within the EDF group but unbundled from EDF on managerial, financial and technical issues (recommendation of the CRE dated July 12 2000), in order to guaranty transparency and a fair competition on the French market.
- August 31, 2000; notice listing eligible consumers for 2000 published in the « Journal Officiel ». This list will be completed on 24 November 2000.
- October 2000, the CRE reports on the introduction of a balancing market and a spot market for the electricity in France
- November 2000, publication of the « trading » decree N°2000-1069 on the purchase of electricity for resale to eligible customers.
- November 14, 2000; the CRE approves the « balance responsible contract » proposed by RTE.
- Decision of the French electricity regulatory commission dated December 14, 2000, regarding the creation of a non mandatory power exchange on the french hub
- French legal Statement dated august 14, 2001 authorising the indirect participation of EDF/RTE in Powernext through a joint venture with other European TSO's (HGRT)
- Decision of the French Electricity Regulation Commission dated September 20,2001, regarding the market code for Powernext
- November 26, 2001, first day of quotation at Powernext

TSO

The single French Transmission System Operator RTE (8000 employees) is responsible for the operation and maintenance of the French EHV and HV networks between 400kV and 63kV.

To fulfil this task RTE is organised into four divisions:

- The Power System Division which includes,
  - the National Control Center (CNES) managing power flows on the 400kV network, real time balance between generation and demand and access to the system by European players,
  - seven Regional Control Centers (CRES) managing power flows on the 225kV & HV networks as well as transmission system access by French users. They are also responsible for customer relations and for system development and renewal,
  - the National Information Engineering Center (CNII) dealing with RTE information system engineering and the operational management of projects in this field.
- The Power Transmission Division which includes,
  - the National Transmission Expertise Center responsible for engineering related to transmission system operation and development,
  - seven regional transmission units dealing with the construction, operation and maintenance of transmission system structures.
- The Economics, Management and Finance Division responsible for establishing

RTE's economic and financial policy for its accounting and financial management and for RTE management control and statistics.

- The Human Resources and Legal Division managing RTE's human resources policy, RTE's legal affairs with regard to competition law. This division is also managing RTE's real estate policy.

The Institutional Relations Section, the International Section, the Audit Section, the Quality Section, the Security & Confidentiality Section report directly to RTE's Chief Executive Officer, as do the Information System Department and the Communication and External Relation Office.

Main generators (incl. IPPs)

The four main generating companies in France are:

- Electricité de France (EDF)
  (Turnover 34 400 000 000€, installed capacity-102800MW, generation-482TWh, employees-117000),
- Energie du Rhône (former CNR)
  (Turnover 340 000 000€, installed capacity-3000MW, generation-16,2TWh, employees 670),
- Société Nationale d'Electricité et de Thermique (SNET)
  (Turnover 490 000 000€, installed capacity-2600MW, generation-8,1TWh, employees-1200),
- Société Hydroélectrique du Midi (SHEM)
  (Turnover 75 000 000€, installed capacity-800MW, generation-2 TWh, employees-220),

Number of distributors

Beside EDF, there are in France 143 municipal distribution companies. The 5 main distributors are:

- Electricité de France (EDF)
  Turnover electricity-34 400 000 000€, sales in distribution-316 500 000 MWh, employees-117000 [80 000 in the distribution sector], customers-31 000 000
- Electricité de Strasbourg (ES)
  Turnover electricity-415 000 000 €, sales electricity -6 114 000 MWh, employees-1363
- Gaz et Electricité de Grenoble (GEG)
  Turnover electricity-59 000 000€, sales electricity -805 000 MWh, employees-448
- Usine d'Electricité de Metz (UEM)
  Turnover electricity-135 370 000€, sales electricity -1 740 000 MWh, employees-500, customers-140 000,
- Vialis (Colmar)
  (Turnover electricity-53 050 000€, sales electricity -397 000 MWh, employees-259, customers -36 650),

Main traders & other players (exchanges etc.)

The other actors selling to eligible customers on the French market are:

- **Energie du Rhône**- sales on the french market outside EDF-1 500 000 MWh
- **RWE PLUS** sales on the french market –1 000 000 MWh
- **ENDESA France** sales on the French market- 600 000 MWh

- **SNET** (51,25% Charbonnages de France, 30% Endesa-future main share holder in 2004, 18,75% EDF)-sales on the French market 2TWh
- **TotalFinaElf** (via Gas and Power North Europe)-sales on the French market 9,5 TWh
- **HEW**-sales on the French market 3TWh

The eligible customers are not allowed to trade on powernext

The actors selling directly to RTE to compensate the losses on the EHV & HV networks are presently:
AXPO(CH), **Compagnie Nationale du Rhone** (FR), **DYNEGY** (UK), **EDF Trading** (UK), **EGL**(CH), **Electrabel** (B), **EON-Trading** (D), **INOGY** (UK), **NORSK HYDRO** (N), **RHODIA Energy** (FR), **RWE-Trading**(D), **TotalFinaElf Gas & Power Ltd** (UK), **TXU EET** (UK), **UNION FENOSA Generacion** (SP), **Verbund** (A), **AEP ENERGY SERVICE Ltd** (UK), **ATEL** (CH), **BKW-FMB Energie SA** (CH)

The other actors registered at the Electricity Regulation Commission are:
Aquila Energy Ltd (UK), **Avenis Trading SA** (CH), **Cargill international SA** (CH), **Compagnie du Vent** (F), **Dalkia** (F), **Duke Energy International Ltd** (UK), **Elektra Birseck Münchenstein (EBM)**(CH) , **Elyo SA** (F), **Enel Trade** (I), **Eole-Res** (F), **E on Energie AG** (D), **Eurowatt-Commerce SA** (B), **MVV Energie AG** (D), **Source Power** (B), **SOVEN** (UK), **SPE SA** (B), **Verbund** (A).

3. Interconnections

Existing Interconnections

FROM	TO	U [kV]	Cap* [MVA]
France	**United Kingdom**		
Mandarins	Sellindge	*270 DC*	2000
France	**Spain**		
Errondenia	*Irún*	*1*132*	*111*
Mouguerre	Arkale	1*220	290
Cantegrit	Hernani	1*400	1,110
Pragnéres	Biescas II	1*220	270
Lac D'Oo	*Benós*	*1*110*	*95*
Baixas	Vic	1*400	1,530
France	**Switzerland/Italy**		
Manbelin	Basse court (CH)	1*400	
Génissiat	Romanel(CH)	2*400	
Sierentz	Basse court (CH)	1*400	
Sierentz	Laufenbourg (CH)	1*400	
Sierentz	Asfart (CH)	1*400	
Génissiat	Verbois(CH)	2*225	
Cornier	Riddes (CH)	2*225	
Pressy	La Batiaz(CH)	1*225	
Albertville	Rondissonne (I)	2*400	

Praz-St André	Venaus (I)	1*400	
Trinité Victor	Camporosso (I)	1*225	
France	**Germany**		
Vigy	Uchtelfangen	2*400	
Mulhbach	Eichstten	1*400	
Sierentz	Kuhmos	1*400	
Vogelgrun	Eichstten	1*225	
Emile Huchet	Ensdorf	1*225	
France	**Belgium**		
Avelin	Avelgem	1*400	
Lony	Achene	1*400	
Chooz	Jamiolle	1*225	
Mt-Saint-Martin	Aubange	1*225	

a) The case of the interconnection to Britain (IFA 2000)

This interconnection has a capacity of 2000MW-DC. The rules for the utilisation of this capacity have been decided in December 2000 and came into force on April 1st 2001. Since that date with the implementation of the New Electricity Trading Arrangement (NETA) the rules have been as follow:

- 650MW between France and England allocated for three years after a tendering procedure.
- an annual auction mechanism has allocated 323MW between France and England and 100MW between England and France.

The remaining capacity of 500MW between France and England and 1900MW between England and France has been allocated since April 1st 2001 by daily auctions. The auctions are done a day ahead for every ½ hour and there is a possibility to sell back on yearly and daily auctions the unused capacities acquired either in former auctions or former tendering procedures.
The use it or lose it principle being applied, the unused capacities are sold back.

b) The case of the interconnection to Spain

Present limitation to 1100MW between France and Spain and 1000MW between Spain and France. The netted interconnection capacity shall be brought to 1400MW in year 2002 and to 2600MW in the year 2005.
An auction mechanism similar to the one into force on IFA 2000 is foreseen.

c) The case of the interconnection to Switzerland/Italy

Referring to the topology of the 400kV European grid, Switzerland and Italy should be considered seen from France as a single bloc.
Following studies conducted in 2001 by RTE and the Italian TSO GRTn, the French regulation commission (CRE) and the Italian regulation authority for gas and electricity (AEEG) have on December 7 2001 fixed for 2002 the netted transmission capacity to the Italian market at 5400MW, among which:

- 2600MW directly coming from France (1800MW for contracts which came into force before the European Directive dated December 19,1996, 645MW (145MW firm and 500MW interruptible jointly allocated by GRTn and RTE on a demand prorate base, 155MW reserved for the State of Vatican, San-Marino and Corsica).
- 2800MW via Switzerland.(800MW for contracts which came into force before the European Directive dated December 19,1996, 1000MW at the free disposal of

Swiss companies holding shares in the electrical lines crossing to Italy, 1000MW firm allocated in theory by GRTn, but allocated in practice jointly by GRTn et RTE on a demand prorate base).

Besides that, in order to improve the use of available capacities and according to market needs, the network operators shall proceed with secondary allocations for periods below one year. These allocations will concern unused annual capacities returned by market actors and additional interconnection capacities above the 5400MW if the actual network status allows it.

d) The case of the other interconnections

The contractual export limit to Northern Europe (via Belgium & Germany) is 2100 MW. There is a 600MW margin in case of favourable conditions.

4. Other

Link	Companies
www.ademe.fr	ADEME (Agence pour le développement et la maîtrise de l'énergie)
www.cnr.tm.fr	CNR (Compagnie Nationale du Rhône, liée à Electrabel)
www.cre.fr	CRE (Commission de régulation de l'électricité)
www.edf.fr	EDF (Électricité de France)
www.energiedurhone.fr	EDR (Énergie du Rhône)
www.electricite-strasbourg.fr	EDS (Électricité de Strasbourg)
www.energie-plus.fr	Énergie Plus (actualité sur l'énergie et l'environnement)
www.deroyer.fr/anroc/DataHtml/Organism/FNCCR.htm	FNCCR (Fédération nationale des collectivités concédantes et régies)
www.geg-grenoble.fr	GEG (Gaz et Electricité de Grenoble)
www.industrie.gouv.fr/accueil.htm	Ministère de l'Industrie
www.rte-france.com	RTE (Réseau de transport d'électricité)
www.ferroviaire.f-g.fr/attente/act_shem.htm	SHEM (Société hydroélectrique du Midi, groupe SNCF)
www.snet-electricite.fr	SNET (Société nationale d'électricité et de thermique, groupe Endesa)
www.uem-metz.fr	UEM (Usine d'Électricité de Metz)
www.vialis.tm.fr	Vialis (Régie Municipale de Colmar)

GERMANY

1. Basic capacity, generation and consumption data

Installed capacity by fuel, MW (net) (Total supply)		
	Thermal	79 923
	Hydro	9 433
	Nuclear	21 283
	Renewables	8 430
	Total	119 069
Yearly generation fuel by fuel, Twh		
	Thermal	328.5
	Hydro	25.4
	Nuclear	161.4
	Renewable	15.2
	Total	530.5
Annual consumption, TWh		529.5
Imports		43.5
Exports		44.5

Source: VDEW

2. Industry structure

Recent key developments

- Liberalisation of the German electricity market has reached 100%.
- Legal/management separation or account unbundling has been implemented.
- Currently, 6 German TSOs bear responsibility for their control areas and the German system. The merger of Bewag, HEW and VEAG will reduce the number of TSOs from 6 to 4.
- Main generating companies are RWE, E.ON, VEAG and EnBW. There are plans for some new power plants (brown coal, gas, pumped storage) with a capacity of about 3.3 GW.
- In Germany, there exist more than 900 DSOs (Distribution System Operators).

3. Interconnection developments

Existing interconnections
See attached Table 1.

Lines under constructions
There are no major lines under construction (neither internal nor cross-border).

Ongoing studies
Ongoing studies in international/cross-border interconnections are related to D-DK: Currently, a joint TEN study of Eltra and E.ON Netz investigates possibilities for the "Strengthening of the aerial electricity interconnections between Germany and

Denmark". The question of measures to be taken can be answered as soon as the study is finalised. The current limitation of the cross-border capacity is determined by dynamic stability limits in the Danish system.

Future projected interconnections
Future projected cross-border interconnections are two HVDC lines from Brunsbüttel (D) to Farsund (N) of about 550 km in length and a capacity of 600 MW each.

Study needs
The increasing construction of (particularly off-shore) wind power plants (for example about 15 GW from 2007 to 2010) entails study needs relating to system technology and operational aspects.

4. Other

Link

www.vdn-berlin.de
www.dvg-heidelberg.de
www.strom.de
www.ucte.org

Year			Connection between									Conventional (thermal)*		Limited by the transformers of the susbtations			
2000			from substation		from substation			to substation		Voltage of the circuit		Transmission capacity		of circuits		of lines	
Country ID	Frontier-Point	Line	Circuit	Country	Name	Operated by	Country	Name	Operated by	Forecast	Present	Forecast	Present	at	(Voltage)	at	transmission capacity
D	Nr	Nr	Nr							kV	kV	MVA	MVA	MVA	kV	MVA	kV
	11	1	1	D	Diele	E.ON	NL	Meeden	TenneT		380		1369				
	11	2	1	D	Conneforde	E.ON	NL	Meeden	TenneT		380		1369				
	13	1	1	D	Siersdorf	RWE Net	NL	Maasbracht	TenneT		380		1645				
	13	1	2	D	Rommerskirchen	RWE Net	NL	Maasbracht	TenneT		380		1698				
	15	1	1	D	Gronau	RWE Net	NL	Hengelo	TenneT		380		1790			1300	
	15	1	2	D	Gronau	RWE Net	NL	Hengelo	TenneT		380		1790			1300	
	71	1	1	D	Uchtelfangen	RWE Net	F	Vigy	EDF		380		1336	1316			
	71	1	2	D	Uchtelfangen	RWE Net	F	Vigy	EDF		380		1336				
	71	2	1	D	Ensdorf	RWE Net	F	St-Avold	EDF		220		282				
	72	1	1	D	Eichstetten	EnBW	F	Vogelgrün	EDF	380	220		492	457	220		
	72	1	2	D	Eichstetten	EnBW	F	Muhlbach	EDF		380		1790				
	83	1	1	D	Asphard	Atel/NOK	F	Sierentz	EDF		380		1660				
	102	1	1	D	Gurtweil	EnBW	CH	Laufenburg	ETRANS		220		492	457	220		
	102	1	2	D	Gurtweil	EnBW	CH	Laufenburg	ETRANS		220		492	457	220		
	102	2	1	D	Kühmoos	EnBW	CH	Laufenburg	ETRANS		220		309				
	102	3	1	D	Kühmoos	EnBW	CH	Laufenburg	ETRANS	380	220		492	457	220		
	102	3	2	D	Kühmoos	EnBW	CH	Laufenburg	ETRANS		380		1698	1264	380		
	102	4	1	D	Kühmoos	EnBW	CH	Laufenburg	ETRANS		380		1698	1580	380		
	102	4	2	D	Kühmoos	RWE Net	CH	Laufenburg	ETRANS		380		1580	984			
	102	5	1	D	Tiengen	RWE Net	CH	Laufenburg	ETRANS		380		1158				
	103	1	1	D	Tiengen	RWE Net	CH	Beznau	NOK		380		1158				
	103	1	2	D	Tiengen	RWE Net	CH	Koblenz	NOK	380	220		335				
	103	1	3	D	Tiengen	RWE Net	CH	Klingnau	AWAG	380	110		58				
	104	1	1	D	Kühmoos	EnBW	CH	Asphard	Atel/NOK		380		1698	1580	380		
	105	1	1	D	Engstlatt	EnBW	CH	Laufenburg	ETRANS		380		1580				
	111	1	1	D	Obermooweiler	EnBW	A	Bürs	VIW		380		1211				
	111	1	2	D	Obermooweiler	EnBW	A	Bürs	VIW		380		1211				
	111	2	1	D	Herbertingen	RWE Net	A	Bürs	VIW	380	220		389				
	111	3	1	D	Dellmensingen	RWE Net	A	Bürs	VIW	380	220		492	457			
	115	1	1	D	Neuötting	BWK	A	Braunau	ÖBK		110		102			82	
	115	2	1	D	Stammham	BWK	A	Braunau	ÖBK		110		102			82	
	115	3	1	D	Neuötting	BWK	A	Ranshofen	APG		110		90				
	115	3	2	D	Neuötting	BWK	A	Ranshofen	APG		110		90				
	115	4	1	D	Egglfing	BWK	A	Antiesenhofe n	APG		110		102				
	115	5	1	D	Altheim	E.ON	A	St. Peter	APG		220		301				
	115	6	1	D	Simbach	E.ON	A	St. Peter	APG		220		301				
	115	7	1	D	Ering	BWK	A	St. Peter	APG		110		152			114	
	115	7	2	D	Ering	BWK	A	St. Peter	APG		110		152			114	
	115	8	1	D	Egglfing	BWK	A	St. Peter	APG		110		105				
	115	9	1	D	Pirach	E.ON	A	St. Peter	APG		220		526	457			
	115	10	1	D	Pleinting	E.ON	A	St. Peter	APG		220		526	457			
	115	11	1	D	Passau	OBAG	A	Ranna	EAGOÖ		110		90				
	115	11	2	D	Passau	OBAG	A	Ranna	EAGOÖ		110		90				
	115	12	1	D	Rosenheim	BWK	A	Oberaudorf	ÖBK		110		90				
	115	13	1	D	Kiefersfelden	E.ON	A	Oberaudorf	ÖBK		110		90				
	116	1	1	D	Leupolz	RWE Net	A	Westtirol	APG		380		1316				
	116	2	1	D	Memmingen	RWE Net	A	Westtirol	APG	380	220		762				

Year			Connection between									Conventional (thermal)*		Limited by the transformers of the susbtations			
2000			from substation		from substation			to substation		Voltage of the circuit		Transmission capacity		of circuits		of lines	
Country ID	Frontier-Point	Line	Circuit	Country	Name	Operated by	Country	Name	Operated by	Forecast	Present	Forecast	Present	at	(Voltage)	at	transmission capacity
D	Nr	Nr	Nr							kV	kV	MVA	MVA	MVA	kV	MVA	kV
	117	1	1	D	Oberbrunn	E.ON	A	Silz	TIWAG		220		793	762			
	117	1	2	D	Oberbrunn	E.ON	A	Silz	TIWAG		220		793	762			
	161	1	1	D	Flensburg	E.ON	DK	Aabenraa	ELSAM		220		330	300			
	161	2	1	D	Flensburg	E.ON	DK	Kassø	ELSAM		220		330	300			
	161	3	1	D	Audorf	E.ON	DK	Kassø	ELSAM		380		830				
	161	3	2	D	Audorf	E.ON	DK	Kassø	ELSAM		380		830				
	162	1	1	D	Bentwisch	VEAG	DK	Bjæverskov	ELKRAFT		400		600				
	191	1	1	D	Niederstedem	RWE Net	L	Vianden	SEO		220		732				
	191	2	1	D	Niederstedem	RWE Net	L	Vianden	SEO		220		492				
	191	2	2	D	Niederstedem	RWE Net	L	Vianden	SEO		220		492				
	191	3	1	D	Bauler	RWE Net	L	Vianden	SEO		220		732				
	191	4	1	D	Bauler	RWE Net	L	Flebour	CEGEDEL		220		492			520	
	191	4	2	D	Bauler	RWE Net	L	Roost	CEGEDEL		220		492			520	
	192	1	1	D	Trier	RWE Net	L	Heisdorf	CEGEDEL		220		492				
	192	2	1	D	Quint	RWE Net	L	Heisdorf	CEGEDEL		220		492				
	321	1	1	D	Etzenricht	E.ON	CZ	Hradec	CEPS		380		1316				
	321	1	2	D	Etzenricht	E.ON	CZ	Prestice	CEPS		380		1579				
	322	1	1	D	Röhrsdorf	VEAG	CZ	Hradec	CEPS		380		1660	1315			
	322	1	2	D	Röhrsdorf	VEAG	CZ	Hradec	CEPS		380		1660	1315			
	323																
	323																
	401	1	1	D	Herrenwyk	E.ON	S	Kruseberg	Sydkraft/ Vattenfall		450		600	372			
	501	1	1	D	Vierraden	VEAG	PL	Krajnik	PPGC		220		392				
	501	1	2	D	Vierraden	VEAG	PL	Krajnik	PPGC		220		392				
	502	1	1	D	Hagenwerder	VEAG	PL	Mikulowa	PPGC		380		1660				
	502	1	2	D	Hagenwerder	VEAG	PL	Mikulowa	PPGC		380		1660				

***Table 1**: Existing interconnections*

*)The conventional transmission capacity of cross-frontier tie-lines is based upon parameters standardised within UCTE for the calculation of the thermal load capability of each line. For aerial lines these are:
ambient temperature of +35°C, wind velocity of 0.56 m/s at a right angle to the lines as well as the voltage value stated in column 7 or 8. The conditions relevant to system operation in various countries at various times of the year can strongly differ from those above.
Because the real allowable load capability of the line depends on many other factors, such as load flow distribution, upholding of voltage, real ambient conditions, limits of stability, n-1 security, etc.,
the conventional transmission capacity has no relevance from the point of view of system operation or economics but allows just a comparison of the order of magnitude of the various lines. Adding together the conventional transmission capacity of several tie-lines does not allow to infer on the real total transmission capability and leads to irrelevant results from the point of view of system operation.

These are the German values. In publications of UCTE, the lower one of two country values will be used .

HUNGARY

1. Basic capacity, generation and consumption data

Installed capacity by fuel, MW		
	Thermal	5 608
	Hydro	46
	Nuclear	1 772
	Renewables	0
	Total	7 426
Yearly generation fuel by fuel, TWh		
(gross production)	**Thermal**	20.062
	Hydro	0.178
	Nuclear	14.180
	Renewables	0
	Total	34.420
Annual consumption, TWh		35.884
Imports		6.470
Exports		3.023

2. Industry structure

Recent key developments

Hungarian power utility MVM Rt and its subsidiaries are among the most important players in the Hungarian electricity sector.

The primary task of MVM Rt is to purchase electricity from Hungarian power stations and abroad, and sell it on to the distribution companies via its supply network.

The group is active in the generation of electrical energy, international trade, the development and operation of the national grid and dispatch. The operation and development of the power transmission network is the task of transmission lines operator MVM Rt. The MVM group includes Hungary's only nuclear power station (Paks Nuclear Power Plant) and a coal-fired power station (Vértes Power Plant). It is also MVM's responsibility to ensure security of supply through the secondary reserve gas turbines operated by subsidiary GTER Kft. Operational management of the Hungarian power system and load distribution for all Hungary's power stations is carried out by MAVIR Rt, which also operates as a subsidiary of MVM (The situation is till 1st of February 2002, and after that MAVIR will be owned by the Ministry of Economics).

As the most important state-owned corporate group in the Hungarian electricity sector, MVM is an active participant on the international electricity market, and a member of the Union for the Coordination of Transmission of Electricity (UCTE) in Western Europe, with which it has formed complex and ever expanding network connections. MVM authorised MAVIR Rt. to realise the co-operation of the

Hungarian power system with international organisations of UCTE, CENTREL, SUDEL and ETSO. MVM carries out its duties in compliance with the regulatory system in force, electricity laws and other related legislation. Operation meets ISO 9001 quality standards, and MVM is also preparing to launch an integrated environmental management system.

State-owned MVM takes maximum advantage of the opportunities on the emerging Hungarian market, as well as the international one, in order to make both its supply and trading activities competitive. Alongside its core activity, MVM Rt aims to become an active player on the telecommunications and heat-services market, and is jockeying for position in the energy markets of neighbouring countries, as a strategic investor. In the interest of attaining all these goals, MVM plans to fully exploit the synergies and diversification opportunities inherent in the group's member companies, and achieve strong strategic and financial management at holding level.

Energy policy is based on the principles accepted in 1992 by the Government and in 1993 by the Parliament.

The most important objective is to create conditions to join the European Union.
The main items of the energy policy are as follows:

- To keep and improve security of supply
- Energy conservation, energy efficiency
- Environmental issues at the existing power plants as well as in the future developments
- Least cost planning within operation and development of the power system with extension step by step of elements of competition
- Creation of market oriented organisational, ownership, economical and legal regulation
- To solve problems of coal mining industry
- To increase role of publicity in decision making processes in the power industry

Construction of new power plants and reconstruction of old ones
CCGT power plants:

- Csepel II.: 389 MW (investment of PowerGen, commissioned in 2000)
- Power plant Debrecen: 110 MW (investment of the TITASZ distribution company, commissioned in 2001))
- The Budapest Power Plant Ltd., CCGT at the site of the Power Plant Újpest, with installed capacity 110 MW commissioned in 2001
- The Budapest Power Plant Ltd., CCGT at the site of the Power Plant Kispest, with installed capacity 110 MW, it will be commissioned in 2004.

Reconstruction, retrofit

- Retrofit of Power Plant Matra is ready
- Reconstruction of the control system and the turbines of the Paks NPP within the project for its security improvement is underway

Energy conservation, energy efficiency, environment protection

- The Energy Conservation Credit Program was continued in 1999. Power modernization of municipality institutions was in process. Reconstruction of district heating systems has been started with state support.

- The Hungarian Government has approved strategy for energy conservation and increase of energy efficiency up to 2010. Main objectives:
  - At 5% average grow of GDP per year energy use increase has not to exceed 1,5%
  - By 2010 energy resources of thermal value 75 PJ have to be saved or replaced by renewable.

  In result 50 kt/year reduction of sulphur dioxide and 5 Mt /year reduction of carbon dioxide emission will be realised.

According to the new Clean air regulation, power plants exceeding emission limits prescribed in the European Union have to be closed after 2004.

Tasks in the field of the market oriented organisational, ownership, economical and legal regulation

Creation of competitive market of electricity, up to the reasonable schedule and measure.

The new Electricity Act was created and approved by the parliament at the end of 2001. This Energy Act will be in effort from the 1st of January 2003 with following main objectives:

- transmission and distribution of electricity, system control and supply of public customers belong to the area of price regulation by the state authorities. The eligible customers, traders and power plants may freely agree on prices of electricity,
- parallel activities in the area of public supply, on one hand and those at the competitive market, on the other hand are to be licensed by the Hungarian Energy Office (HEO). Having licenses anybody may establish a power plant, transmission or distribution network based on the market,
- Investors owing the licenses have to separate in their accountancy activities within and outside of the power industry,
- the company having exclusive rights for power system operation and those having licenses for transmission or distribution of electricity are not allowed to pursue any other activities within the power industry, for the transparency and operation of the market without discriminations,
- the power system operator is responsible for the operation of the interconnected power system.

3. Interconnection and network developments

System interconnections

FROM	TO	U [kV]	Cap* [MVA] Winter	Cap* [MVA] Summer
Hungary	**Austria**			
Győr	Bécs	400	1840	1550
Győr	Bécs	220		
Győr	Neusiedel	220		
Hungary	**Croatia**			
Hévíz	Tumbri (Zerjavinec)	400	1840	1550
Hungary	**Yugoslavia**			
Sándorfalva	Subotica	400	1840	1550
Hungary	**Romania**			
Sándorfalva	Arad	400	1840	1550
Hungary	**Ukraine**			
Sajószöged	Mukacevo	400	1840	1550
Sajószöged-(Tiszakök)	Mukacevo	220		
Sajószöged-(Kisvárda)	Mukacevo	220		
Hungary	**Slovakia**			
Győr	Gabcikovo	400	1390	1390
Göd	Levice	400	1390	1390

Lines under construction (internal lines)

- Sándorfalva-Békéscsaba 400 kV line (commissioning will be in 2003)
- Paks-Pécs 400 kV line (commissioning will be in 2004)

Ongoing studies in **international/cross-border** *interconnections*

- To Slovenia (Cirkovce) – Hévíz-Cirkovce; this line is ready on Hungarian territory
- To Croatia (Ernestinovo) from Pécs to Ernestinovo. (This line has to be built after the construction of the Paks-Pécs 400 kV line and Pécs 400/120 kV substation on Hungarian territory and the rebuilt of Ernestinovo substation on Croatian territory.)
- To Slovakia (Rimavska Sobota or Moldava) from Sajóivánka .
- Győr-Szombathely 400 kV transmission line

Study needs

- Szombathely-Südburgenland (This line will be built after the construction of the Győr-Szombathely transmission line and the Szombathely 400/120 kV substation).
- New 400 kV interconnection between Hungary and Yugoslavia (Pécs-Sombor). (This line has to be built after the construction of the Paks-Pécs 400 kV line and Pécs 400/120 kV substation.)
- New 400 kV interconnection between Hungary and Romania (Békéscsaba-Oradea)

Figure: Hungarian Power System 2001

4. Other

Link
www.mvm.hu
www.mavir.hu
www.eh.gov.hu
www.apvrt.hu
www.gm.hu
www.energiainfo.hu
www.centrel.org

ITALY

1. Basic capacity, generation and consumption data

Installed capacity by fuel, MW (as of 31.12.2000)		
	Thermal	54 197.9
	Hydro	20 346.1
	Nuclear	-
	Renewables	959.7
	Total	75 503.7

Yearly generation fuel by fuel, TWh			
		2000	**Pre-closing 2001**
	Thermal	208.0793	NA
	Hydro	50.2292	NA
	Nuclear	-	NA
	Renewables	4.9842	NA
	Total	263.2927	266.5030
Pump storage consumption, TWh		-9.1295	-9.4340
Imports, TWh		44.8310	48.9330
Exports, TWh		-0.4840	-0.5560
Annual consumption, TWh		**298.5103**	**305.4460**
Grid losses, TWh		-19.1907	NA
Annual consumption, (net of grid losses), TWh		**279.3196**	**NA**

(*) Geothermal, wind and photovoltaic

2. Industry structure

Recent key developments

In March 1999 the Italian Ministry of Industry, Trade and Handicraft published Decree n. 79 (so called *Bersani Decree*) implementing Directive 96/92/EC, thus starting a deep process of change in the Italian electricity industry.

Bersani Decree stated, amongst other things:

- Eligibility of consumers: timeframe and thresholds levels for the opening up of supply market to competition;
- Grid access: Third Party Access to the transmission system via regulated arrangements and creation of a Single Buyer, responsible for the supply of power to non-eligible customers;
- Vertical unbundling: Enel, as well as all the others electric operators, had to create legal separate entities for generation, transmission, distribution and supply activities; the Decree also stated the creation of an Independent System Operator (ISO), responsible for transmission and dispatching activities, and an Independent Market Operator, responsible for establishing and operating the wholesale market;
- Regulation: an independent regulator has been established, the Energy Authority, responsible for ensuring that competition and efficiency characterise the electricity industry and that an adequate quality of service is offered to customers; Energy

Authority is also responsible for ensuring the development of a tariff regime that is fair and transparent, based on predefined criteria protecting the interest of customers;
- Special provisions: the Decree stated limitations on companies' generation shares, thus resulting in the requirement for the divestment of 15 GW of Enel's generation assets; the Decree also stated the end of Enel's import/export monopoly and the reorganisation of the distribution system, permitting only one concession for a distribution network in each area/city.

Initial activities:
- In March 2001 Enel and ACEA signed an agreement in order to transfer Enel's distribution network in the area of Rome to ACEA
- In May 2001 the Italian Ministry of Industry, Trade and Handicraft approved Electricity Market Rules proposed by the Market Operator. The Rules contain provisions on the management of electricity and capacity purchase and sale offers/bids and on the price setting mechanism.
- In July 2001 was concluded the divestment process of the first Enel's generation company, Elettrogen (5,438 MW), the buyer being the consortium Endesa-BSCH-Asm Brescia.
- In October 2001 the Energy Authority published the new single text governing the technical-economic conditions regarding the transportation, metering and sales services for both the free and captive markets. In particular, the Energy Authority has reformed the rules governing the transportation of electricity for customers on the free market, bringing them into line with the rules applying to customers on the captive market
- In December 2001 Enel and AEM Torino signed an agreement in order to transfer Enel's distribution network in the area of Turin to AEM Torino.

Main actions under way:
- Divestment of two more Enel's generation companies, Eurogen (7,008 MW) and Interpower (2,611 MW)
- Definition of the agreement between Enel and AEM Milano in order to transfer Enel's distribution network in the area of Milan to AEM Milano
- New Government regulations in order to speed up the authorisation procedure for the construction of new power plants and new transmission facilities
- Definition of agreements between GRTN (ISO) and individual owners of portions of the national grid regarding responsibilities and remuneration criteria
- Technical-economic conditions for access to the grid

TSO(s)

Referring to transmission sector *Bersani Decree* stated the division between national grid operation and ownership, thus creating the new figure of the Independent System Operator (ISO), so called GRTN.

GRTN (ISO) and individual Grid Owners have to sign agreements defining responsibilities and remuneration criteria, on the basis of a standard agreement approved by the Ministry of Industry, Trade and Handicraft in December 2000.
Splitting of responsibilities between ISO and Grid Owners are briefly described here below.

- ISO: manages power flows, co-ordinates maintenance on national transmission system, plans development of the national transmission system
- Grid Owners: remote control of transmission facilities, propose and execute maintenance interventions on transmission facilities, execute development interventions

Main generators (incl. IPPs)

Here below are the most important generation companies in Italy, with a rough indication of respective installed capacity.

Company	**Installed Capacity (MW)**
Enel Produzione	39,500
Eurogen	7,008
Endesa Italia	5,438
Edison	3,400
Interpower	2,611
Enel Green Power	2,000
Sondel	1,300
EniPower	985

Foreseen/Outgoing projects for new generating units

At present there are numerous initiatives for the construction of new power plants subjected to the authorisation procedure. Companies such as Edison, EniPower, Sondel, Foster Wheeler are carrying on the more relevant initiatives.

Number of distributors

In Italy there are almost 200 distribution company. The most important are listed here below:

- Enel Distribuzione
- AEM Milano
- ACEA Roma
- AEM Torino
- ASM Brescia
- AGSM Verona

Main traders & other players (exchanges etc.)

The main trading company operating in Italy is listed below:

- Enel Trade
- AEM Trading
- ACEA Trading
- AEM Energia
- EnBW Italia
- TXU Europe Energy
- ATEL Energia
- Edison Energia
- Alpenergie Italia
- Energia
- E.ON Italia

3. Interconnection developments

Existing Interconnections

FROM (IT)	TO	Type	Voltage (kV)	Winter Net Transfer Capacity (MW)
Italy	**France**			
Venaus	Villarodin (FR)	AC single circuit	380	2,600
Rondissone	Albertville (FR)	AC double circuit	380	
Camporosso	Le Broc-Carros (FR)	AC single circuit	220	
Italy	**Switzerland**			
Musignano	Lavorgo (CH)	AC single circuit	380	2,800
Bulciago	Soazza (CH)	AC single circuit	380	
Avise	Riddes (CH)	AC single circuit	220	
Valpelline	Riddes (CH)	AC single circuit	220	
Pallanzeno	Moerel (CH)	AC single circuit	220	
Ponte	Airolo (CH)	AC single circuit	220	
Sondrio	Robbia (CH)	AC single circuit	220	
Mese	Gorduno (CH)	AC single circuit	220	
Italy	**Austria**			
Soverzene	Lienz (AT)	AC single circuit	220	220
Italy	**Slovenia**			
Redipuglia	Divaccia (SI)	AC single circuit	380	380
Padriciano	Divaccia (SI)	AC single circuit	220	
Italy	**Greece**			
Galatina	Arachthos (GR)	DC single circuit	200	500 (*)

(*) Starting commercial operation from 2002

Ongoing studies in international/cross-border interconnections

- Interconnection Italy-France AC double circuit 380 kV 1,500 MW – feasibility stage
- Interconnection Italy-Slovenia AC single circuit 380 kV 800 MW - feasibility stage
- Interconnection Italy-Austria AC single circuit 380 kV 800 MW - feasibility stage

Lines under construction (internal and cross-border)

- Matera-Santa Sofia AC single circuit 380 kV - starting operation in 2003
- Turbigo-Bovisio AC single circuit 380 kV - E.I.A. stage

Future projected interconnections

Interconnection Italy-Switzerland AC double circuit 380 kV 1,500 MW - E.I.A. stage

4. Other

Link

www.grtn.it
www.autorita.energia.it
www.enel.it

NETHERLANDS

1. Basic capacity, generation and consumption data (data from 2001)

Installed capacity by fuel, MW		
	Thermal	18 042
	Hydro	37
	Nuclear	449
	Renewables	876
	Total	19 404
Yearly generation fuel by fuel, TWh		
	Thermal	84.5
	Hydro	0.1
	Nuclear	3.7
	Renewables	1.5
	Total	89.8
Annual consumption, TWh		107.1
Imports, TWh		21.5
Exports, TWh		4.2

2. Industry structure

Recent key developments

From 1-1-2002 the market was opened for the second tranche of customers (approx. 65000 customers). From 1-10-2003 the whole market will be open. For green energy it is already open for all customers since 1-7-2001. In the midsegment 30% of the customers have chosen another supplier.

Three out of the five biggest producers have been privatised and got foreign owners. Privatisation of suppliers (distributors) is still under discussion. A law is under construction, which gives the rules for privatisation. For network owners more strict rules are foreseen. The juridical ownership cannot change; the economical ownership may follow the same rules as for suppliers (distributors).

The TSO, TenneT, has been further unbundled from the producers. Since end 2001 the shares for 100% are in the hands of the national authorities.

TSO(s)

TenneT is since 1998 acting as TSO for the Netherlands. It is responsible for providing system services for the whole system and provides transmission services on the 220- and 280 kV-level.
Transmission services on lower voltage levels are provided by some 20 network operators.

Main generators

The main locations for generation are:

- Eemshaven 2300 MW
- Maasbracht 1300 MW
- Geertruidenberg 1250 MW
- Hemweg 1200 MW
- Maasvlakte 1000 MW
- Velsen 800 MW
- Borssele 850 MW

One big project (900 MW) is foreseen by 2004 near Rotterdam. Furthermore a lot of wind projects are developed. Some older generating plants may be decommissioned if the market circumstances remain bad for their economic operation.

Distribution

There is a growing number of suppliers of electrical energy. EnergieNed has 47 members in its section of supply (electricity and gas suppliers). But also some merging has taken place among the large distributors. The biggest suppliers on the moment are NUON, Essent and Eneco.

Traders and brokers

Very important is the Amsterdam Power Exchange, which operates a day-ahead market and an adjustment market. Furthermore some brokers are active. All producers and suppliers may act as trader, directly or via the APX.

3. Interconnection developments

Existing interconnections

FROM - TO	Type	Thermal capacity (MVA)
Meeden - Diele/Conneforde	2 circuits	2x1370
Hengelo – Gronau	2 circuits and 1 phase-shifter	2x710
Maasbracht - Rommerkirchen/Siersdorf:	2 circuits	2x1710
Maasbracht - Gramme/Meerhout	2 circuits	1x1350 1x1420
Geertruidenberg – Zandvliet	1 circuit	1x1645
Borssele - Zandvliet	1 circuit via 380/150 kV transformers	1x450

Sum of the capacity is 12 445 MVA. Taking into account the actual flows in Gernamy, Belgium and the Netherlands, the (N-1) reserve margin and the TRM (300 MW) 3350 MW (ATC) is available for the market up until 1-8-2002.

Ongoing studies for interconnections

Studies have been performed together with the German TSO's to investigate the possibility to improve the utilisation of the existing interconnections. Studies are still going on with the Belgian TSO in order to study the weak points in the transmission and interconnection system.

Projects
In the interconnection Meeden - Diele/Conneforde two phase-shifters will be installed in order to increase the total import/export capacity for the Netherlands. These phase-shifters will be in operation from 1-8-2002.

Study needs
The Haubrich study asked for by the EU, clearly recommended further studies in the Benelux area including parts for France and Germany. This will be picked up by the respective TSO's.

4. Other

Link	Companies
www.tennet.org	TSO for the Netherlands
www.apx.nl	Amsterdam Power exchange (daughter company of TenneT)
www.tso-auction.org	TSO Auction (daughter company of TenneT)
www.nma-dte.nl	Dienst uitvoering en toezicht Energie (regulator)
www.energiened.nl	EnergieNed (association of energy companies)
www.minez.nl	Ministry of Economic Affairs
www.energieliberalisering.nl	Platform for liberalisation


Nederlands hoogspanningsnet

POLAND

1. Basic capacity, generation and consumption data

Installed capacity by fuel, MW[1]		**Year 2001***
	Thermal	31 189
	Hydro	2 185
	Nuclear	-
	Renewables	70
	Total	33 449
Yearly generation fuel by fuel, TWh		
	Thermal	140.5
	Hydro	4.0
	Nuclear	-
	Renewables	0.2
	Total	144.8
Annual consumption, TWh[2]		124.7
Imports, TWh		4.3
Exports, TWh		11.0
Load of pump storage power plant		2.6

** TSO's corrected data*

2. Industry structure

Recent key developments

The most important piece of legislation governing the activities of the energy sector in Poland is the Energy Law from 1997 (with modifications in1998, 1999, and 2000) and related executive Ordinances of the Minister of Economy.

The ERA President is responsible for regulatory supervision of the Polish energy sector concerning electricity, gas and heat. According to the Energy Law, the President of ERA supervises the regulations of activities of energy companies and its compliance with the state energy policy guidelines.

Also, the Minister of Economy (responsible for energy policy and ordinances to the Energy Law) and President of the Competition and Consumers Protection Office (responsible for supervision on competitive market) have regulatory influence on activity on the electricity market.

Liberalisation and the electricity market

The current program for the development of Poland's electricity market is based on a document titled "The Electricity Market in Poland" drafted by the Ministry of the Economy and the Energy Regulatory Authority. This document was reviewed and updated by the Economic Committee of the Council of Ministers in December of 1999.

[1] *gross value*
[2] *net value*

The principles governing the functioning of the electrical power market proposed in the document are designed to secure:

- equality for all entities active on the market,
- possibilities for achieving the strategic objectives defined in State energy policy,
- the minimisation of transaction costs,
- the reduction of negative effects on the environment.

In April 2001 the Council of Ministers adopted the document "The Program of Introduction of the Electric Power Market in Poland".

Since the Polish electricity market is decentralised one the wholesale electricity trade is carried out in three basic ways:

- On the contract market where electricity is traded by means of bilateral agreements concluded between participants;
- On the exchange market where trading is carried out by means of contracts concluded at Polish Power Exchange;
- On the 'balancing' market where the Transmission System Operator (PSE S.A.) matches transactions concluded on the contract and exchange markets with real electricity demand.

Polish Power Exchange (Giełda Energii S.A.) started its operation in June 2000, and operated The Day Ahead Market. Later on Polish Power Exchange introduced forward and future contracts as well as green electricity contracts (renewable sources). The day ahead hourly balancing market was introduced by PSE S.A. as TSO on September 1, 2001. This mechanism replaced the monthly balance market operated before.

Privatisation of the Electrical Power Sector

Privatisation process has already started and its progress is defined in governmental document issues periodically. This process is supervised by the Ministry of the State Treasury.

The following entities has been already privatised:

- power plants: Rybnik, Połaniec, PAK(Pątnów-Adamów-Konin);
- CHP plants: Zielona Góra, Kraków, Białystok, Nowa Sarzyna, Będzin, ZEW Kogeneracja,
- ZEC Wybrzeże, Zespół Elektrociepłowni Warszawskich and
- distribution companies: ZE Kraków, GZE.

Many other power plants (including CHP) and distribution companies are in the process of privatisation.

Renewable energy

In August 2000 the Polish Parliament adopted "Strategy for renewable energy". The goal of the strategy is to achieve 7,5% of total primary energy production from renewable energy sources up to 2010.

TSO

On the basis of current effective regulations of the Energy Law and licenses obtained from the President of the Energy Regulatory Authority, PSE S.A. is responsible for

the transmission of electricity through the national transmission network, performing these activities throughout the entire territory of the Republic of Poland. PSE S.A. is the operator of the national transmission system (220, 400 and 750 kV), which consist of 238 lines on total length of 12662 km and 108 of the power substation.

Since 1995 the Polish Power System has operated synchronously with the UCTE system, and since 17 May 2001 PSE S.A. has been the founding member of new UCTE. Since 30 November 2001 PSE S.A. is the associate member in the ETSO.

In compliance with Energy Law and licenses obtained from the ERA, PSE S.A. periodically works out "Development plans for covering current and future electricity demand". (Similar plans are being prepared by distribution companies).

Main generators (incl. IPPs)

The total available power of 22 baseload power plants connected to the national transmission system, is 24 420 MW. Main generators (more than 600 MW) are as follows:

Bełchatów TPP	4390 MW	Pątnów TPP	1200 MW
Kozienice TPP	2785 MW	Łaziska TPP	1155 MW
Połaniec TPP	1800 MW	Siersza TPP	764 MW
Rybnik S.A. TPP	1760 MW	Łagisza TPP	710 MW
Dolna Odra TPP	1742 MW	Ostrołęka TPP	676 MW
Turów TPP	1733 MW	Siekierki CHP	619 MW
Jaworzno III S.A. TPP	1610 MW	Adamów TPP	600 MW
Opole S.A. TPP	1490 MW		

Foreseen/Outgoing projects for new generating units

- Bełchatów II TPP 833MW (after 2007)
- Żarnowiec CCGT 250 MW (by the end of 2004)

Number of distributors

33 distributing companies, operating the grids of 110 kV and lower voltage.

Main traders & other players (exchanges etc.)

The following entities play active role on the electricity market: generators, distribution companies (main buyers of energy), wholesale electricity traders, big end customers (using TPA rules) and Giełda Energii S.A. as the Polish Power Exchange.

3. Interconnection developments

Existing Interconnections

FROM (PL)	TO	Type AC/DC Single/Double	U, kV	Thermal capacity**),MVA
Krajnik	Vierraden (Germany)	AC- Double	400, operating on 220	930 *)
Mikułowa	Hagenwerder (Germany)	AC- 2*Single/Double[1)]	400	2770 *)
Wielopole	Albrechtice (Czech Republic)	AC- Single[2)]	400	1385 *)
Wielopole	Nosowice (Czech Republic)	AC- Single[2)]	400	1385 *)
Kopanina	Liskovec (Czech Republic)	AC- Single[3)]	220	400 *)

Bujaków	Liskovec (Czech Republic)	AC- Single[3)]	220	400 *)
Krosno Iskrzynia	Lemesany (Slovak Republic)	AC- Double	400	2770 *)
Słupsk	Karlshamn (Sweden)	DC	±450	600 MW
Zamość	Dobrotwór (Ukraine)	AC- Single	220	394
Białystok	Roś (Belarus)	AC- Single	220	362
Rzeszów Widełka	Chmielnicka (Ukraine)	AC- Single	750	disconnected

1) *on Polish side two single-circuit line, on Germany side double tower double circuit line.*
2) *lines are constructed as one double circuit*
3) *lines are constructed as one double circuit*
*) *total transmission capacity from Polish system to the UCTE system in normal conditions is 1800 MW at the present time.*
**) *temperature below 10^0 C*

Ongoing studies on international/cross-border interconnections

FROM (PL)	TO	Type AC/DC Single/Double	U, kV	P,MW	Date for study completion	Expected date for commissioning the line under study
Ełk	Alytus (Lithuania)	AC - Double	400	600 b-t-b	mid 2002	2005-2008
Narew	Berezowska (or Roś) (Belarus)	AC- Double	400	Under study DC b-t-b	*)	2005-2008
Rzeszów Widełka	Chmielnicka (Ukraine)	AC-Single	750	600 or 2*600 DC b-t-b	*)	Not yet defined
Plewiska	Eisenhuttenstadt(Germany) (new sbs. in Preilack-Neuenhagen line)	AC- Double	400	Not defined yet	*)	After 2015
Byczyna	Varin (Slovak Republic)	AC – Double	400	Under study	*)	Not yet defined

*) *Prefeasibility study was completed in 2001.*

The project of installation the phase shifting transformers in Mikulowa substation on existing and future 400(380) kV interconnection lines between Poland and Germany are taken under consideration.

Lines under construction (internal)

FROM (PL)	TO (PL)	Type AC/DC Single/Double	U, kV	Thermal capacity, MVA	Expected date for commissioning the line
Dobrzeń	Wielopole	AC- Double	400	3700	2003
Rogowiec	Ostrów	AC-Double	400	3700	2007
Ostrów	Plewiska	AC-Single (on double tower)	400	1850	2005
Tarnow	Krosno	AC-Single	400	1850	2004

Future projected interconnections

FROM (PL)	TO (PL)	Type AC/DC Single/Double	U, kV	Thermal capacity, MVA	Expected date for commissioning the line
Krajnik*	Vierraden (Germany)	AC- Double	Switch over to 400	3700	Not yet defined

** Presently operating on 220 kV line*

Study needs

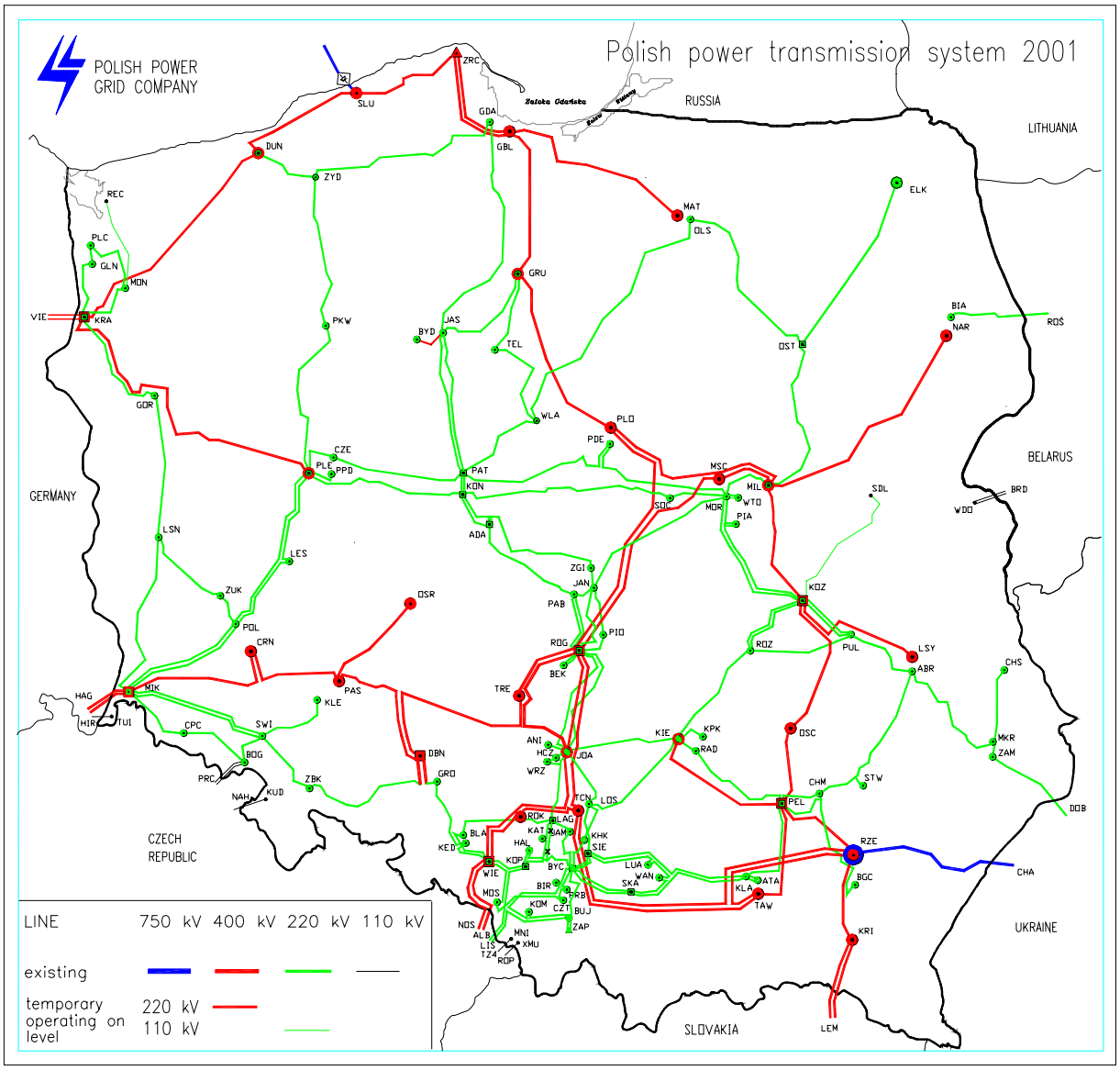
Feasibility study on international/cross-border new interconnections:

- Elbląg - Kaliningrad (Russian Federation) + back-to-back converter station,
- Narew – Berezowska or Ros (Belarus) + back-to-back converter station,

feasibility study on technical means for elimination of the transmission grid "bottle necks" for East - West and West - East electricity transfer, feasibility study on activating of the existing 750 kV Rzeszów – Chmielnicka international line by means of back-to-back converter station in Rzeszów.

4. Other

Link	Company
www.pse.pl	Polish Power Grid Company
www.ure.gov.pl	Energy Regulatory Authority
www.msp.gov.pl	Ministry of the State Treasure
www.are.waw.pl	Energy Market Agency
www.mg.gov.pl	Ministry of Economy
www.cire.pl	Information Centre on the Electricity Market
www.polpx.pl	Polish Power Exchange


POLISH POWER GRID COMPANY
Polish power transmission system 2001
RUSSIA
LITHUANIA
BELARUS
UKRAINE
SLOVAKIA
CZECH REPUBLIC
GERMANY
LINE 750 kV 400 kV 220 kV 110 kV
existing
temporary operating on level 220 kV 110 kV

PORTUGAL

1. Basic capacity, generation and consumption data

Installed capacity by fuel, MW		
	Thermal	5 065
	Hydro	4 408
	Nuclear	
	Renewables	203
	Total	9 676
Yearly generation fuel by fuel, TWh		
	Thermal	25.500
	Hydro	14.069
	Nuclear	
	Renewables	0.700
	Total	40.269
Annual consumption, TWh		40.023
Imports, TWh		3.741
Exports, TWh		3.502

2. Industry structure

Recent key developments

Regulation
The key issues in the evolution of the Portuguese electrical sector towards the liberalisation are:

1989 - Open Market to Small Independent Producers
1995 - New Legislation for the Electricity Sector
- Decree Law 182/95
- Decree Law 185/95
- Decree Law 187/95

1996 - Establishment of Regulatory Entity
- Decree Law 187/95

1997 - Legal Framework for privatisation of the full vertically integrated Electricity Sector under the EDP Group of companies.
The proposals for the planning of the Public System Generation have been assigned to REN for which approval the General Directorate of Energy is responsible.
- Decree Law 56/97

1999 - Liberalisation of the Electricity Sector
2000 - Legal Separation of REN becoming an independent company within the electrical sector (the Portuguese TSO)
- Decree Law 198/2000

A Public System and a Non Binding System compose the Portuguese Electrical Sector. In the beginning, all the producers and consumers where connected to the

Public System. The producers have Power Purchase Agreements with REN whose costs are passed trough to the unique distributor and the consumers pay a fixed tariff depending on the voltage level at which they are connected to the network.

Nowadays, the Public System remains in the same situation. All the consumers connected to the medium, high and very high voltage are allowed to change to the Non Binding System. At the moment, 1012 consumers (about 8,4% of the eligible ones) did do it.

In the year 2001 all the tariffs (Public and Non Binding Systems) becomes of the additive type which means that each consumers can understand the different parts of the price they are paying for.

In the Non Binding System there is not yet organized a power exchange. This system is based on bilateral contracts between producers and consumers. There are not allowed traders in the Portuguese System: only the producers connected to the Non Binding system and external agents can commercialise their energy or energy that they buy to replace its own production until their maximum power.

Organisation
At the end of 2001, a governmental agreement between Spain and Portugal has been signed in order to develop the Iberian Electrical Power Market. The TSO of both countries – REE from Spain and REN from Portugal – have been in charge of elaborating all necessary procedures during 2002 in order that this new context should be in force in the beginning of 2003. Those procedures include legal, market and system operation, development and planning aspects.

TSO
REN - Rede Eléctrica Nacional, S. A., the Portuguese TSO, is the sole company responsible for the system and market operation in mainland Portugal. It holds the concession of the transmission network – lines and substation of 150, 220 and 400 kV – including the interconnection with Spain.

Main generators

Main generating companies in Portugal are EDP Produção, Tejo Energia e Turbogás.

The main generating plants are of the thermal type. In the following table are selected those plants with installed capacity bigger than 180 MW:

Alto Lindoso	630 MW
Aguieira	336 MW
Miranda	369 MW
Picote	195 MW
Bemposta	240 MW
Pocinho	186 MW
Valeira	240 MW
Régua	180 MW
Carrapatelo	201 MW
T. Outeiro CC	990 MW

Pego	584 MW
Carregado	710 MW
Setúbal	946 MW
Sines	1192 MW

Foreseen/Outgoing projects for new generating units

In the following table are indicated the expected new generation:

a) Conventional

Year	Name	Type	Ratted power (MW)
2003	Ribatejo (group 1)	Thermo CC	392
	Alqueva	Hydro	236
2004	Ribatejo (group 2)	Thermo CC	392
	Venda Nova II	Hydro	178
2006	Ribatejo (group 3)	Thermo CC	392
2008	Picote II	Hydro	232
2009	Baixo Sabor	Hydro	138
	Carregado	Thermo SC	159
2010	Carregado	Thermo SC	159
2011	Fridão	Hydro	128
	Lavos	Thermo CC	1176

b) Renewable (wind)

Until the year 2005, 1100 MW and 2010, 3300 MW of wind power generators are expected.

Number of distributors

In mainland Portugal one distribution company (EDP Distribuição) operates the grids of 60 kV and below.

Main traders and other players

As referred above, traders in the electricity market are not allowed in Portugal. Only producers belonging to the Non Binding System and external agents may commercialise its energy. At the moment there is only one Portuguese company in that situation (EDP Energia) and two external companies.

3. Interconnections

Existing Interconnections

All existing interconnections are of the AC type, single circuit, with Spain. They are indicated in the table below. The interconnections in *italics* are to support local demand and are explored by the distribution company:

Name	U (kV)	Capacity (MVA) (winter values)
Cartelle-Lindoso	400	1330
Conchas-Lindoso	132	131
Aldeadávila-Bemposta	220	344
Aldeadávila-Pocinho	220	344
Saucelle-Pocinho	220	344
Cedillo-Pego	400	1386
Santa Marina-Elvas	60	50

Foreseen cross-border interconnections:

Name	U (kV)	Capacity (MVA)	Type of action	Foreseen date
Cartelle-Lindoso	400	2x1330	Instalation of 2nd circuit	Under study
Aldeadávila-Bemposta	220	-	Uprating of lines in this region	Under study
Aldeadávila-Pocinho	220	-		
Saucelle-Pocinho	220	-		
New 400 kV corridor				Under study
Cedillo-Falagueira	400	1480	Uprating of existing line	2004
Balboa-Alqueva	400	1330	New double circuit overhead line (equipped only with one circuit in the first phase)	2004

4. Other

Link	Companies
www.ren.pt	REN – Rede Eléctrica Nacional, S. A. (Portuguese TSO and unique transmission company)
www.erse.pt	Entidade Reguladora do Sector Energético (The Portuguese Regulator for gas and electricity)
www.dge.pt	Direcção Geral de Energia (The General Directorate for Energy)

SLOVAKIA

1. Basic capacity, generation and consumption data

Installed capacity by fuel, MW		
	Thermal	3 177
	Hydro	2 474
	Nuclear	2 640
	Renewables	-
	Total	8 291
Yearly generation fuel by fuel, TWh		
	Thermal	10
	Hydro	5
	Nuclear	17
	Renewables	-
	Total	32
Annual consumption, TWh		28
Imports, TWh		1
Exports, TWh		5

2. Industry structure

Recent key developments

In 2001 the restructuring process of the Slovak electricity sector has been completed in compliance with the Resolution of the Slovak Government No 758/2000 of 27 September 2000.

The key point of this Resolution in the first step was to divide Slovenské elektrárne, a.s. as a dominant vertical integrated company into three entities:

- Slovenské elektrárne - generation, a.s. (SE-gen)
- Slovenská elektrizačná prenosová sústava, a.s. (SEPS) as a fully completed and independent TSO in Slovakia
- Tepláreň Košice, a.s. (heating plant)

and to transform three regional distribution utilities, state owned into the privatisation of these newly established companies up to 49% of shares except SEPS which is going to serve for the period of next 5-6 years in state's hands.

In December 2001 the extraordinary General Assembly of SE, a.s. decided to split SE, a.s. into three entities mentioned above from 1 January 2002 following the Governmental Resolution mentioned above.

Simultaneously, three state regional companies have been transformed to public limited companies and later on will be privatised.

The regulatory framework for the new structure of the electricity sector in Slovakia is established by two main legal provisions as follow:

- Act No 276 of June 14, 2001 on the Regulation in Network Industries (Regulation Act),
- Act No 70 of February 11, 1998 on the Energy Management and on Amendments to the Act No. 455/1991 Coll. on Trade, as later amended (Energy Act)

The key objective of the Regulation Act is the establishment of an independent Regulatory Authority for Network Industries. The Regulatory Authority has started its operation since August 1, 2001. Main tasks of the Regulatory Authority is to issue authorisation, licences, tariffs and market rules setting.

TSO

By December 2001 Slovenské elektrárne, a.s. - Prenosová sústava (in English Slovak Electric, plc. - Transmission system - further SE-PS) has performed the role of the Slovak Transmission System Operator as a division of Slovenské elektrárne, a.s. SE-PS providing the transmission of electricity through 220 kV and 400 kV networks in parallel operation with the interconnected UCTE system.

According to the Governmental decision No 758/2000 on restructuring of the Slovak energy sector, SE-PS as a division of SE, a.s. was separated to the new company SEPS, a.s. to perform the role of the Transmission System Operator independently from January 1, 2002.

Main generators (incl. IPPs)

Jaslovske Bohunice NPP V-1, V-2	1760 MW
Mochovce NPP	880 MW
Cierny Vah HPP	735 MW
Gabcikovo HPP	746 MW
Vojany 1 TPP	660 MW
Vojany 2 TPP	660 MW
Novaky TPP	522 MW
Bratislava PPC	218 MW
Kosice TPP	121 MW

Foreseen/Outgoing projects for new generating units

Malzenice PPC	385 MW
Novaky TPP	270 MW

Number of distributors

Three distribution companies, operating grids of 100 kV and medium voltage.

Main traders & other players (exchanges etc.)

In 2001 Slovenské elektrárne, a.s. has been acting as a single buyer.

3. Interconnection developments

Existing Interconnections

From - To	Type AC/DC single/double	Voltage	Capacity (one circuit)
Varin SK - Nosovice CZ	single	400 kV	1905
Krizovany SK - Sokolnice CZ	single	400 kV	1818
Stupava SK - Sokolnice CZ	single	400 kV	951
P. Bystrica SK - Liskovec CZ	single	220 kV	600
Senica SK - Sokolnice CZ	single	220 kV	800
Lemesany SK - Krosno PL	double	400 kV	951
V. Kapusany SK - Mukacevo UA	single	400 kV	951
Gabcikovo SK - Gyor H	single	400 kV	1800
Levice SK - God H	single	400 kV	1800

Ongoing studies in international/cross-border interconnections
400 kV line from Slovakia (Moldava, Rimavska Sobota) to Hungary (Sajoivanka)
(double circuit AC line 400 kV 1600 A (one circuit)

400 kV line from Slovakia (Varin) to Poland (Byczyna)
(double circuit AC line 400 kV 2400 A (one circuit)

Lines under construction (internal and cross-border)
At present there are no new lines in construction

Future projected interconnections

The construction of the 2 x 400 kV international line between Slovakia (Stupava) - Austira (Wien SO)

4. Other

Link	Company
www.sepsas.sk	Slovenská elektrizačná prenosová sústava
www.seas.sk	Slovenské elektrárne, a.s.
www.urso.gov.sk	National regulatory authority

SLOVENIA

1. Basic Capacity, Generation and consumption data

Installed capacity by fuel, MW		
	Thermal	1 241
	Hydro	896
	Nuclear	670
	Renewables	-
	Total	2 870
Yearly generation fuel by fuel, TWh		
	Thermal	4.092
	Hydro	3.513
	Nuclear	4.540
	Renewables	-
	Total	12.145
Annual consumption, TWh		10.521
Losses		0.303
Imports, TWh		0.672
Exports, TWh		1.960

Capacity data at the end of year 2001

2. Industry structure

Recent key developments

Liberalisation in Slovenia formally started with adoption of Energy Act in September 1999 (National Gazette No 79 /30.9.1999) despite the Slovenian electricity sector had been unbundled since 1990. Electricity sector is consisted of three river chain companies, four thermal power plant companies, nuclear power plant, five distribution companies and ELES as transmission company responsible for undisturbed operation, maintenance and development of the Slovenian electric power system acting as a single buyer.

The most important secondary legislation which supplement regulatory framework of electric power sector is:

- Decree about execution of transmission system operation and power transmission public services (National Gazette No 54 /16.6.2000)
- Decree about execution of distribution system public services (National Gazette No 54 /16.6.2000)
- Decree about execution of public service Organisation of electricity market (National Gazette No 54 /16.6.2000)
- Order about establishing independent regulatory body – Agency for energy (National Gazette No 54 /16.6.2000)
- Standing orders about reimbursement for use of networks energy (National Gazette No 30 /26.4.2001)
- Standing orders about imbalances market (ELES web 27.12.2001)

In accordance with Energy Act, two commercial public services were formed inside ELES for transmission system operation and electricity transmission at the beginning of year 2001. Besides this a subsidiary company of ELES Borzen was established as market operator and another subsidiary company Trgel as trading company.

The electricity market was formally opened on April 17, 2001 with opening of internal electricity market, first market meetings and sale production surpluses. With this some two thirds of consumption is opened to direct purchases what really came to effect during contracts making for year 2002. According to government Order also external market was partially opened for year 2002. All customers with yearly consumption more than 100 GWh became eligible to buy electricity from foreign producers. Total opening of external market is expected in January 2003.

Generation also experienced changes in 2001. River chain companies Dravske elektrarne, Savske elektrane and Soske elektrane established together with Thermal power plant Sostanj and Coal Mine Velenje Holding of Slovenian power plants and with this consolidated generation sector. Nuclear power plant remained independent power producer while thermal power plants TE-TO Ljubljana and Trbovlje were considered as stranded investments.

All Slovenian power sector companies are so far mainly in state ownership and are governed through Asemblies, Supervisory Boards and General Managers. Some privatisation is envisaged, mainly in distribution of electricity.

TSO(s)

Elektro-Slovenija, d.o.o. - ELES acts as transmission system operator. The tasks of the transmission network operation public service include the management and operation of the transmission network (110, 220, 400 kV), the provision of ancillary services, the preparation of Grid Code, and enabling access to the network to all eligible consumers and producers of electricity.

Main generators (incl. IPPs)

Drava river	575 MW
Sava river	116 MW
Soča river	105 MW
TPP Sostanj	662 MW
TPP Trbovlje	164 MW
TPP Brestanica	312 MW
TPP Ljubljana	103 MW
NPP Krsko	670 MW

Foreseen/Outgoing projects for new generating units

No changes are expected.

Number of distributors
There are five distribution companies regionally dispersed, operating medium and low voltage networks and total consumption in year 2000 at the level of 8442 GWh.

Five direct consumers had consumption in year 2000 at the level of 2079 GWh.

Main traders & other players (exchanges etc.)
Main internal traders are:
- Holding slovenskih elektrarn
- Nuclear power plant Krško
- ELES TSO for stranded investments through power exchange
- ELES Trgel

Some foreign companies also have their representative offices is Slovenia, among them:
- ATP Austria
- Entrade

3. Interconnection developments

Existing Interconnections

The Slovenian electric power system is connected with the neighbouring electric power systems of Austria, Italy and Croatia on the 400 kV and 220 kV levels and to Croatia also on 110 kV level. No connections have been established with the neighbouring Hungary. The currently existing electric power connections are strong enough to enable functioning of the electricity market, which is expected to achieve its full swing in the year 2003.

On other hand there are some obstructions which can impede greater development of the electricity market in Slovenia and in neighbouring countries:
- Transmission capacity towards Italy is on the level only of 380 MW despite that there are two lines, one 220 kV and one 400 kV line. Transmission capacity is in compliance with the UCTE regulations taking into account the N-1 rule.
- Slovenia has quite a strong 400 kV network and connection to Austria with two 400 kV lines. Since on the Austrian side these two lines lack an adequate connection with the Central European 400 kV network, their current capacities do absolutely not attain their rated capacities.
- Slovenia is planning to establish a connection on the 400 kV level with Hungary where progress of work is slow because of spatial issues in Slovenia.

Existing interconnections are:

From	To	Type AC/DC Single/Double	U (kV)	I max (A)
Divaca	Redipuglia	AC – single	400	1600
Divaca	Padriciano	AC – single	220	1200
Maribor	Kainachtal	AC – double	400	2100
Podlog	Obersielach	AC – single	220	1200
NEK	Tumbri	AC – double	400	2100
Divaca	Melina	AC – single	400	1100
Divaca	Pehlin	AC – single	220	800
Cirkovce	Mraclin	AC – single	220	850
Cirkovce	Nedeljanec	AC – single	110	600
Ilirska bistrica	Matulji	AC – single	110	350
Koper	Buje	AC – single	110	500

Future projected internal lines
OHL 400 kV Krsko - Bericevo

Future projected interconnections
OH to Hungary 2 x 400 kV Cirkovce Heviz.

4. Other

Link	Company
www.gov.si	Slovenian government
www.agen-rs.si	State energy agency
www.eles.si	ELES

SPAIN

1. Basic capacity, generation and consumption data

Installed capacity by fuel, MW [1]		
	Thermal	24 923
	Hydro	17 985
	Nuclear	7 816
	Renewables	3 068
	Total	53 792
Yearly generation fuel by fuel, TWh [2]		
	Thermal	92.669
	Hydro	44.251
	Nuclear	61.017
	Renewables	8.384
	Total	206.321
Annual consumption, TWh [2]		205.6
Imports, TWh [2]		10.2
Exports, TWh [2]		6.7

Data derived from temporary closure of year 2001

*[1] Values denote **brute power** at generator mains.*
*[2] Values denote **net energy** at substation –i.e., consumption at power stations are netted-.*

2. Industry structure

Recent key developments

Regulation- After publication of the 54/1997 Electricity Act, last year –2001- has been the fourth of the liberalised "era", being the most significant regulatory developments those presented next (RD refers to Royal Decree):

- A further step in transmission regulation [RD1955/2000] has dealt with a number of key issues (development of the transmission network, access to the grid and public interest of facilities and authorisation procedures, quality related to transmission grid, …). The advance in the philosophy based in the lack of network capacity reserve for planning and access is one of the main features of this regulation
- Some organisational changes within CNE -Regulatory Commission- [RD 3487/2000]
- Modifications of procedures for agents willing to participate within Spanish Market, as well as some modifications concerning costs of transition to concurrency [RD 2/2001]
- A new set of access tariffs are approved with the purpose of maximising the access for current eligible consumers (connected at above 1 kV), as well as to provide a coverage for the entrance of the remaining ones (connected at less than 1 kV, expected for January 2003) [RD 1164/2001]
- Publication of new tariffs (energy consumption) for 2002 with an average nominal increase of 0.32% for (decrease of 1.68% in real terms, for an estimated inflation of 2%). In nominal terms, domestic tariffs are left constant; tariffs for commercial

and industrial customers will increase.

Organization - At the end of 2001, an governmental agreement between Portugal and Spain has been signed in order to develop the Iberian Power Market, for which purpose both national TSOs –REN and REE- have been appointed responsible for elaborating all necessary procedures during 2002, so that this new context may be in practice in 2003 (this involves coordination of legal, market, operation, development, equipment and planning issues)

TSO

Red Eléctrica de España (REE) is the company responsible for the system operation of the whole mainland Spanish System, owning 96% of 400 kV lines and around 30% of 220 kV lines (transmission system is made up by 220 and 400 kV levels, in addition to international interconnection of any level).

Main generators (incl. IPPs)

Main generating companies in Spain are Endesa, Iberdrola, Unión Fenosa and Hidrocantábrico.

The main generating units of the Spanish power system are the nuclear plants of the las generation; next, those with rated power around 1,000 MVA are selected:

PLANT	RATED POWER [MW at substation]
TRILLO	1066
VANDELLOS II	1040
COFRENTES	1025
ASCO (G.1)	992
ASCO (G.2)	992
ALMARAZ (G.1)	983
ALMARAZ (G.2)	974

Foreseen/Outgoing projects for new generating units

Due to the lack of regulation in the generation expansion process, future data are at the level of forecasts. Two main "families" concentrate most of the expectations:

- A great number of combined cycle gas turbines (CCGT) have been announced (applications to the system operator add up to 33,000 MW), both from national generating companies and foreign being the next a possible profile for commissioning in the short term horizon:
  2002 - 2,800 MW
  2003- 2,400 MW

- In addition to the approximately 3,000 MW of wind power generators currently installed (end of 2001), a huge number of applications and regional plans are announced. The next are possible figures for new generation likely to be incorporated to the system in the short term (next 2 years):
  2002 - 1,600 MW
  2003 - 2,400 MW

Number of distributors

4 distributing companies (Endesa, Iberdrola, Unión Fenosa and Hidrocantábrico) operate the grids of 132 kV and lower voltages.
A 5th company is expected to arise with the ongoing sale of Viesgo from Endesa to ENEL.

Main traders & other players (exchanges etc.)

The main national companies above mentioned have within their holdings the corresponding trading company (required legal separation).
Besides, there is a number of licensed trading companies (authorized to negotiate within the Spanish system, with the main aim of supply eligible customers) as well as external agents (authorized for international interchanges). Both groups may be consulted in the Market Operator web-page (www.omel.es) or that of the National Commission for Energy (www.cne.es)

3. Interconnections

Existing Interconnections

All existing interconnections are AC type and single circuit overhead lines, except:
[1] to Andorra: double circuit line, [2] to Morocco: submarine cable

FROM	TO	U [kV]	Cap* [MVA]
Spain	**France**		
Irún	*Errondenia*	*132*	*111*
Arkale	Mouguerre	220	290
Hernani	Cantegrit	400	1,110
Biescas II	Pragnéres	220	270
Benós	*Lac D'Oo*	*110*	*95*
Vic	Baixas	400	1,530
Spain	**Andorra**		
Adrall	Escaldes	110	2 x 120 [1]
Spain	**Portugal**		
Cartelle	Lindoso	400	1,390
Conchas	*Lindoso*	*132*	*105*
Aldeadávila	Bemposta	220	320
Aldeadávila	Pocinho	220	320
Saucelle	Pocinho	220	360
Cedillo	Pego	400	790
Santa Marina	*Elvas*	*66*	*80*
Spain	**Morocco**		
Pinar	Melloussa	400	730 [2]

: Thermal Rate at Summer Season (Only Spanish side limits**; necessary to complement with the corresponding TSO in the "TO" country)*

In italics, interconnections with minor interchange magnitude (support to local demand), which might be disregarded for most purposes

Foreseen developments in international/cross-border interconnections:

FROM	TO	U [kV]	Cap* [MVA]	Nature of action	Status**	Foreseen date	Comments
Spain	**France**						
Hernani	Cantegrit	400	1,640	Uprating of existing line	Decided	2002	
Bescanó	Baixas	400	2 x 1,350	New double circuit overhead line	Decided	2004-2005	
New 400 kV corridor					Under study	> 2005	Bilateral RTE-REE studies launched
Spain	**Andorra**						
Adrall	Andorra	220	2 x 620	New double circuit overhead line substituting existing 110 kV	Decided	2004-2005	
Spain	**Portugal**						
Balboa	Alqueva	400	2 x 1,255	New double circuit overhead line	Decided	2004-2005	
Cedillo	Falagueira	400	1,640	Uprating of existing line	Under study		Bilateral REN-REE studies launched
Cartelle	Lindoso	400	2 x 1,390	Installation of 2nd circuit in existing line	Under study		Bilateral REN-REE studies launched
New 400 kV corridor					Under study	> 2005	Bilateral REN-REE studies launched
Spain	**Morocco**						
Tarifa	Mellousa	400	730	New set of submarine cables (AC)	Decided	2004-2005	Operation Conditions subject to study
Spain	**Algeria**						
New 400 kV Direct Current Cable					Under study	> 2005	Preliminary feasibility studies launched

: Thermal Rate at Summer Season (Only Spanish side limits**; necessary to complement with the corresponding TSO in the "TO" country). For new lines, capacities are estimated project values. For reinforcement of existing lines, it is the new value.*

***: Decision denotes the confirmation of the action, although some design specifications must be detailed.*

4. Other

Link	Company
www.ree.es	Red Eléctrica de España (Spanish TSO and main Transmission Company)
www.mineco.es/comun/Economia/SEEEyPyME/seeeypyme.htm	Ministry of Economy (National Administration competent for main regulation)
www.cne.es	Comisión Nacional de la Energía (Advisory Regulation Commission)
www.omel.es	OMEL (Market Operator)

UCTE 2

BULGARIA

1. Basic capacity, generation and consumption data*
(All data are for year 2001)

Installed capacity by fuel, MW		
	Thermal	6 553
	Hydro	2 870
	Nuclear	3 760
	Renewables	0
	Total	13 183
Yearly generation fuel by fuel, TWh		
	Thermal	22.129
	Hydro	2.163
	Nuclear	19.532
	Renewables	0
	Total	43.824
Annual consumption, TWh		36.899
Imports, TWh		1.092
Exports, TWh		8.017

2. Industry structure

Recent key developments

In 2000, in conformity with the National Strategy of Energy and Energy Efficiency Development until 2010, the actual restructuring of the electric power sector in the Republic of Bulgaria started. The vertically integrated National Electric Company (NEK) was restructured in phases.

The regulatory framework of operation, restructuring and liberalisation of the electric power sector was actually set up by the new Energy and Energy Efficiency Act adopted by the National Assembly and promulgated in the State Gazette No.64/16.07.1999. The most important secondary legislation acts were also adopted, in the first place:

- Ordinance on the Formation and Application of Electrical Energy Prices and Tariffs till 2001 -subject to electric power prices aprobated by the Council of Ministers.
- Ordinance on the Conditions and Procedure of Licensing in the Energy Sector.
- Ordinance on the Connection of Power Producers and Consumers to the Transmission and Distribution Network.
- Ordinance on the Minimum Fuel Stocks in Power Plant Stores.
- Regulations Governing the Work of Transmission and Distribution Network Operators, etc.

* *The data are preliminary and will be precised with figures about Bulgarian Electrical power System when data for EURELECTRIC/EURPROG report will be available*

Restructuring was carried out through unbundling of some operations from NEK and establishment of new commercial companies in the order listed below:

First Phase
Detachment of the medium-and low-voltage distribution operations and establishment of seven commercial distribution companies as independent legal entities. Detachment of Kozloduy NPP and five thermal power plants as independent power producers.

Second Phase
Detachment of the remaining thermal power plants as independent commercial companies. The "single buyer" model was chosen as the most appropriate in view of the existing technological scheme and the scale of electric power system in Bulgaria.

In that manner, NEK started functioning as a separate unit within a new regulatory framework on conditions meeting the requirements of Directive 96/92 EC of the European Parliament on the Common Rules on the Internal Power Market. The reform carried out resulted in:

- Separation of electric power generation, transmission and distribution costs and creation of conditions of complete transparency;
- Better management of commercial companies and higher efficiency;
- Creation of conditions for competition;
- Predictability of electric power prices as a basic factor of privatisation and attracting foreign investment for rehabilitation and construction of new capacities;
- Creation of prerequisites for establishment of energy market in Bulgaria.

Since December 2001 the State Agency for Energy and Energy Resources has been transformed in the Ministry of Energy.

The approval of following ordinance is forthcoming:

- Ordinance on the Formation and Application of Electrical Energy Prices and Tariffs after 2001 -under conditions of free electricity prices regulated by the State Energy Regulatory Commission;
- Ordinance on free access of eligible customers.

The privatisation process of small HPP is ongoing.

TSO
The National Electric Company (NEK) is the operator of the national transmission network (110, 220, 400 and 750 kV).

Main generators (incl. IPPs)
Main generators in the Bulgarian Power system are:

- Kozloduy NPP - 3760MW
- Maritsa East 2 TPP - 1450MW
- Varna TPP - 1260 MW
- Maritsa East 3 TPP - 800 MW
- Bobov dol TPP - 630 MW

- Russe TPP - 400MW
- Maritsa 3 TPP - 120 MW

Foreseen/Outgoing projects for new generating units

- Maritsa East 1 TPP (2 x 300 MW), by the end of 2004.
- Gorna Arda Hydro Cascade (160 MW), by 2004.

Number of distributors

7 distributing companies, operating the grids of 110 kV and medium voltage.

Main traders & other players (exchanges etc.)

The National Electric Company (NEK) acts as a single buyer

3. Interconnection developments

Existing Interconnections

FROM (BG)	TO	Type AC/DC Single/Double	U,kV	P,MW
Kozloduy NPP	Tintareni (RO)	AC - Double	400	2600
Kozloduy NPP	Isalnita (RO)	AC - Single	220	360
Sofia West s/s	Nish (YU)	AC - Single	400	1300
Blagoevgrad s/s	Thessaloniki (GR)	AC - Single	400	1300
Dobridja s/s	TPP Moldova (MO)	AC - Single	400	1700
Varna s/s	Isaccea (RO)	AC - Single	750	3500
Maritza East 3 s/s	Babaeski (TR)	AC - Single	400	1300

Ongoing studies in international/cross-border interconnections;

FROM (BG)	TO	Type AC/DC Single/Double	U,kV	P,MW	Date for study completion	Expected date for commissioning the line under study
Chervena Mogila s/s	Stip (FIROM)	AC - Single	400	1300		
Maritza East 3 s/s	Filippi (GR)	AC - Single	400	1300		

Lines under construction (internal and cross-border)

FROM	TO	Type AC/DC Single/Double	U,kV	P,MW	Expected date for commissioning the line
Zlatitsa s/s (BG)	Plovdiv s/s (BG)	AC - Single	400	1000	
Maritza East 3 s/s (BG)	Hamidabat (TR)	AC - Single	400	1300	

4. Other

Link	Company
www.nek.bg	NEK
www.dker.bg	State Energy Regulation Commission
www.doe.bg	Ministry of Energy

FEDERAL REPUBLIC OF YUGOSLAVIA (FRY)

1. Basic capacity, generation and consumption data

Installed capacity by fuel, MW		Yugoslavia	Serbia	Montenegro
	Thermal	5 734	5 524	210
	Hydro	3 462	2 804	658
	Nuclear	0	0	0
	Renewables	0	0	0
	Total	9 196	8 328	868
Yearly generation fuel by fuel, TWh				
	Thermal		22.043	0.645
	Hydro		10.693	1.767
	Nuclear		0	0
	Renewables		0	0
	Total		32.736	2.412
Annual consumption, TWh			32.407	3.963
Imports			5.248	1.704
Exports			3.136	0

2. Industry structure

Recent key developments

Federal Republic of Yugoslavia consists of two republics, Serbia and Montenegro, each having responsibility in electricity sector regulation within its area.

Elektroprivreda Srbije – EPS is vertically integrated public electric utility (owned by Government) responsible for coal production, power generation, transmission and distribution of electricity for the whole territory of Serbia. It consists of 23 public companies and 13 departments/centres on corporate level.

In 2001 Ministry of Mining and Energy of Serbia initiated the process of electricity sector reform. The new Energy Law and corresponding Restructuring Action Plan are under preparation. The final draft of the Energy Law is expected in 2002. The new law will be in compliance with current EU directives on electricity sector liberalization.

The Montenegrin electrical sector consists of a state owned vertically integrated utility (EPCG – Elektroprivreda Crne Gore) involved in electrical generation, transmission and distribution. EPCG is joint stock company in which 98% of the shares are state owned with the remainder being employee owned.

The preparation of new Energy Law in Montenegro started in 1999 and is still in progress.

TSO
As still vertically integrated companies, EPS and EPCG have role of TSO in Serbia and Montenegro respectively

Main generators (incl. IPPs)
Main power plants owned by EPS are:
- TENT A TPP - 1502 MW
- TENT B TPP - 1160 MW
- Djerdap HPP - 1058 MW
- Kostolac B TPP - 640 MW
- Kosovo B TPP - 618 MW
- Kosovo A TPP - 617 MW
- Bajina Basta PS HPP - 614 MW

Main power plants owned by EPCG are:
- Perucica HPP - 307 MW
- Piva HPP - 342 MW
- Pljevlja TPP - 210 MW

Foreseen/Outgoing projects for new generating units
- Serbia:
  Kolubara B TPP (2 x 350 MW), by the end of 2006.

- Montenegro:

1. HPP ″Koštanica″:		552 MW	and 1120,4 GWh yearly production
2.HPP ″Morača″:		357,2 MW (with 3 units)	and 1053,9 GWh yearly production
	or	238 MW (with 2 units)	and 693,7 GWh yearly production
3. TPP ″Pljevlja″:		210 MW	and 1000 GWh yearly production
4. HPP ″Komarnica″:		168 MW	and 231 GWh yearly production
5. HPP ″Ljutica″		224 MW	and 553,6 GWh yearly production

Number of distributors
EPS - 11 distributing companies, operating the grids of 110 kV, medium and low voltage.
EPCG - 16 distributing companies, operating the grids of medium (35 kV and 10 kV) and low (0,4 kV) voltage.

Main traders & other players (exchanges etc.)
All power exchange and trade is done through EPS in Serbia and EPCG in Montenegro.

3. Interconnection developments

Existing Interconnections

FROM (YU)	TO	*Type AC/DC* Single/Double	U,kV	P,MW
Subotica s/s	Sandorfalva (HU)	AC - Single	400	1300
Djerdap HPP	Portile de Fier (RO)	AC - Single	400	1300
Nis s/s	Sofia West (BG)	AC - Single	400	1300
Mladost s/s	Ernestinovo (CR)	AC - Single	400	1300
Kosovo B TPP	Skopje(FYROM)	AC - Single	400	1300
Podgorica	Trebinje (BiH/R. of Srpska)	AC - Single	400	1400
Perucica HPP	Trebinje (BiH/R. of Srpska)	AC - Single	220	275
Piva HPP	Buk Bijela (BiH/R. of Srpska)	AC - Single	220	380
Prizren s/s	Fierza (AL)	AC - Single	220	300
Kosovo A TPP	Skopje (FYROM)	AC - Single	220	300
Kosovo A TPP	Skopje (FYROM)	AC - Single	220	300
Pozega s/s	Visegrad (BiH/R. of Srpska)	AC - Single	220	300
Podgorica s/s	Vau Dejes (AL)	AC - Single	220	275

**- damaged, not in operation*

Ongoing studies in international/cross-border interconnections

FROM (YU)	TO	*Type AC/DC* Single/Double	U,kV	P,MW	Date for study completion	Expected date for commissioning the line under study
Podgorica	Elbasan(AL)	AC - Single	400			

Future projected interconnections

Interconnection line to be studied is:

- Pljevlja TPP – Buk Bijela HPP or Gacko TPP (BiH/R.of Srpska).
- The 400 kV lines Niš-Skopje(FYROM) and Sombor-Pecs(Hungary) were proposed by EPS as a possible new interconnection lines among Yugoslavia and neighboring countries and role of these lines will be studied within SECI Regional Transmission Planning Project in 2002.

4. Other

Link	Company
www.eps.co.yu	EPS
www.epcg.cg.yu	EPCG

FORMER YUGOSLAV REPUBLIC OF MACEDONIA (FYROM)

1. Basic capacity, generation and consumption data (data from 2001)

Installed capacity by fuel, MW		
	Thermal	1 010
	Hydro	446
	Nuclear	0
	Renewables	0
	Total	1 456
Yearly generation fuel by fuel, TWh		
	Thermal	5.241
	Hydro	0.621
	Nuclear	0
	Renewables	0
	Total	5.862
Annual consumption, TWh (incl. pumping consumption)		6.294
Imports, (Cross-border exchange) TWh		0.431

2. Industry structure

Recent key developments

"Elektrostopanstvo na Makedonija" – ESM (Electric Power Company of Macedonia) is still the only electricity company in country with vertically integrated businesses of production, distribution, transmission and control. With decision by its Board of Directors, approved by the Macedonian Government has been made transformation of the public enterprise into a joint stock company.

The privatisation of the joint stock company and restructuring of ESM is ongoing process with support of the international consultants.

TSO

ESM – as the operator and owner of the transmission grid (110, 220 and 400 kV) in the year 2001.

Main generators

- TPP Bitola 1, Bitola 2 and Bitola 3 3 x 225 MW
- TPP Oslomej 125 MW
- TPP Negotino 210 MW
- HPP Vrutok, Raven and Vrben 150 + 19,2 +12,8 MW
- HPP Globocica 42 MW
- HPP Tikvesh 92 MW
- HPP Spilje 84 MW

Foreseen/Outgoing projects for new generating units
HPP Kozjak (80 MW) – under construction
HPP Sv.Petka (36 MW) – designing and preparation on going
Rehabilitation of six large hydro power plants – financed by the World Bank Loan, on going
Rehabilitation, operation and transfer of small hydro power plants – concession on going

Number of distributors
28 regional ESM distribution areas (operating medium voltage networks and exceptionally 110 kV network in larger cities) in the year 2001.

3. Interconnection developments

Existing AC Interconnections

From (MKD)	To	Number of circuits	U (kV)	Rate (MVA)	Remark about status
Skopje 4	Kosovo B (Serbia)	1	400	1420	
Dubrovo	Thessaloniki(GR)	1	400	1420	
Skopje 1	Kosovo A(Serbia)	1	220	314	*Temporary out of operation*
Skopje1	Kosovo A(Serbia)	1	220	314	*Temporary out of operation*

Internal and cross- border AC lines and substation under construction and ongoing studies

Internal AC line or SS	Number of circuits	U (kV)	Remark about status
Dubrovo - Stip	1	400	*Under construction*
SS Skopje 5	-	400/110	*Under construction*
SS Shtip	-	400/110	*Designing on going*
Shtip – Chervena Mogila (BG)	1	400	*Negotiation financing*
Bitola - Florina (GR)	1	400	*Preparation construction*

GREECE

1. Basic Capacity, Generation and Consumption data

Installed capacity by fuel, MW		
	Thermal	6 760
	Hydro	3 060
	Nuclear	-
	Renewables	200
	Total	10 020
Yearly generation fuel by fuel, TWh		
	Thermal	41.4
	Hydro	2.7
	Nuclear	-
	Renewables	0.2
	Total	44.3
Annual consumption, TWh		46.8
Imports, TWh		3.6
Exports, TWh		1.1

2. Industry structure

Recent key developments

Officially the liberalisation of the Greek Market started the 19.2.2001. The regulatory framework for the organisation of the electric sector was established by the law 1773/99. According this law:

- A Regulatory Authority (RAE) was established with main functions to advise the Minister of Development to accord the production license to new producers and the supplier license to suppliers of electricity to eligible customers. Furthermore RAE has the responsibility to supervise the whole sector and establish the rules for the proper function of the Market.

- An Independent Transmission System Operator (HTSO) was also established. This is an independent company with 51% of the shares belonging to the state and 49% to the producers. The HTSO has the responsibility of System Operation, Planning new Transmission Assets, programming Transmission System maintenance, giving access to the system for the new producers and HV consumers. He has also the responsibility of functioning of the market and allocating the capacity of the interconnecting lines to the users.

- The eligible customers have the possibility to choose the supplier. Eligible customers are all HV and MV consumers.

- The producers of renewable have the right to sell energy to HTSO to regulated prices, which are very advantageous. Furthermore this production is scheduled by priority.

Main generators:

Lavrion station, fuel-oil and Natural Gas (4 units)	1.115 MW
Kardia station, lignite (4 units)	1.200 MW
Ptolemaida station, lignite (4 units)	660 MW
Ag. Dimitrios station, lignite (5 units)	1.585 MW
Megalopolis station, lignite (4 units)	850 MW
Komotini station, Natural Gas (1 unit)	570 MW

Foreseen/Outgoing projects for new generating units:

- Florina station, lignite (1 unit), producer PPC 330MW, 2003
- Independent producers having production licenses of about 2000MW for thermal units. The commission date is not yet known.
- Independent producers of renewable sources having production license of about 1000MW. Commission date depends upon the availability of the HV network to accept the new power.

Number of Distributors

Only one, PPC

Main traders & other players (exchanges etc)

The legislation does not permit traders but only suppliers having production capabilities.

3. Interconnection developments

Existing Interconnections

FROM (BG)	TO	Type AC/DC Single/Double	U,kV	P,MW
Thessaloniki	Blagoevgrad s/s (BG)	AC - Single	400	1300
Thessaloniki	Negotino (FYROM)	AC – Single	400	1300
Kardia	Elbasan (AL)	AC – Single	400	250
Aetos	Galatina (IT)	DC – Single	400	500

Ongoing studies in international/cross-border interconnections

FROM (GR)	TO	*Type AC/DC* Single/Double	U,kV	P,MW	Date for study completion	Expected date for commissioning the line under study
Filippi	Maritza 3 (BG)	AC - Single	400	1300	Completed	Not yet defined
Filippi	Hamitabat (TR)	AC - Single	400	1600	Completed	Not yet defined

Lines under construction (internal and cross-border)

FROM	TO	Type AC/DC Single/Double	U,kV	P,MW	Expected date for commissioning the line
Florina (GR)	Bitola (FYROM)	AC - Single	400	1100	2003
Florina (GR)	Amyntaio (GR)	AC - Double	400	2 X 1100	2003
Lavrion (GR)	Argiroupolis (GR)	AC – Single	400	1100	2004

Korinthos (GR)	Patras (GR)	AC – Double	150	2 X 200	2003

Future projected interconnections
Realization of the above mentioned projects. The planning of Transmission System is the responsibility of HTSO, who will define the commissioning dates for the new lines.

4. Other

Link

www.rae.gr

ROMANIA

1. Basic capacity, generation and consumption data (2001 Data)

Installed capacity by fuel, MW		
	Thermal	12 047.0
	Hydro	6 007.0
	Nuclear	706.5
	Renewables	0
	Total	18 760.5
Yearly generation fuel by fuel, TWh		
	Thermal	33.5
	Hydro	14.5
	Nuclear	5.4
	Renewables	0
	Total	53.4
Annual consumption, TWh		52.5
Imports		0.8
Exports		-2.1

2. Industry structure

The National Power Grid Company – Transelectrica (joint stock company) was founded further to the Government Ordinance no. 627/2000 by splitting off the former vertically integrated National Electricity Company (CONEL) into separate legal entities: SC Electrica SA for electricity distribution and supply, SC Termoelectrica SA for electricity and heat generation, SC Hidroelectrica SA for electricity generation and Transelectrica SA for electricity transmission, power system operation and dispatching.

Transelectrica is a national state-owned legal Company, with a high share of public assets and a high degree of autonomy. It is aligned to the power sector strategy drawn up by the Ministry of Industry and Resources. The Company is the Transmission System Operator (TSO) of the entire Romanian Power System ensuring the transmission and the technical management of the whole system. It functions in compliance with the Transmission Operator and System Operator licenses received from the Romanian Electricity&Heat Regulatory Authority (ANRE), the Transmission Grid Code, and is based on commercial principles. Moreover Transelectrica ensures the cross-border operations and, in this respect, it carries efforts for connecting the National Power Grid with the European system (UCTE).

Transelectrica is also the administrator of the electricity market, trough its legal subsidiary – the market operator OPCOM.
The Romanian electricity market is based on:

- bilateral contracts:
  - regulated contracts (85% of the market – in 2001), the main players being generators, suppliers and captive customers

  - negotiated contracts (15% of the market – in 2001), representing the competitive segment and the first pillar of the market; the main players of the negotiated contracts are generators, suppliers and contestable consumers
- daily offers (a day ahead offer), according to which the market operator carries out the power system scheduling for the following day
- daily payments, according to the specific procedures approved by ANR, that regulates these payments which are in strict conformity with the regulate contracts and the accepted offers.

Participants to the market

PRODUCERS:
Main producers

SC Termoelectrica SA, SC Hidroelectrica SA, SN Nuclearelectrica SA, SC CET Govora SA, SC CET SA Braila, SC Electrocentrale Deva SA, as well as other independent producers (9) and self producers.

BUYERS:
Distributors
SC Electrica SA, with further splitting into 8 subsidiaries during year 2002.
Suppliers
(29) Main Suppliers: SC Electrica SA, SC Termoelectrica SA, SC Hidroelectrica SA, SC Nuclearelectrica SA, SC Romenergo SA, SC Romelectro SA, SC UNICOM TRADING SA, SC ALRO SA, SC GRIVCO SA.
Eligible Consumers (19)

Transmission and System Operators *(for transmission and system services at regulated tariffs).*
According to the principle of gradualness, 25% of the market is being competitive since December 21, 2001. It is already of 33% by February 1st, 2002. The regulated contracts of the wholesale electricity market offer a guarantee to our suppliers that are obliged to deliver electricity at regulated prices to the captive customers.

The domestic primary legislation for the Romanian electricity industry is made up of Law No. 99/2000 (Energy Regulation), Government Emergency Ordinance (GEO) No. 63/1998 (Energy Act), and a number of Government Decisions (GD). The European Union legislation is a relevant part of the Romanian legislative framework. The secondary legislation consists of regulations issued by the Romanian Electricity and Heat Regulatory Authority (ANRE) and include:

- Licenses and Authorizations
- Technical Transmission Grid Code
- Technical Distribution Grid Code
- Wholesale Electricity Market Commercial Code
- Tariffs and tariff methodology
- Framework contracts for trading arrangements

All regulations were drafted on the basis of Laws, GEOs and GDs, with a view to setting out correct, transparent and market-driven relationships among market participants.

Figure below shows the main types of power purchasing contracts, transmission and system services contracts and also ancillary system services purchasing contracts. Electricity trade arrangements are mostly represented by bilateral contracts. Spot market trades are meant to cover only the differences between the contract provisions and the actually traded volumes.

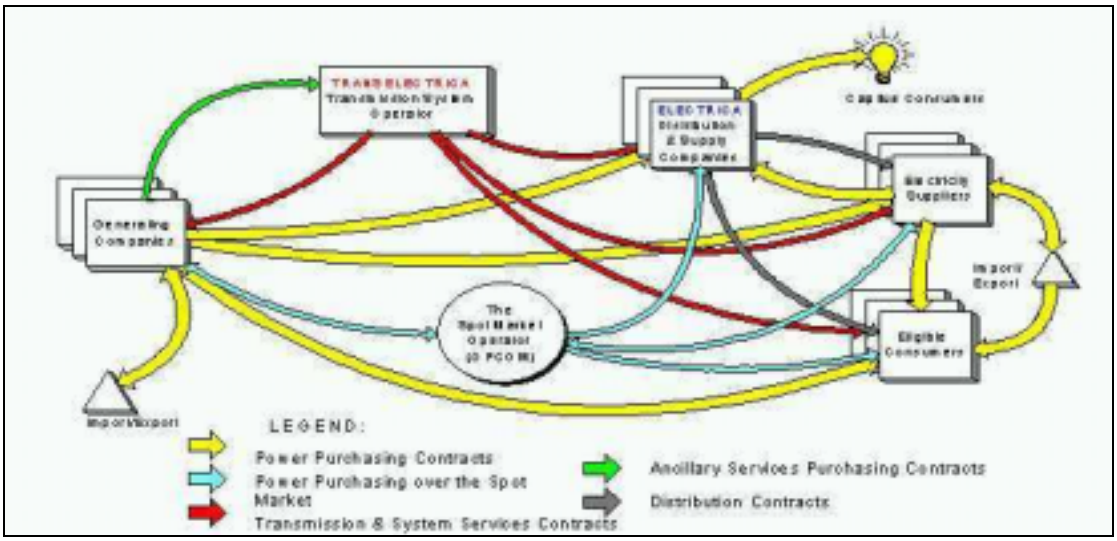


Figure: Contractual Arrangements over the Romanian Electricity Market

Both the old and the new participants on the electricity market are equally treated on transparent and non-discriminatory basis, which also include the regulated access to the transmission and distribution networks. In this respect, connection to the grids is a compulsory public service.

End user tariffs in the regulated market are set by ANRE, the same for all captive customers. The end user tariff methodology explicitly indicate the costs of generation, transmission and system operation, distribution and supply and, for the industrial and commercial end users, the Development Fund Tax.

Generating tariffs for the regulated market, on behalf of the captive consumers, are also regulated.

Eligible consumers, power suppliers and even ELECTRICA have the opportunity to trade electricity in the competitive market, where prices are directly negotiated according to bilateral OTC contracts or settled on the spot market.

Electricity distribution & supply and the hydropower generating units under construction are to be privatised. In the area of thermal power plants, the co-generation ones will be the first to undergo outsourcing and enter under the management of local authorities or will be subject of privatisation.

3. Interconnection developments

Existing interconnections

From RO	TO	Type AC/CD Single/Double	U [kV]	P** [MW]
Tantareni	Kozloduy NPP (BG)	AC - Double	400	2600
Isalnita	Kozloduy NPP (BG)	AC - Single	220	360
Issacea	Varna (BG) *	AC - Single	750 *	850
Rosiori	Mukacevo (UA)	AC - Single	400	1300
Isaccea	South Ukraine (UA)	AC - Single	750	2600
Arad	Sandorfalva (HU)	AC - Single	400	1000
Portile de Fier	Djerdap (YU)	AC - Single	400	900

** operating temporarily at 400 kV as OHL 400 kV Isaccea – Dobrudja (BG)*
*** actual settings*

Ongoing studies in international/cross-border *interconnections*
"Regional Transmission Planning Project" SECI Programme

Lines under construction (internal and cross-border)
400/110 kV Substation Oradea (border substation)
L400 kV Arad – Oradea (internal line) feasibility study performed

Future projected interconnections
L400 kV Romania – Hungaryproposal under study
Back-to-Back (AC/DC/AC) Substation Isaccea feasibility study performed

Study needs
L400 kV Romania – Hungaryfeasibility study

Investment projects in the power transmission grid

Based on grid reinforcement studies, an investment of about US $ 850 mill. resulted as necessary during 2001 – 2010, out of which US $ 450 mill. by the year 2004.
The Transmission System Investment Plan for 2001 – 2004 include:

- Overhead electric line replacement and optic fiber network accomplishment (US $ 105 mill.)
- Metering System for the wholesale electricity market (US $ 31.5 mill.)
- EMS/SCADA facilities (US $ 13.5 mill.)
- Market administration system (US $ 4.2 mill.)
- Modernization of telecommunication systems (US $ 43.5 mill.).

The projects are carried out with US $ 153 mill. from EBRD, EIB loans and PHARE grant respectively, as well as US $ 74 mill. Transelectrica own funds.

- Substation rehabilitation (US$ 183.5 mill.). There are one substation – Arad 400 kV (it is in operation since 2000) and three substantions – Portile de Fier, Tantareni, Urechesti 400 kV (start in operation at the end of 2002). On the other hand, there are 6 turnkey projects meant to be carried out in the frame of long run

commercial loans. The first priority is granted to interconnection substations on the border towards the UCTE main grid Oradea, Rosiori and Constanta 400 kV.

Figure below shows the three-stage implementation of the 3,900 km optic fiber network, connecting 67 locations.This network was justified mainly for the Romanian power system control and the wholesale electricity market: voice and video data transfer, EMS/SCADA facilities, metering data transfer. There will be however enough data transmission extra capacity to be offered on the future competitive telecom market in Romania.

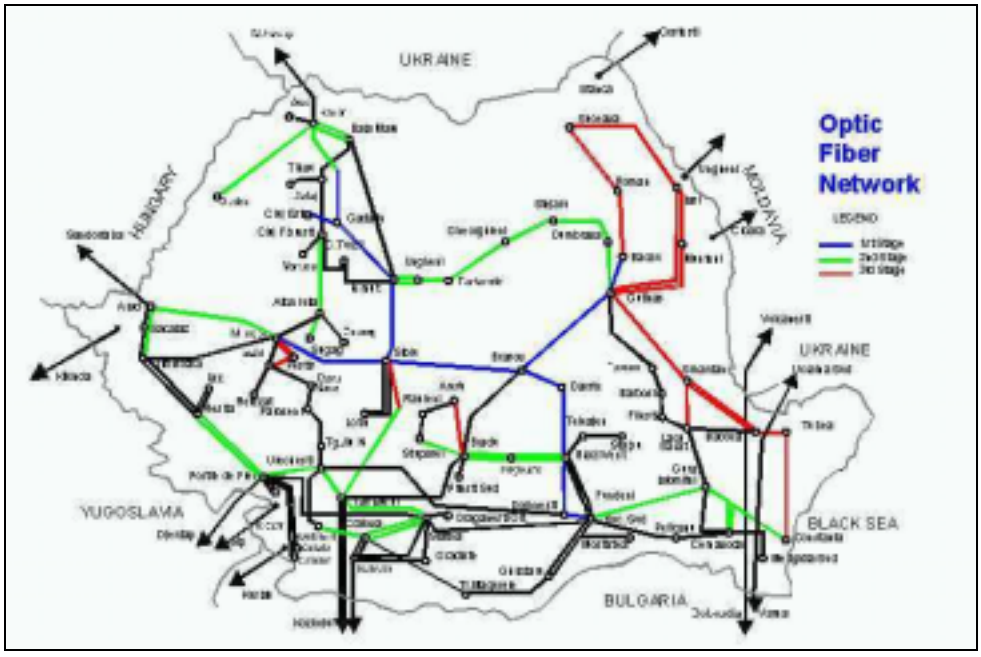


Figure: ***Future Optic Fiber Network***

4. Other

Link

www.transelectrica.ro
www.termoelectrica.ro
www.hidroelectrica.ro
www.anre.ro
www.nuclearelectrica.ro
www.electrica.ro

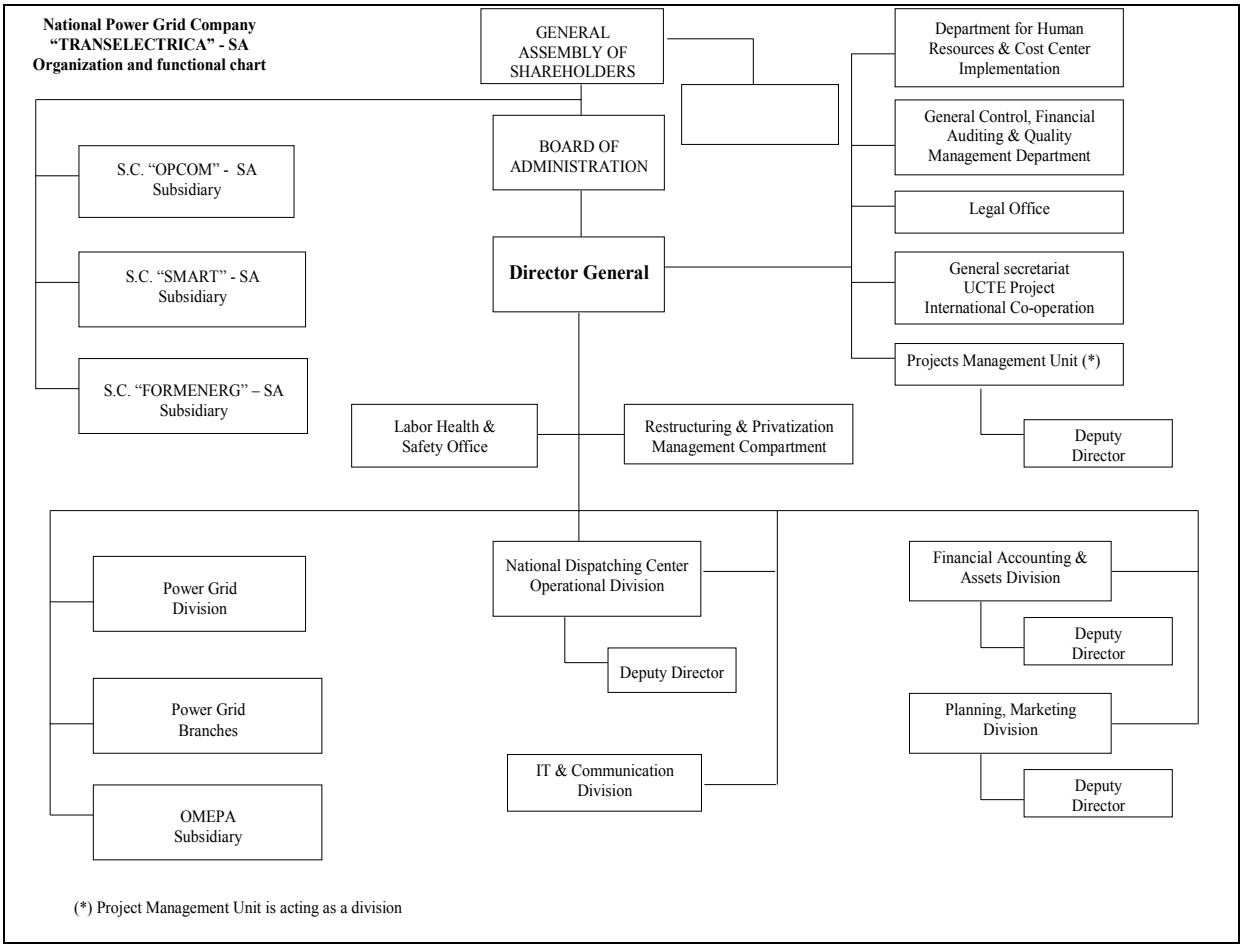


Figure: National Transmission Grid

NORDEL

DENMARK

1. Basic Capacity, Generation and Consumption Data

Installed capacity by fuel, MW		
	Thermal	10 118
	Hydro	11 000
	Nuclear	0
	Renewables	2 418
	Total	23 538
Yearly generation fuel by fuel, TWh		
	Thermal	30.00
	Hydro	0.03
	Nuclear	0
	Renewables	4.40
	Total	34.43
Annual consumption, TWh		35.6
Imports, TWh		8.4
Exports, TWh		7.7

2. Industry Structure

Recent key developments

In 2001, the further improvement of the internal energy market was supported by the transmission system operators. Denmark is a fully integrated partner in the Nordic pool system Nord Pool. The market opening in Denmark is today limited to end consumers with a consumption in excess of 1 GWh per year. As from January 1, 2003 all end consumers will be free to trade their consumption, apart from the priority consumption, in the market.

The priority production is defined by law for wind production and local CHP, apart from a small fraction of utility-owned units. As a special obligation, the TSOs have the balance responsibility for priority production and the end consumers have an obligation to take their equal share of the priority production. It is planned to introduce a green certificate market in order to split the financial support and the commercial activities.

In Denmark, two TSOs – Eltra and Elkraft System – have been given authorisation, as Denmark is split into two electrically separate areas.

There is one main generator in each of the two TSO areas, i.e. Elsam and E2 respectively.

Generation is connected to the transmission grid, the medium voltage grid and the distribution grid. The increase in local renewable and CHP production units has

resulted in a situation with a major part of the production connected to the lower voltage grid.

There are no plans for new primary conventional units connected to the transmission grid. In mid-2002 a 150 MW offshore wind farm will be commissioned and onshore wind production is expected to increase further. Local industrial CHP is also expected to increase due to special tarification.

There are over 50 network companies, but an ongoing restructuring process will reduce this number.

There are a number of market players (traders, producers and buyers). Further information is available on the Internet (see below).

3. Interconnection Developments

Existing interconnections

Between	And	Type	Capacity MW
Denmark/Eltra	Norway/Statnett	HVDC	1,040
Denmark/Eltra	Sweden/Svenska Kraftnät	HVDC	*) 630/670
Denmark/Eltra	Germany/E.ON Netz	AC	*) 1,200/800
Denmark/Eltra	Germany/Stadtw. Flensburg	AC	150
Denmark/Elkraft System	Sweden/Svenska Kraftnät	AC	1,900
Denmark/Elkraft System	Germany	HVDC	600

**) Exports/Imports*

A 400 kV a.c. line in the northern part of Jutland is under construction.

4. Other

Link	Company
www.elkraft-system.dk	Elkraft System
www.eltra.dk	Eltra
www.nordel.org	Nordel

FINLAND

1. Basic capacity, generation and consumption data

Installed capacity by fuel, MW		
	Thermal	9 467
	Hydro	2 948
	Nuclear	2 640
	Renewables	1 772
	Total	16 827
Yearly generation fuel by fuel, TWh		
	Thermal	27.0
	Hydro	13.3
	Nuclear	21.9
	Renewables	9.4
	Total	71.6
Annual consumption, TWh		81.6
Imports, TWh		11.8
Exports, TWh		1.8

2. Industry structure

Recent key developments

Open market for all customers and Nord Pool power exchange trade since 1998. Working group report in November 2001 on the revision of the Electricity Market Act making several proposals for actions and recommendations for improving the efficiency of the electricity market. As a general conclusion, the working group states that the Finnish electricity market is functioning in an appropriate manner and that there is no reason to essentially change the model chosen for the opening of the electricity market.

TSO(s)
Fingrid plc

Main generators (incl. IPPs)
Fortum, Teollisuuden Voima, Pohjolan Voima, Helsingin Energia, Kemijoki, Vaskiluodon Voima, Alholmens Kraft, UPM-Kymmene, Stora Enso, Metsä-Botnia

Foreseen/Outgoing projects for new generating units
five industrial and municipal CHP plants under construction (in total 186 MW), a governmental program to increase renewable power generation (incl. hydro) to 31 % of power demand by 2010, gas CHP project plans for some major cities partly replacing existing coal-fired generation, application for a new nuclear power plant unit

Number of distributors
104 *(in 2000)*

Main traders & other players (Balance responsible companies 1 Jan 2002)
Aquila Energy Limited, Bergen Energi Ab, EL-EX Sähköpörssi Oy, Energiameklarit Oy, Espoon Sähkö Oyj, Fingrid Oyj, Fortum Power and Heat Oy, Helsingin Energia, Kaakon Energia Oy, Kainuun Sähkö, Kuopion Energia, Kymppivoima Oy, Lahti Energia Oy, MVM Energiatieto Oy, Oulun Energia, Outokumpu Oyj, PVO Pool Oy, Sempra Energy Europe Ltd ,Tampereen Sähkölaitos, Turku Energia Oy, Vantaan Energia Oy, Vattenfall Sähköntuotanto Oy

3. Interconnection developments

Existing Interconnections

to Sweden:	*AC, 400 kV lines, 1200 MW*
	DC, 400 kV cable, 550 MW
from Sweden:	*AC, 400 kV lines, 1600 MW*
	DC, 400 kV cable, 550 MW
to Norway:	*AC, 220 kV line, 100 MW*
from Norway:	*AC, 220 kV line, 120 MW*
from Russia:	*HVDC unit + two 400 kV lines: 1000 MW*
	AC, 110 kV line, 60 MW
	AC, 110 kV line, 100 MW

Lines under construction (internal and cross-border);

to Russia:	*The 3rd AC 400 kV line, increase of the total AC/HVDC transmission capacity up to 1400 MW*

Study needs

to/from Sweden	*AC/ DC, 400 kV, 500 MW*

4. Other

Link
www.energia.fi/eindex.html
www.energiamarkkinavirasto.fi/eng/index.html
www.fingrid.com/index_eng.html
www.nordel.org/eng/index.html

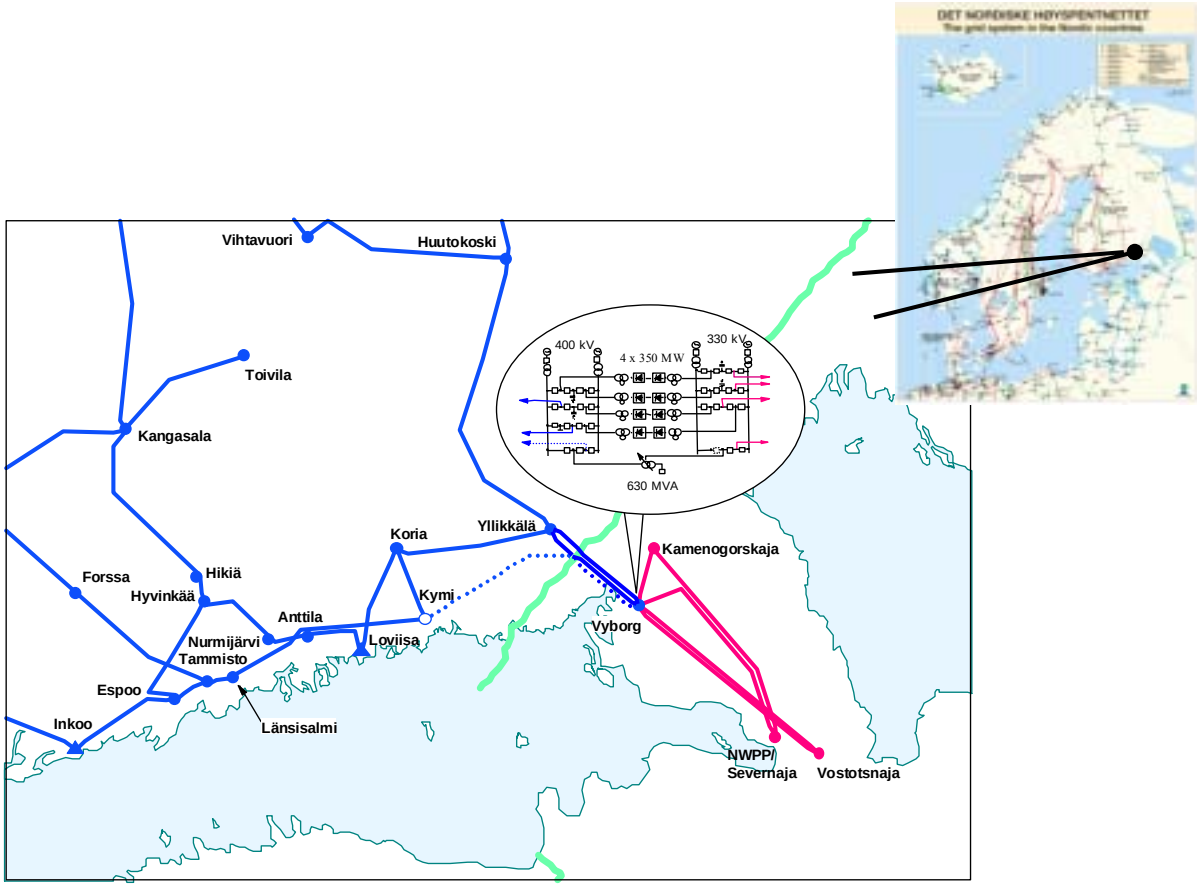


Figure: ***Development of the cross border connections between Finland and Russia***

United Kingdom

UNITED KINGDOM

1. Basic capacity, generation and consumption data (2000 Data)

Installed capacity by fuel, MW		
	Thermal	6 1171
	Hydro	4 273[3]
	Nuclear	12 486
	Renewables	961
	Total	78 891
Yearly generation fuel by fuel, TWh		
	Thermal	272.364
	Hydro	7.804[4]
	Nuclear	85.063
	Renewables	5.305
	Other	4.364
Annual consumption, TWh		387.926
Imports, TWh		14.3
Exports, TWh		0.134

2. Industry structure

Recent key developments

On 27 March 2001 the New Electricity Trading Arrangements (NETA) were introduced in England and Wales. This marked a move from the day-ahead Electricity Pool to a 3.5 hour ahead market based on bilateral trading between generators, suppliers, traders and customers, and includes:

- forwards and futures markets that allow contracts for electricity to be struck over timescales ranging from several years ahead to on-the-day markets;
- a Balancing Mechanism by which National Grid, the operator of the transmission system, accepts offers and bids for electricity close to real time to enable it to balance supply and demand; and
- an Imbalance Settlement process for making payments to and from those whose contracted positions do not match their actual metered electricity production or consumption and for clearing certain other costs of balancing the system.

TSO(s)

There are 4 TSOs in the United Kingdom
National Grid is the TSO for England and Wales
Scottish Power and Scottish and Southern are TSOs for Scotland

[3] *Includes 2788 MW pumped storage*
[4] *Includes 2.694 TWh of pumped storage*

Northern Ireland Electricity is the TSO for Northern Ireland

Main generators (incl. IPPs)
In England and Wales the main generators are:

Generator	% market share
Powergen	16.5
British Energy	14.8
National Power	13.0
TXU	9.2
Edison	8.9
AES	7.6
BNFL Magnox	5.4
EdF	3.3
IPP (CCGT)	17.2
Others	4.2

In Scotland the main generators are

Generator	% market share
Scottish Power	41
Scottish and Southern	29
British Energy	25
BNFL	2
Others	3

Number of distributors
There are 12 distribution areas in England and Wales, 2 in Scotland and 1 in Northern Ireland.

Main traders & other players (exchanges etc.)
The main power exchanges active in the UK are
IPE (www.ipe.com)
APX Europe (www.apx.com)
UK Power Exchange (www.ukpx.com)

3. Interconnection developments

Existing Interconnections
England - France 2000 MW HVDC interconnector
England – Scotland being upgraded to 2500 MW
Scotland – Northern Ireland 500MW HVDC (Moyle Interconnector)
England to Isle of Man – 50MW AC interconnector

Ongoing studies in* international/cross-border *interconnections;
England – Norway (1000 – 1200MW) HVDC interconnector in feasibility stage
England – the Netherlands (800 – 1000MW) HVDC interconnector in feasibility stage
Wales – Ireland (300 – 500MW) HVDC interconnector in feasibility stage

4. Other

Link	Companies
www.nationalgrid.com/uk	National Grid
www.scottish-southern.co.uk	Scottish and Southern Electricity
www.scottishpower.com	Scottish Power
www.nie.co.uk	Northern Ireland Electricity
www.ofgem.gov.uk	UK regulator
www.elexon.co.uk	Elexon (Trading Arrangements)

Figure: ***Interconnectors under development***

Turkey

TURKEY

1. Basic capacity, generation and consumption data

Installed capacity by fuel, MW		
	Thermal	*16584.9*
	Hydro	11673.4
	Nuclear	-
	Renewables	60.2
	Total	*28318.5*
Yearly generation fuel by fuel, TWh		
	Thermal	*98.9365*
	Hydro	24.0035
	Nuclear	-
	Renewables	0.2355
	Total	123.1755
Annual consumption, TWh		*127*
Imports		4.5781
Exports		0.43258

2. Industry structure

Recent key developments

Ministry of Energy and Natural Resources has completed the studies on the restructuring of the electricity sector aiming to reduce the public sector involvement in the industry while increasing the effectiveness of governmental supervision in auditing and regulating the activities during the establishment process of liberalised markets.

These studies have been executed in compliance with the UE 96/92 Directive on the internal Electricity Market. Thus, the new market model seeks to align the electricity industry with the principals applicable to Member States of the European Union.

In the scope of these studies, Turkish Government has already issued the "Electricity Market Law" No: 4628 to constitute the legal framework required for the restructured electricity sector in March 3, 2001. The purpose of this Law is; "To ensure the formation of an electricity market which is financially strong and transparent and which will operate in accordance with the provisions of civil law under competition with a view to provide consumers adequate electric energy of high quality in a continuous, low-cost and environment friendly manner and to ensure and independent regulation and supervision on this market"

Review of Progress since March, 2001

Substantial progress has been made since March 2001, when the Electricity Market Law came into effect, and the Government began active implementation. While there have been delays on some fronts, the achievements over the last year are still quite significant. They include:

(a) The three TEAŞ successor companies – EÜAŞ (The Electricity Generation Company; TEİAŞ (The Transmission Company) – and TETAŞ (the electricity trading and contracting company) – were established in October 2001.
(b) Energy Market Regulatory Authority (EMRA) Inception and Operation
- Board appointed (November 2001)

(c) TEİAŞ – Preparation for the Market
- advisors (Cameron McKenna-PwC-NGC) contract signed (July 2001)
- Work on six work streams largely on track

(d) Reform Implementation Structure
- PCU for procurement coordination established
- All agencies nominate implementation coordinators (Jan/Feb 2002)

(e) Privatisation Administration (PA) working group complete legal review of privatisation constraints (March 2002) – conclusion:
- Asset sales possible for thermal generation and distribution

Hydro plants can be leased or given on long-term concession to private sector

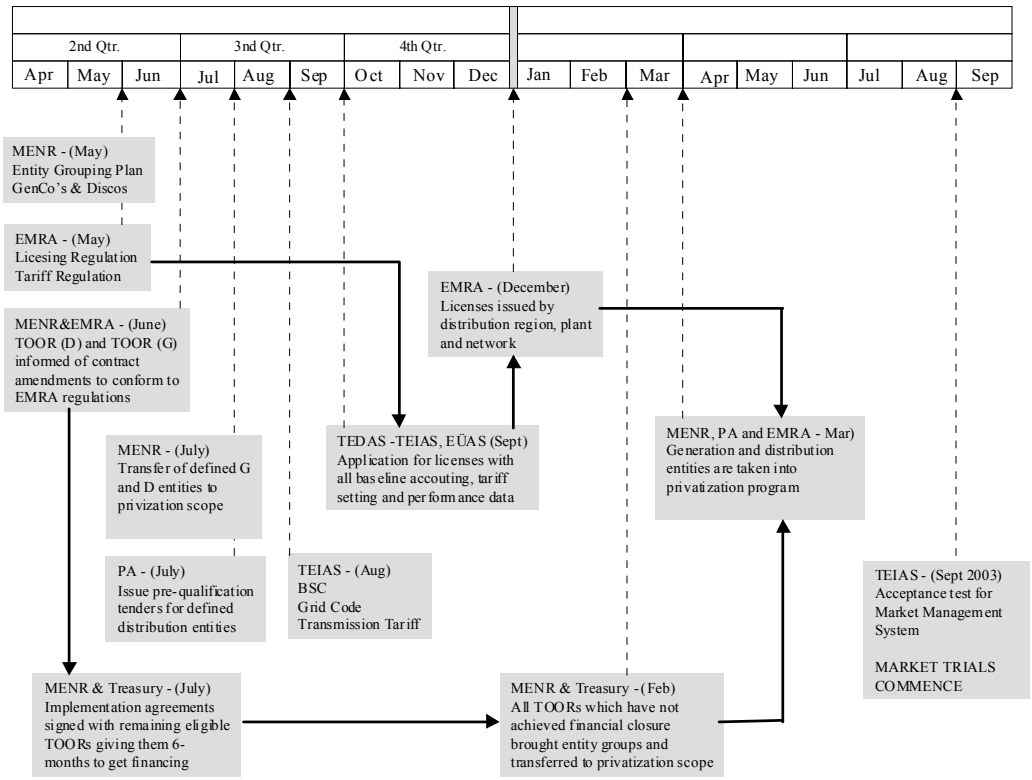


Figure: The Main Implementation Milestones

TSO
The Turkish Electricity Transmission Corporation (TEİAŞ) is the owner & operator of the national transmission network (66, 154 and 400 kV)

Main generators
Main generators in the Turkish Power System are (by considering the generators more than 500 MW capacity);

- Atatürk HPP - 2400 MW
- Karakaya HPP - 1800 MW
- Keban HPP - 1328 MW
- H.Uğurlu HPP - 520 MW
- Altınkaya HPP - 700 MW
- Ambarlı NGCC+FO - 1344 MW+630 MW
- Hamitabat NGCC - 1244 MW
- Bursa NGCC - 1434 MW
- Seyitömer TPP - 615 MW
- Soma TPP - 1030 MW
- Kemerköy TPP - 650 MW
- Yatağan TPP - 630 MW
- Elbistan TPP - 1360 MW
- Çayırhan TPP - 640 MW (TOR)
- Birecik HPP - 750 MW (IPP)
- Adapazarı NG - 770 MW (IPP)
- Gebze NG - 1540 MW (IPP)
- Oymapınar HPP - 540 MW
- Unimar NGCC - 505 MW (IPP)
- Berke HPP - 510 MW
- Birecik HPP - 750 MW (IPP)

Foreseen/Ongoing Projects for new generating units
- Aliağa NGCC 1520 MW, by 2003 (August) - IPP
- İskenderun TPP (2x660 MW) 1320 MW, mid of 2004 - IPP
- Ankara NGCC 770 MW, by the end of 2004 - IPP
- Elbistan 2 TPP 1410 MW, by 2004

Number of distributors
TEDAŞ operating the distribution system (below 36 kV)

Main traders & other players (exchanges etc.)
Turkish Electricity Trade and Contracting Corporation (TETAŞ)

3. Interconnection Developments

The existing Interconnections of Turkish Power System

INTERCONNECTIONS	U (kV)	LENGTH km	TRANSMISSION CAPACITY (MW)
BABAESKI-MARITSA EAST	400	136.0	500
HOPA-BATUM	220	28.0	300*
KARS-LENINAKAN	220	78.4	300*
PS3-ZAKHO	400	16.0+	500
IGDIR-BABEK	154	87.3	100
DOGUBEYAZIT-BAZARGAN	154	73.0	100*

(+) To
(*) Capacity is limited by regional transmission system and 200/154kV, 154/132 kV transformers

Ongoing studies in international/cross-border interconnections

FROM (TR)	TO	Type AC/DC Single/Doub le	U,kV	P,MW	Date for Study Completion	Expected date for commissioning the line under study
Babaeski	Filippi (GR)	AC-Single	400	2000	2001	2005-6(*)

* *MOU have been signed for construction of this line to complete at least by the end of 2006 on 28th March 2002 in Ankara*

Lines under construction (internal and cross-border)

FROM	TO	Type AC/DC Single/Double	U,kV	P,MW	Expected date for commissioning the line
Hamitabat (TR)	Maritza East 3 s/s (BG)	AC-Single	400	2000	Mid of April 2002 Turkish side-completed (end of 2001)
Birecik HPP (TR)	Aleppo (SR	AC-Single	400	1000	Turkish side-completed (end of 1997) Syria side?

North Africa

EGYPT

1. Basic capacity, generation and consumption data (data for year 2001)

Installed capacity by fuel, MW		
	Thermal	12 478
	Hydro	2 745
	Nuclear	0
	Renewables	63
	Total	15 286
Yearly generation fuel by fuel, TWh		
	Thermal	64.006
	Hydro	13.697
	Nuclear	0.000
	Renewables	0.137
	Total	77.840
Annual consumption, TWh		74.805
Imports, TWh		0.116
Exports, TWh		0.147

2. Industry structure

Recent key developments

Power pool development in Egypt takes place in the context of overall reforms in the power sector. Egypt has taken a number of significant steps to restructure and reform its power sector, including recently:

- Introducing privately financed independent power producer (IPP) projects, contracted for through competitive tenders and under development on a build-own-operate-transfer (BOOT) basis.
- Transforming the former Egyptian Electricity Authority (EEA) into Egyptian Electricity Holding Company (EEHC).
- Unbundled EEHC into separate 5 generation companies (one Hydro, and 4 thermal) , 7 Distribution Companies.
- It also created a new Egyptian Electricity Transmission Company (EETC),which includes the transmission system, the National Energy Control Center (NECC), and other functions (Protection, Chemical laboratories, Communications).
- Establishing “The Electric Utility and Consumer Protection Regulatory Agency as a new regulatory body between EEHC and the consumers.
- The seven Distribution and four thermal Generation companies will sell shares, with up to 49% private ownership.
- Single-Buyer had been selected to be the power pool system in Egypt.

These structural changes represent significant steps towards a more open, competitive power sector with much greater private ownership. These steps have some important implications:

- The power pool need to abide by whatever regulations are developed, will be subject to regulation itself, and will need to coordinate closely with the regulatory body.
- The needs of the new companies' private investors will have to be considered.
- In addition to the changes, some existing structural features retained :
  - The hydro generation company and the rest of the EEHC central Functions (transmission, national dispatch, administration, and other central activities) will remain 100% government owned.
  - End-use customers and generators do not have access to the transmission and distribution grids, and cannot use the grid for power transactions between themselves. EEHC is the only organisation empowered to buy power from generators.

TSO(s)

EETC is the operator of the national transmission network (66, 132, 220, and 500 Kv).

Main generators (incl. IPPs)

Main generators in the Egyptian power system are

- Shoubra(st) 1260MW
- Cairo west(st) 1018MW
- Cairo south(C.C) 725MW
- Demietta(C.C) 1126MW
- Damanhour(st+C.C) 653MW
- Abukir(st) 910MW
- Sidi krir(st) 671MW
- Attaka(st) 880MW
- Abu sultan(st) 600MW
- Oyoun Mosa (st) 680MW
- Walidia(st) 614MW
- Korimate(st) 1248MW
- High dam(hydro) 2160MW
- Aswan dam(hydro) 544 MW

Foreseen/Outgoing projects for new generating units;

- Sidi Krir (3,4) (BOOT system) 2*325MW
- Gulf El Suez (BOOT system) 2*325MW
- Port Said East (BOOT system) 2*325 MW

Number of distributors

7 distributing companies, operating the grids of 33, and 11Kv and low voltage.

Main traders & other players (exchanges etc.)

Egyptian Electricity Transmission Company (EETC) acts as a single buyer

3. Interconnection developments

Existing Interconnections

FROM (Egypt)	TO	Type AC/DC Single/Double	U,kV	P,MW
Taba	Aqba (Jordon)	Under sea Cable - Single	400	600
Saloum	Tobtouk (Libia)	AC - Double	220	300

Ongoing studies in international/cross-border interconnections

Egypt is actively driving the process to interconnect the power system in the North Africa and Middle East. In the position of managing one of the major and best developed power systems in the region the potential for sharing production facilities and develop energy trade is clearly identified.
UCTE has formed four task forces for system Development (Expanding the system)

- Med Ring Subgroup (Syria-Lebnan-Jordan-Egypt-Lybia) connection to UCTE
- Turkey, connection to UCTE.
- Eastern Europe, connection to UCTE.
- Study group, technical analysis.

The Mushrek countries (Egypt to Morocco) have applied to be synchronously interconnected to the UCTE. Egypt and Libya are interconnected since 1998 and discussions are ongoing to get acceptance from UTCE. Tests will soon be carried out in Egypt in order to find out the compliance. If this turns out right the already established interconnection between Libya and Tunisia will be envisaged.

Egypt and the other Mushrek countries have adopted to UCTE rules since long . primarily the physical interconnection requires defence plan revisions only. The operational grid code is in place formally since 1998 but practically since quite some time

From the power system perspective the region can be viewed as the Mushrek, the Gulf countries and the Turkey system Apossible scenario is that Mushrek are synchronously connected to the UCTE. The Gulf countries are synchronously interconnected while Turkey is tightened to the UCTE . DC links between the three systems makes interconnection scheme complete and flexible.

An upgrade to 400KV of the interconnected power network between Egypt and Morocco is currently evaluated and will soon be conducted, financed by the Arab Fund.

Norconsult currently carries out a desk study on the extension of the Egyptian power grid southwards in Africa through Nile Basin Initiative Financed by World Bank.

Lines under construction (internal and cross-border)

FROM (Egypt)	TO(Egypt)	Type AC/DC Single/Double	U,kV	P,MW	Length (Km)
Port said	El Raswa	AC - Double	220	300	50
Port said	El Shrkia	AC - Double	220	300	30
Sidi Krir	El dekhila	AC - Double	220	300	25
El shrkia	10 Ramadan New	AC - Double	220	300	35
Port said	Pear El abd	AC - Double	220	300	70

Unified Power Systems

BELARUS

1. Basic capacity, generation and consumption data

Installed capacity by fuel, MW		
	Thermal	7 760.4
	Hydro	9.3
	Nuclear	-
	Renewables	-
	Total	7 769.7
Yearly generation fuel by fuel, TWh		
	Thermal	24.84
	Hydro	0.02
	Nuclear	-
	Renewables	-
	Total	24.86
Annual consumption, TWh		33.13
Imports, TWh		8.32
Exports, TWh		0.05

2. Industry structure

Recent key developments

The actual restructuring of the electric power sector in the Republic of Belarus has not started yet. The State Power Concern Belenergo is a vertically integrated company.

Main generators (incl. IPPs)

Main generators in the Belarusian Power system are:

- Lukomlskaya TPP – 2400 MW
- Minskaya TEC4 (CHP) – 1030MW
- Berezovskaya TPP – 930 MW
- Gomelskaya TEC (CHP) – 540 MW
- Novopolotskaya TEC (CHP) – 505 MW
- Minskaya TEC3 (CHP) – 420 MW
- Mogilevskaya TEC (CHP) – 345 MW
- Minskaya TEC5 (TPP) – 330 MW
- Svetlogorskaya TEC (CHP) – 260 MW
- Mozyrskaya TEC (CHP) – 195 MW
- Bobrujskaya TEC (CHP) – 180 MW
- Grodnenskaya TEC (CHP) – 170 MW

Number of distributors

6 distributing companies operating the grids of 110 kV and below are included in the State Power Concern Belenergo.

Main traders & other players (exchanges etc.)

The State Power Concern Belenergo is a main trader.

3. Interconnection developments

Existing Interconnections

FROM (Belarus)	TO	Type AC/DC Single/Double	U,kV	P,MW
Belorusskaya s/s	Smolenskaya NPP (Russia)	AC - Single	750	1000
Vitebsk s/s	Talashkino s/s (Russia)	AC - Single	330	780
Kritchev s/s	Roslavl s/s (Russia)	AC - Single	330	940
Polotsk s/s	Novosokolniki (Russia)	AC - Single	330	570
Grodno s/s	Alitus (Lithuania)	AC - Single	330	780
Molodechno s/s	Vilnus (Lithuania)	AC - Single	330	780
Molodechno s/s	Ignalinskaya NPP (Lithuania)	AC - Single	330	810
Polotsk s/s	Ignalinskaya NPP (Lithuania)	AC - Single	330	780
Belorusskaya s/s	Ignalinskaya NPP (Lithuania)	AC - Single	330	810
Mozyr s/s	Chernobyl NPP (Ukraine)	AC - Single	330	940
Gomel s/s	Chernigov s/s (Ukraine)	AC - Single	330	780
Ross s/s	Bialystok s/s (Poland)	AC - Single	220	220

Ongoing studies in international/cross-border interconnections

The project on reinforcement of the interconnection between Belarus and Poland is being considered. This project consists of building a 400 kV AC double circuit line Ross-Narew in the corridor of existing 220 kV AC line Ross-Bialystok, and installing back-to-back station in Ross. Currently this 220 kV line operates with an island on the Polish side.

4. Other

Link	Company
e-mail: pep@odu.belpak.minsk.by	State Power Concern Belenergo

THE RUSSIAN FEDERATION

1. Basic capacity for all Russia, generation and consumption data (01.01.2002)

Installed capacity by fuel, MW		
	Thermal Conventional	140 009
	Hydro	44 690
	Nuclear	22 314
	Renewables[*)]	
	Total	**207 012.9**
Yearly generation fuel by fuel, TWh		
	Thermal Conventional	*563.399*
	Hydro	175.812
	Nuclear	136.540
	Renewables[*)]	
	Total	**875.751**
Main exports, MWh		
	Finland	*7 697.82*
	Norway	209.33
	Poland	592.84
	Estonia	- 183.82 (to Russia)
	Latvia	385.21
	Lithuania	- 805.1 (to Russia)
	Georgia	419.6
	Belarus	6 259.14
	Azerbaijan	218.29
	Kazakhstan	354.14
	China	164.28
	Mongolia	176.85
	Turkey	180.45
	Total	**15 507.03**

**) There exist some renewable power, for ex., recently (December 2001) commissioned 1-st Geothermal unit 25 MW in Kamchatka, but no separated information. It is inside the above given* lines.

2. Industry structure

Recent key developments

As a result of power sector restructuring and implementation of the measures aimed at the market formation the following should be established:

- infrastructure of the market, including the system operator, trading system administrator, Federal and regional grid companies, generating companies;
- commercially efficient, investment-attractive sector organisations.
- The restructuring process will encompass RAO EES of Russia, its subsidiaries and dependent companies, power utilities and other entities-owners of power networks that provide power transmission (distribution) services, it will also include

reorganisation of federal nuclear power enterprises.

TSO(s)
The TSO is creating on the basis of the actual Central Dispatching Office of Unified Power System (CDO UPS) of Russia and its regional filial branches.

Taking into account the monopolistic character of the System operator's activity and its importance for Russia's power system, its activities will be separated from other commercial activities and controlled by the state, while the payment for the services of System operator should be effected based on the tariffs regulated by the state authorised bodies. But at the initial stage (up to March 2004) of the sector restructuring, System operator will be established as a 100%-ownned subsidiary of RAO EES Rossii with the majority of the state representatives in the Board of Directors of the System operator.

Main generators (incl. IPPs)
Main units in UPS of Russia are:
1 unit 1200 MW at TPP
19 units 1000 MW at NPP
14 units 800 MW at TPP
7 units 500 MW at TPP
10 units 640 MW at HPP
12 units 500 MW at HPP
More than 60 thermal units 300 MW

Foreseen/Outgoing projects for new generating units
Recently connected units (in 2001): 1-st Geothermal unit 25 MW in Kamchatka;
1-st Gas turbine 110 MW in Vladimir region; 2-d unit 200 MW at Irganai HPP in Dagestan; 1-st unit 1000 MW at Rostov NPP etc.
Foreseen units for the near future: 1-st unit 185 VW at Bureia HPP (Amur region); 2-d CC unit 450 MW in S.-Petersburg; 3-d unit 1000 MW at Tver NPP; 5-th unit 1000 MW at Kursk NPP; 2-d unit 1000 MW at Rostov NPPand 5-th unit 1000 MW at Balakovo NPP (Saratov region) etc.

Number of distributors
75 regional power systems so called AO-energo, which are members of the Federal wholesale power (energy) market can be consider as distributors, but inside them there are also filial divisions.

Main traders & other players (exchanges etc.)
Formation of the competitive wholesale power market should be the main institutional result of the reform of Russia's power sector. During the period of transformation of the existing system of economic relations in the power sector, commercially consistent and technically feasible relations between buyers and sellers of power should be ensured. These relations should be based both on competitive pricing in the sectors where sufficient conditions for competition have been created and on tariffs set by the authorised state body in the cases where competition cannot be introduced due to objective technological conditions. Competitive wholesale power market should be formed on the basis of free commercial interaction between its participants acting in accordance with established market functioning rules.

The power supplied to the federal wholesale market shall be the power produced by the generating companies formed on the basis of existing federal thermal, nuclear and hydro power stations as well as the power produced by regional energy companies and independent generators.

During the first stage each supplier to the market, except for independent producers, will have an equal right to sell during the trading a certain, equal for each, part (5-15% of the generation volume) of power in order to work out the competitive mechanisms, form the market structure, and receive market signals about the power pricing. Tariffs for the rest of the generated power will continue to be regulated by the state. Independent producers will sell all the generated power at a free price through the mechanism of commercial dispatch.

Market pricing will be based on comparing the price bids of buyers and sellers on the basis of minimal price (commercial dispatch) in accordance with the principles of determining an equilibrium price at the wholesale market.

3. Interconnection developments

Existing interconnection lines (only 220 kV and more)

FROM (RU)	TO	Operating voltage (kV)	Thermal rating, A (for t=25° C)
Volgograd	Donbass (UA)	±400	2000
Kurskaya NPP	Severoukrainskaya (UA)	750	2000
Novovoro-nezhskaya	Donbass (UA)	500	2000
Kurskaya NPP	Sumy (UA)	330	1420
Kurskaya NPP	Shostka (UA)	330	1650
Valuiki	Zmiev TPP (UA)	330	1420
Belgorod	Zmiev TPP (UA)	330	1650
Shebekino	Losevo (UA)	330	1650
Pryidonsk	Velikotsk (UA)	220	710
Shakhty	Pobeda (UA)	500	2000
Novocherkassk TPP	Uzhnaya (UA)	330	1650
Nesvetai TPP	Pobeda (UA)	220	710
Syisoevo	Lugansk TPP (UA)	220	825
Taganrog 15	Amvrosievka (UA)	220	710
Syisoevo	Velikotsk (UA)	220	710
Smolensk NPP	Belorusskaya (BY)	750	2000
Talashkino	Vitebsk (BY)	330	1420
Roslavl	Krichev (BY)	330	1650
Novosokolniki	Polotsk (BY)	330	1420
Tsentralnaya	Inguri HPP (GE)	500	2000
Psou	Bziby (GE)	220	825
Derbent	Iashma (AZ)	330	1420
Balakovo NPP	Stepnaya (KZ)	500 (operates at 220)	2000
Chelyabinsk	Kustanay(KZ)	1150 (operates at 500)	2000
Troitsk TPP	Sokol (KZ)	500	2000
Irikla TPP	Dzhetygara (KZ)	500	2000
Kurgan	Avrora (KZ)	500	2000
Barnaul	Ekibastuz (KZ)	1150 (operates at 500)	2000
Rubtsovsk	Ermak TPP (KZ)	500	2000

FROM (RU)	TO	Operating voltage (kV)	Thermal rating, A (for t=25° C)
Rubtsovsk	Ust-Kamenogorsk (KZ)	500	2000
Omsk	Ekibastuz TPP (KZ)	500	2000
Irtysh	Ermak TPP (KZ)	500	2000
Omsk	Avrora (KZ)	500	2000
Pskov	Tartu (EE)	330	1420
Leningrad	Baltija TPP (EE)	330	700 * 2 (two circuits)
Kingisepp	Estonia TPP(EE)	330	2000
Pskov	Rezekne (LV)	330	1210
Sovetsk (Kaliningrad)	Urbarkas (LT)	330	1420
Sovetsk	Kruonio PSHP (LT)	330	1420
Sovetsk	Klaipeda (LT)	330	1420
Vyiborg	Ullikkialia (Fi)	400	1650*2 (two circuits)
Vyiborg	Kymi (Fi)	400	1650

Lines under construction
A line 400 kV from Vyborg substation to Finland.
Overhead line 500 kV from Siberia IPS to Ural IPS.

Study needs
Study on practical ways for synchronous interconnection between East and West Power Systems.

4. Other

Link	Company
www.rao-ees.ru	RAO “UES of Russia”
www.rosatom.ru	Concern «ROSENERGOATOM»
www.so-cdu.ru	System Operator CDU "UPS of Russia"
www.cdo.org	CDO (Prague)

UKRAINE

1. Basic capacity, generation and consumption data (data are for year 2001)

Installed capacity by fuel, MW		
	Thermal	34 339
	Hydro	4 731
	Nuclear	11 835
	Renewables	24
	Total	50 929
Yearly generation fuel by fuel, TWh		
	Thermal	83.878
	Hydro	12.124
	Nuclear	76.169
	Renewables	0.013
	Total	172.184
Annual consumption, TWh		169.184
Imports, TWh		0.188
Exports, TWh		3.249

2. Industry structure

Recent key developments

Ukraine was in progress. As a result of market changes and restructuring of power complex, conditions for market relation between suppliers and consumers and competition between those who generate electricity are creating in Ukraine. Deep reforming processes caused by the structural reforming In 2001, in conformity with the Law of Ukraine on Power Industry and other branch documents the restructuring of electric power sector in of power industry, privatisation of power companies, creation and improvement of power market, taking into account own limited power resources and securing of country's power independence, take place in power complex. Privatisation and introduction of market relations open favourable conditions for foreign investments in power industry.

Under elaboration of the wholesale market of electricity much attention was paid to organisation of generation companies and also to separation of generation, supply and transmission of electricity. State enterprise "Energorynok" (power market) was organised for performing functions of wholesale electricity supplier and also National Commission on Regulation of Power Industry of Ukraine, which should defend competition basis of market functioning. Considerable attention was also paid to creation of price forming mechanisms, which were included in the Law of Ukraine on Power Industry. The most important secondary legislation acts were also adopted, in the first place:

- President's Ordinance No.745/29.05.2001 on the Change in Management Structure of Executive Power in Ukraine. The posts of State Secretary and his deputies were introduced in the structure of the Ministry of Fuel and Energy of

Ukraine.

- Ordinance of the Government of Ukraine No. 45-p/02.14.2001 on the System of Payment for the Electricity.
- Ordinance of Verkhovna Rada (the Parliament) No.2275-III on adopting as a Basis the Draft of the Law of Ukraine on Alternative Sources of Power.
- Ordinance of the Government of Ukraine No.133/04.07.2001 on Creation of Favourable Conditions for the Development of Power Industry

The principal events that took place in the Power Industry of Ukraine in the year 2001:

- 7 distribution companies (oblenergoes) were privatised in 2001;
- reconstruction of Starobeshev TPS (unit No.4 of 200 MW capacity) and Zmiyev TPS (unit No.8 of 300 MW capacity) are underway;
- Hydro Power Stations rehabilitation of the Dnepr and Dnestr rivers and System Control was in the stage of implementation;
- on August 20, the transition to parallel operation of the United Power System of Russia and the Interconnected Power System of Ukraine was made;
- April 25, the President of UCTE and representatives from Hungary, Poland, Slovak Republic and Ukraine signed a Memorandum of Understanding in Berlin (Germany) to speed up the process of connecting the Burshtyn Island to the UCTE networks.

TSO

The state enterprise National Power Company «UKRENERGO» is the operator of the national transmission network (220, 330, 400, 500 and 750 kV) and all interconnection lines.

Main generators (more than 3000MW)

Main generators in Ukrainian Power system are:

*Uglegirska TPP	- 3600 MW
*Zaporizka TPP	- 3600 MW
*Zaporizka NPP	- 6000 MW
*Pivdennoukrainska NPP	- 3000MW

Foreseen/Outgoing projects for new generation units

Khmelnitsky NPP (unit No.2)	2003
Rivne NPP (unit No.4)	2004
Tashlyk pump storage power station	2003
Dnestr pump storage power station	2005 (1st unit)

Number of distributors

27 distributing companies, operating the grids of 110 kV and of lower voltage

Main traders and other players (exchanges etc.)

The State Enterprise "Energorynok" acts as a single buyer of electricity

3. Interconnection developments

Existing Interconnections

At present time Ukraine has 40 interconnections with Russia. All lines (except one) are of AC type. The voltage of interconnections with Russia ranges from 35 kV to 750 kV.

Ukraine has now 9 interconnections with Byelorussia, all of them are of AC type. The voltage of interconnections with Byelorussia includes 35 kV, 110 kV and 330 kV.

We have 25 interconnections with Moldova, all of them are of AC type. The voltage of interconnections with Moldova includes 110 kV and 330 kV.

Ukraine also has 9 interconnections with countries of Central Europe, all of them are of AC type. The voltage of these interconnections includes 220 kV, 400 kV and 750 kV.

Lines under construction (internal and cross-border)

FROM	TO	Type AC/DC Single/Double	U,kV	P,MW	Expected date for commissioning the line
Khmelnitsk NPP (UKR)	Khmelnitsk (UKR)	AC- Single	330kV	up to 700 MW	2003
Rivne NPP (UKR)	Zakhidnoukrainskaya s/s (UKR)	AC- Single	transfer from 330kV to 750kV	up to 2500 MW	2004

Future projected interconnections

Burshtyn Island (Burshtyn TPP) - CENTREL networks

Baltic States

LATVIA

1. Basic capacity, generation and consumption data (data for year 2000)

Installed capacity by fuel, MW		
	Thermal	595
	Hydro	1 530
	Nuclear	0
	Renewables	2
	Total	2 127
Yearly generation by fuel, TWh		
	Thermal	1.2
	Hydro	2.8
	Nuclear	0
	Renewables	0
	Total	4.0
Annual consumption, TWh		5.8
Imports		1.8
Exports		0

2. Industry structure

Recent key developments

In Latvia the State joint-stock company **Latvenergo** is the natural monopoly functioning in power transmission and distribution branches. It also operates two combined heat and power plants providing the capital Riga with heat and three large hydro power plants. Latvenergo is state joint stock company. In 2000 *Latvenergo* has provided 97% of total national energy consumption. Small CHP facilities, small hydro plants and wind turbines produced the rest.

There are strong synchronous interconnections uniting Latvia with Estonia, Lithuania and Russia through 330 kV lines. Latvia is the "transit country" for electricity. Approximately three TWh wheel through the national grid annually.

In annual electrical energy balance, Latvia is the net importer of electricity due to shortage of available capacity and its high dependence on hydropower for its domestic production. The share of HPPs produced energy (run-of-river) fluctuates between 30-70 % of energy consumption.

The Energy Law has come in force in 1998. The Energy Law serves as a framework for the transposition and implementation of EU Directive 96/92/EC. An independent Public Services Regulation Council (including Energy Supply) has been set up under the supervision of the Ministry of Economy. The national Grid Code has been elaborated in 2000. In September 2000, the Saeima (Latvian Parliament)

complemented Energy Law with the article stating that *Latvenergo* assets (HPPs, CHPs, transmission and distribution systems) are the strategically important subjects owned by the state. They cannot be neither consigned to third parties nor used as a pledge. *Latvenergo* was excluded from the register of companies to be privatised.

The Latvian power market opening formally has started in 2000, initially for to consumers, having consumption over 100 GWh per year. Further market opening was hold (implemented) in 2001 for eligible customers, with reduced consumption limit (40 GWh threshold). The access to the network model TPA is used. In the interim, the Single Buyer model is being used.

Unbundling: Account unbundling has already been achieved in *Latvenergo* in 1998.

Competition in generation: At present, in Latvia prevails HPP and CHPs generation. HPPs produce cheap energy, CHPs generate electricity as heat by-product. The Energy Law obliges to purchase excess the electricity generated by small renewable power producers.

In 2000, Latvia, Estonia and Lithuania decided to create Common Baltic Electricity Market (CBEM) in order to gain benefits from mutual co-operation. In February 2001, Baltic States along with Russia and Belarus signed a multilateral technical agreement on the parallel operation of their power systems.
There is competition in Baltic electricity market, since Estonia, Lithuania and Russia, as electricity exporting countries, are looking for the possibility to sell energy to Latvia or other interested participants.

TSO
A separate High Voltage Network unit within *Latvenergo* is determined like independent TSO (110 and 330 kV).

Main generation stations
- Plavinas HPP - 868.5 MW
- Kegums HPP - 264.0 MW
- Riga HPP - 402.0 MW
- Riga CHP-1 - 129.5 MW
- Riga CHP-2 - 390.0 MW

Foreseen/Outgoing projects for new generating units
Reconstructing Riga CHP-1 (110 MW), by 2005.

Number of distributors
7 distribution companies are responsible for operating and maintaining medium voltage grids (20, 10, 6 and 0.4 kV).

Main traders & other players
The State joint-stock company Latvenergo is as a single buyer.

3. Interconnection developments

Existing Interconnections

From (LV)	To	Type AC/DC Single/Double	U, kV	P, MW Thermal
Grobina	Klaipeda (LT)	AC - Single	330	580
Jelgava	Siaulai (LT)	AC - Single	330	580
Plavinu HPP	Panevezys (LT)	AC - Single	330	800
Liksna	Ignalinos NPP	AC - Single	330	1160
Valmiera	Tartu (EE)	AC - Single	330	1140
Valmiera	Tsirgulina (EE)	AC - Single	330	1160
Rezekne	Pskov (RU)	AC - Single	330	840

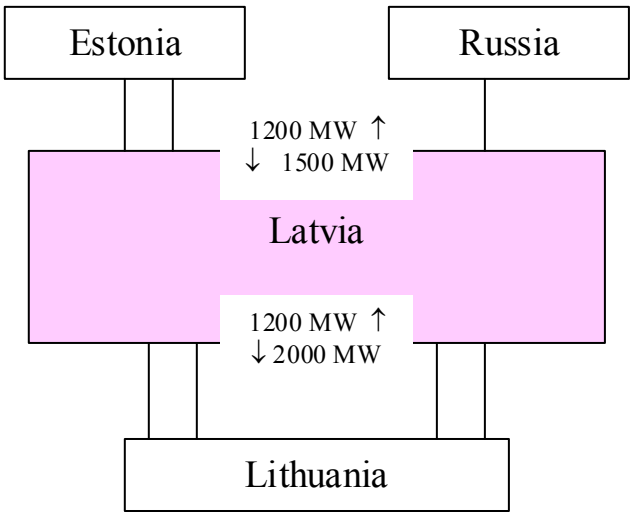


Figure: Existing Interconnections dynamic capacity:

Ongoing studies in international/cross-border Interconnections:
No

Lines under construction (internal and cross-border):
No

Future projected interconnections:
Sindy (EE) - Salaspils (LV)

Study needs:
Sindy (EE) - Salaspils (LV)

LITHUANIA

1. Basic capacity, generation and consumption data (data for year 2001)

Installed capacity by fuel, MW		
	Thermal	2 476
	Hydro (including hydro pump storage plant)	913
	Nuclear	2 367
	Renewables	0
	Total	5 756
Yearly generation by fuel, TWh		
	Thermal	2.22
	Hydro (including hydro pump storage plant)	0.70
	Nuclear	10.24
	Renewables	0
	Total	13.16
Annual consumption, TWh		7.22
Losses in the network		1.43
Load of Pump Storage Power Plant		0.55
Imports		0.20
Exports		4.16

2. Industry structure

Recent key developments

The main source of electricity in Lithuania is the Ignalina Nuclear Power Plant fully state owns. Over the period of the last five years it has generated 75-80% of the total electricity production and with the lowest production cost.

Total installed capacity of power plants (nuclear and non-nuclear) exceeds the present domestic requirement almost three times. Future development of the whole power sector will be greatly influenced by the operating lifetime of the two units of the Ignalina NPP. The Lithuanian parliament (Seimas) on 05 October 1999 approved National Energy Strategy. Upon comprehensive assessment of technical, economic and political factors, the following strategy for further operation of the Ignalina NPP is adopted: in line with the Nuclear Safety Account Grant Agreement, Unit 1 of the Ignalina NPP will be closed down by the year 2005.

The Main Legal Acts Regulating the Energy Sector are:

- Law on Energy 28 March 1995 No.I-828 (as amended by 16 March 2000 No. VIII-1567);
- Law on Electricity 20 July, 2000, No. VIII –1881 (as amended by 20 December, 2000, No.IX-97);
- Law on Nuclear Energy 14 November, 1996, No.I-1613 (as amended by 7 July, 1999, No VIII-1309).

Based on the Law on Reorganization of Special Purpose Company "Lietuvos Energija" the Special Purpose Joint Stock Company "Lietuvos Energija" has been reorganized to Joint Stock Company "Lietuvos energija" by means of separation, i.e. by separating from Special Purpose Joint Stock Company "Lietuvos energija certain parts of assets, rights and obligations, and by establishing on their basis the following new companies: Joint Stock Company "Lietuvos elektrine" (Lithuanian Power Plant), Joint Stock Company "Mazeikiu elektrine" (Mazeikiai Power Plant), Joint Stock Company "Rytu skirstomieji tinklai" (East Distribution Network) and Joint Stock Company "Vakaru skirstomieji tinklai" (West Distribution Network). Excluding cases when the imperative provisions of Laws state otherwise and following the procedure established by the reorganization plan, all rights and obligations of the reorganized Joint Stock Company Lietuvos Energija are allocated to these companies.

Main generators (incl. IPPs)
Main generators in the Lithuanian Power system (installed capacity) are:

- Ignalina NPP - 2600MW
- Lithuania PP - 1800MW
- Vilnius CHP - 384 MW
- Kaunas CHP - 170 MW
- Mazeikiai CHP - 160 MW
- Kruonis HPSPP - 800 MW
- Kaunas HPP - 100 MW

Foreseen/Outgoing projects for new generating units
No foreseen new large generating units until 2005.

Number of distributors
Two distribution companies, operating the grid less then 110 kV voltage.

Main traders & other players (exchanges etc.)
The JSC Lietuvos Energija temporary (until 01 April 2002 according to the decision of the Government) acts as a single buyer.

3. Interconnection developments

Existing Interconnections

FROM (LT)	TO	Type AC/DC Single/Double	*U, kV*	P, MW
Lithuania – Latvia				
Klaipeda	Grobinia	AC	330	789
Siauliai	Jelgava	AC	330	789
Panevezys	Pliavine	AC	330	789
Ignalina NPP	Liksna	AC	330	943
Lithuania – Belarus				
Ignalina NPP	Polock	AC	330	1097
Ignalina NPP	Belarusskaja	AC	330	1143
Ignalina NPP	Smorgon	AC	330	943

Vilnius	Molodechno	AC	330	943
Alytus	Grodno	AC	330	789
Lithuania – Kaliningrad region (Russian Federation)				
Kruonis	Sovietsk	AC	330	1143
Jurbarkas	Sovietsk	AC	330	572
Klaipeda	Sovietsk	AC	330	572

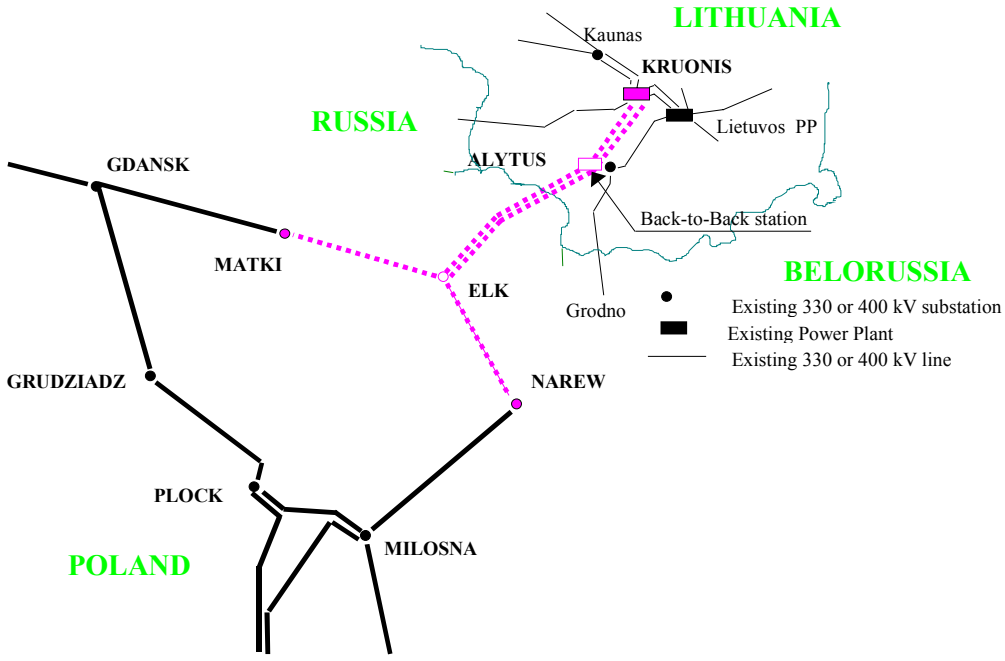
Ongoing studies in international/cross-border interconnections

FROM (LT)	TO (PL)	Type AC/DC Single/Double	U, kV	P, MW	Date for study completion	Expected date for commissioning the line under study
Alytus, Lithuania	Elk, Poland	Overhead double-circuit AC line and 600 MW BBS	400 kV	600 MW	June, 2002	Not defined yet

400 kV AC Link Poland - Lithuania[*1].

This planned overhead double-circuit line with Back-to Back converter station on Lithuanian side 600 MW in Alytus, Lithuania. Expected date for commissioning not yet defined. Common Polish and Lithuanian pre-feasibility study completed. New feasibility study concerning financing aspects is under the way. It is expected to be finished in June, 2002. Length of the line - 154 km[*2]. Expected investments for the construction of this interconnection ~354-410 M EURO[*3]

*1) with internal 400 kV single lines in Poland
Elk – Narew - ~134 km
Elk – Matki - ~169 km
and one double 330 kV line in Lithuania
Kruonis - Alytus – ~53 km
*2) Double circuit 400 kV line Alytus – Elk only; project includes also internal lines in PL and LT (ref. *1)
*3) Total investment costs on both sides (ref. *1).



Lines under construction (internal and cross-border)
There are no lines under construction now.

Future projected interconnections
There are no other lines projected at the moment.

4. Other

Link	Company
www.lpc.lt	AB Lietuvos Energija
www.regula.is.lt	National Control Commission for Prices and Energy
www.ekm.lt	Energy Agency – Energy Efficiency Centre

Isolated systems

CYPRUS

1. Basic capacity, generation and consumption data

Installed capacity by fuel, MW		
	Thermal	998
	Hydro	-
	Nuclear	-
	Renewables	-
	Total	998
Yearly generation fuel by fuel, TWh		
	Thermal	3.55185
	Hydro	-
	Nuclear	-
	Renewables	-
	Total	3.55185
Annual consumption, TWh		3.12475
Imports, TWh		
Exports, TWh		

2. Industry structure

Recent key developments

Under the EU Electricity Market Directive no 96/92, all EU members are required to open up their electricity markets gradually. The E.A.C and the government of Cyprus are preparing the electricity sector for partial opening (33%) in line with the E.U Directive upon accession that is scheduled for the 1st of January 2004. The harmonisation of Cyprus Electricity sector with the E.U internal energy market will require changes in sector structure and electricity market arrangements.

Electricity Directive allows Member States to impose upon their electricity undertaking public service obligations in the general economic interest. These may relate to the following categories:

- Security
- Rural development
- Quality of supply
- Price of supply
- Environmental protection.

The changes in EAC structure include the creation of:

- A generation business
- The transmission system operator independent in management terms.
- The transmission business and

- The supply business.

The Generation function should be "unbundled" and become a separate business unit within EAC. This entity would have its own purchasing, personnel, training and commercial functions as well as the technical sections overseeing plant integrity and performance.

In order to comply with the present EU Directive requirements EAC must set up a separately identifiable Transmission and Distribution System Organisation within EAC. Split the Area's responsibilities at least in accounting terms between the supply function and the network function.

Business units will be run as independent profit centres. Business unit managers will be effectively managing independent business lines operating commercially at arm length from other business units of EAC. Managers will be responsible for the financial performance of their business unit.

TSO
Expected to be established by the end of 2002.

Main generators (incl. IPPs)
- VASSILIKO P.S – 298 MW
- DHEKELIA P.S -360 MW
- MONI P.S – 330 MW

Foreseen/Outgoing projects for new generating units;
Vassiliko P.S phase two, which includes the installation of one new generator 130 MW capacity.

Number of distributors
Distribution for the whole of Cyprus shall remain within EAC but unbundled in accounting terms.

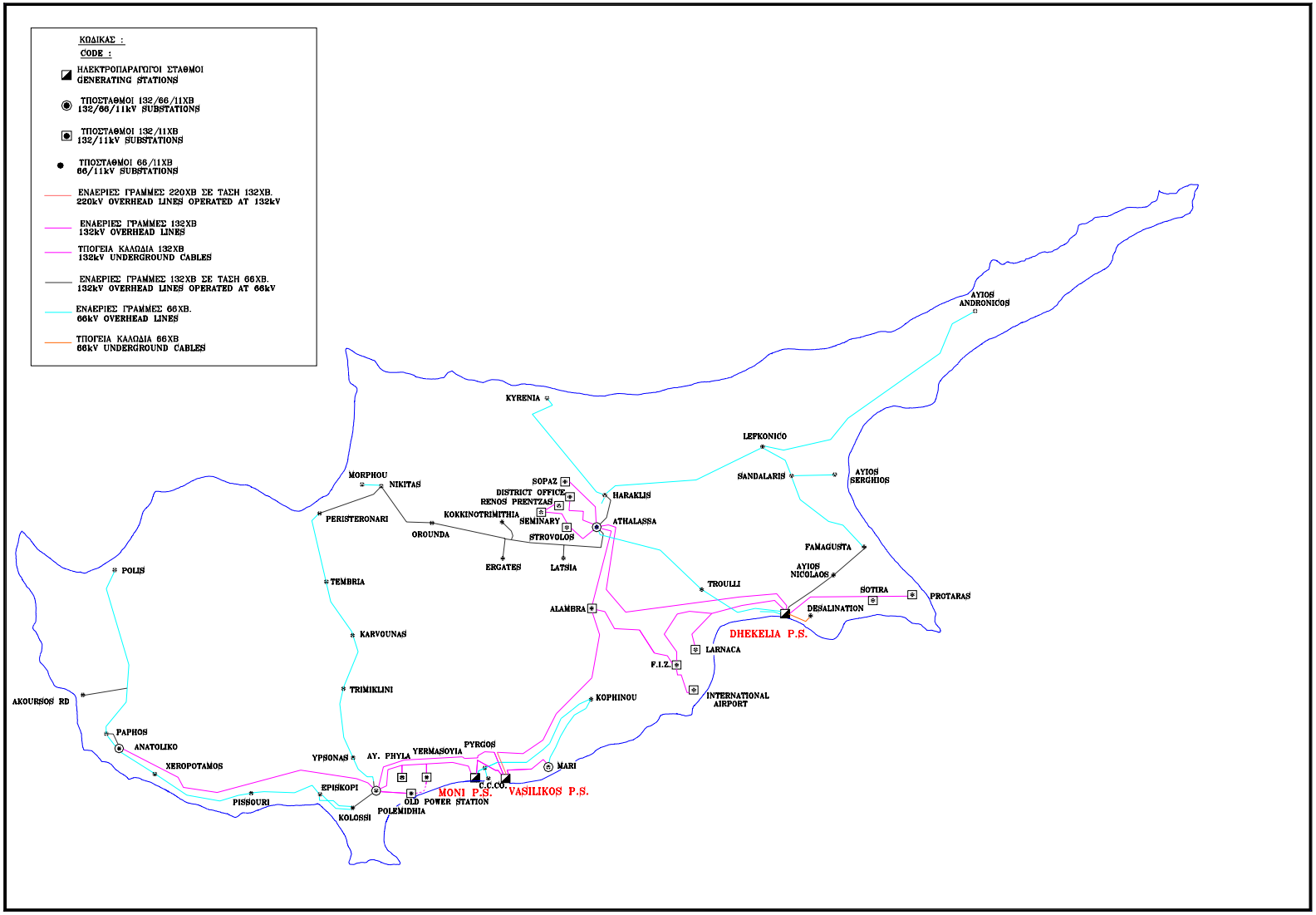
Main traders & other players (exchanges etc.)
Not applicable for Cyprus.

3. Interconnection developments

Lines under construction (internal and cross-border);
Internal only:
- Kolossi – Anatoliko 132 kV Double Circuit Line.
- Anatoliko - Hadjipashalis 132 kV Double Circuit Line and cable.
- Anatoliko - Stroumbi 132 kV Double Circuit Line.
- Dhekelia – Pyla Double Circuit Line and cable.
- Orounda – Tembria Single Circuit Line.
- Renos Prentzas – Sopaz Double Circuit cable.
- Athalassa – Dasoupolis Double Circuit cable from terminal tower.

4. Other

Link
www.eac.com.cy


ΚΩΔΙΚΑΣ :
CODE :
ΗΛΕΚΤΡΟΠΑΡΑΓΩΓΟΙ ΣΤΑΘΜΟΙ
GENERATING STATIONS
ΥΠΟΣΤΑΘΜΟΙ 132/66/11ΚΒ
132/66/11kV SUBSTATIONS
ΥΠΟΣΤΑΘΜΟΙ 132/11ΚΒ
132/11kV SUBSTATIONS
ΥΠΟΣΤΑΘΜΟΙ 66/11ΚΒ
66/11kV SUBSTATIONS
ΕΝΑΕΡΙΕΣ ΓΡΑΜΜΕΣ 220ΚΒ ΣΕ ΤΑΣΗ 132ΚΒ.
220kV OVERHEAD LINES OPERATED AT 132kV
ΕΝΑΕΡΙΕΣ ΓΡΑΜΜΕΣ 132ΚΒ
132kV OVERHEAD LINES
ΥΠΟΓΕΙΑ ΚΑΛΩΔΙΑ 132ΚΒ
132kV UNDERGROUND CABLES
ΕΝΑΕΡΙΕΣ ΓΡΑΜΜΕΣ 132ΚΒ ΣΕ ΤΑΣΗ 66ΚΒ.
132kV OVERHEAD LINES OPERATED AT 66kV
ΕΝΑΕΡΙΕΣ ΓΡΑΜΜΕΣ 66ΚΒ.
66kV OVERHEAD LINES
ΥΠΟΓΕΙΑ ΚΑΛΩΔΙΑ 66ΚΒ
66kV UNDERGROUND CABLES
AYIOS ANDRONICOS
KYRENIA
LEFKONICO
SANDALARIS
AYIOS SERGHIOS
MORPHOU
NIKITAS
SOPAZ
DISTRICT OFFICE
RENOS PRENTZAS
HARAKLIS
KOKKINOTRIMITHIA
SEMINARY
ATHALASSA
PERISTERONARI
OROUNDA
STROVOLOS
ERGATES
LATSIA
FAMAGUSTA
AYIOS NICOLAOS
POLIS
TEMBRIA
TROULLI
SOTIRA
PROTARAS
ALAMBRA
DESALINATION
DHEKELIA P.S.
KARVOUNAS
LARNACA
F.I.Z.
TRIMIKLINI
KOPHINOU
INTERNATIONAL AIRPORT
AKOURSOS RD
PAPHOS
ANATOLIKO
PYRGOS
YERMASOYIA
YPSONAS
AY. PHYLA
MARI
XEROPOTAMOS
C.C.C.O.
EPISKOPI
MONI P.S.
VASILIKOS P.S.
OLD POWER STATION
PISSOURI
POLEMIDHIA
KOLOSSI

ANNEX 2:
Abbreviations used

AC	Alternating current
ATC	Available transmission Capacity
AUPTDE	Arab Union of Producers, Transmission & Distribution Companies
COMELEC	Maghreb association of the electricity sector
CDO	Central Dispatching Organisation
CENTREL	Organisation for the synchronous interconnection of the electric power systems of the Czech Republic, Slovakia, Poland and Hungary with the UCTE power systems
CEER	Council of European Energy Regulators
CHP	Combined Heat and Power
CIGRE	International Council on Large Electric Systems
CIS	Commonwealth of Independent States
DC	Direct current
ETSO	European Transmission System Organisation
EU	European Union
GW	Gigawatt
HVDC	High-voltage direct current
IPS	Integrated Power System
kV	Kilovolt
MEDELEC	Mediterranean Liaison Committee
MW	Megawatt
NETA	New Electricity Trading Arrangements
NSI	North Sea Interconnector
NORDEL	Organisation for Nordic power cooperation
NPP	Nuclear Power Plant
OME	Observatoire Méditeranéen de l'Energie
PS	Power System
TEAS	Turkish Electric Generation and Transmission Company
TEN	Trans-European Network
TESIS	Trans-European Synchronously Interconnected System

TSO	Transmission System Operator
SYSTINT	Joint EURELECTRIC and UCTE working group dealing with system development
SYSTMED	Working group dealing with network developments around the Mediterranean Sea
TWh	Terawatt hour
UNIPEDE	International Union of Producers and Distributors of Electrical Energy
UCPTE	Union for the Co-ordination of Electricity Generation and Transmission
UCTE	Union for the Co-ordination of Transmission of Electricity
UES	Unified Energy Systems of Russia
UPDEA	Union of Producers and Distributors of electricity in Africa
UPS	Unified Power System

ANNEX 3:
Useful web-sites

Organisations	Web-sites
AUPTDE – Arab Union of Producers, Transmission and Distribution Companies	www.auptde.org
BALTREL – Association of Baltic Sea Region Power Companies	www.baltrel.com
CDO – Central Dispatching Organisation	www.cdo.org
CEER – Council of European Energy Regulators	www.ceer-eu.org
CENTREL – Organisation for the synchronous interconnection of the electric power systems of the Czech Republic, Slovakia, Poland and Hungary with the UCTE power systems	www.centrel.org
CIGRE – International Council on Large Electric Systems	www.cigre.org
COMELEC – Association of Maghreb electricity utilities: ONE, SONELGAZ, STEG, GECOL and SONELEC	Mbendaace@sonelgaz.dz
DC BALTIJA – Joint Venture of Estonia-Latvia-Lithuania Baltic power Systems Control Centre Ltd.	www.de.riga.lv
ETSO – European Transmission System Organisation	www.etso-net.org
EURELECTRIC – Union of the Electricity Industry	www.eurelectric.org
European Commission, DG TREN	http://europa.eu.int/comm/dgs/energy_transport/index_en.htm
MEDELEC – Mediterranean Liaison Committee comprising the following associations: EURELECTRIC, UCTE, COMELEC, AUPTDE and UPDEA	www.medelec.org
NORDEL – Organisation for Nordic power co-operation	www.nordel.org
RAO "UES of Russia" (Unified Energy System of Russia)	www.rao-ees.ru
UCTE – Union for the Co-ordination of Transmission of Electricity	www.ucte.org
UPDEA – Union of Producers and Distributors of electricity in Africa	updea.org@aviso.ci

ANNEX 4:
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