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**The Potential of Regional
Power Sector Integration**

**Union for the Coordination of
the Transmissions of
Electricity (UCTE) | Developed
Country Case Study**

**Submitted to ESMAP by:
Economic Consulting Associates**

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Abbreviations and acronyms

AC	Alternating Current
ACER	Agency for Cooperation of Energy Regulators
ATSOI	Association of the Transmission System Operators of Ireland
BALTSO	Baltic Transmission System Operators association
CEER	Council of European Energy Regulators
CIS	Commonwealth of Independent States (former Soviet Republics)
CMEP	The UCTE Compliance Monitoring and Enforcement Process
DC	Direct Current
EC	European Community
ECSC	European Coal and Steel Community
EIA	Energy Information Administration of the USA
ENTSO-E	Association of the European Network of Transmission System Operators for Electricity
ERGEG	European Regulators' Group for Electricity and Gas
ETSO	Association of the European Transmission System Operators
EU	European Union
EU-15	EU Membership immediately prior to new accessions in May 2004: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden and the United Kingdom
Eurelectric	The Union of the Electricity Industry
Eurostat	Statistical office of the European Commission
EWIS	European Wind Integration Study
FYROM	Former Yugoslav Republic of Macedonia
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GW	Gigawatt (unit of electrical power = 10^9 watts)
GWh	Gigawatt-hour (measure of electrical energy = 10^9 watt-hours)
Hydro	Hydroelectric generation
IEA	International Energy Agency
IPS	Integrated Power System (of former Soviet Republics outside Russia): Ukraine, Kazakhstan, Kyrgyzstan, Belarus, Azerbaijan, Tajikistan, Uzbekistan, Georgia, Moldova and Mongolia
km	Kilometer
kV	Kilovolt (1,000 volts)
LNG	Liquefied Natural Gas
LRMC	Long Run Marginal Cost
MVA	Megavolt Ampere
MW	Megawatt (unit of electrical power = 10^6 watts)

NORDEL	Organization for the Nordic Transmission System Operators
OEEC	Organization for European Economic Cooperation
R'voir	Reservoir used by a hydroelectric generator
RES	Renewable Energy Source
RES-E	Electricity from renewable energy sources
SAF	System Adequacy Forecast
TEN-E	Trans-European networks (TEN) - area of energy infrastructures
TSO	Transmission System Operator
TWh	Terawatt-hour (measure of electrical energy = 10 ¹² watt-hours)
UCPTE	Union for the Coordination of the Production and Transmission of Electricity
UCTE	Union for Coordination of Transmission of Electricity, Europe
UKTSOA	United Kingdom Transmission System Operators Association
UPS	Unified Power System of Russia

Preface

This case study is part of an Energy Sector Management Assistance Program (ESMAP) project on Regional Power System Integration (RPSI). The objective of the project is to facilitate and accelerate RPSI projects in developing countries around the world. The project will draw on international experience and theoretical analysis in this area to provide a framework to assess:

- o the economic, financial and environmental benefits that can accrue to regional power trading;
- o the institutional and regulatory arrangements needed to sustain and optimize regional projects; and
- o the ways in which obstacles to integration have been successfully overcome.

The final output of the project will be an umbrella report, *Regional Power Sector Integration – Lessons from Global Case Studies and a Literature Review*. This review will summarize the 12 case studies and literature review undertaken and analyze common themes on barriers to RPSI and solutions to overcome them.

Economic Consulting Associates was contracted to execute the project. In doing so, we are working closely with ESMAP and World Bank staff, as well as government officials, utility, power pool, and regional economic community personnel, and others directly involved in implementing regional power schemes.

This and other 11 Case Studies are prepared as clear, factual presentations of the selected projects. The intent is to provide a direct, easily digestible description of each of the selected projects without imposing an analytic framework or making judgments about the degree of success. Such analysis will be undertaken at the global level, considering the entirety of experiences from the Case Studies, in the aforementioned umbrella report.

All 12 Case Studies follow a uniform structure to facilitate ease of comparison and reference from one Study to the next. Some sections are longer than others, depending on the specifics of the Study. Additionally, there is some cross-referencing within each Study.

1 Executive summary

This case study examines the role of the Union for the Coordination of Transmission of Electricity (UCTE) in the development of electricity integration in Europe. When it was formed in 1951, UCTE represented national integrated electricity utilities, including generation; hence it had the acronym UCPTE (P for production). With the unbundling and privatization of generation in many of the countries, in 1999 the organization became the UCTE, concentrating on the technical issues of operating a large, synchronous system spanning national boundaries. Responsibility for market-related interconnection issues was passed to the Association of the European Transmission System Operators (ETSO), which was formed in 1999.

By the time this UCTE case study was being finalized, UCTE, ETSO and other similar organizations outside of the synchronous area had been subsumed into a new institution called the Association of the European Network of Transmission System Operators for Electricity (ENTSO-E). This is a very recent development, which is covered in Section 6 of this case study and in Annex A5. The main thrust of the case study is on UCTE as it was prior to this development. The members of UCTE were the transmission systems operators (TSOs) within its synchronous zone. The original UCTPE had seven members; as of early 2009, UCTE had 29 TSO members, representing 24 countries.

1.1 Motivations/objectives for trade

When UCTPE was formed, the priority was the rebuilding of generation and transmission capacity in Western Europe. Trade in electricity was complementary to the main goals of rehabilitating electricity infrastructure after the Second World War and extending electrification to reach a higher proportion of the population.

One of the aims of UCPTE at its inception was fuel economy (maximizing use of hydro resources in order to conserve coal). As the European electricity industry recovered in later years, the goals of UCPTE, and later UCTE, became to ensure reliability and security of supply in Europe and to reduce transmission costs by coordinating electricity flows and sharing reserve capacities. UCTE's declared mission was to provide a reliable market base through technical and operational coordination in the synchronous area with a view to maintaining security and stability. Supporting this central goal was the monitoring of long-term generation and transmission adequacy, but there was also the additional ambition of extending the synchronous area.

The continued development of the UCTE synchronous area was based on benefits from sharing reserve requirements, as well as improved reliability due to the greater diversity of supply available in a multinational system. There was also improved efficiency of generation utilization due to the diversity of load (with peaks in demand occurring at slightly different times in the different countries).

From 1996 on, electricity markets in Europe came increasingly to be shaped by the single market project of the European Union (EU). With the exception of Switzerland, all of the member countries of UCTE are members of the EU or aspire to EU membership, and hence the EU Directives pertaining to electricity have had a determining influence within UCTE's synchronous area. As electricity trade grew as a result of the EU-inspired liberalization, the

benefits noted above from UCTE's technical interventions enhanced the continuous improvements to efficiency from least-cost generation gaining access to the widest possible market.

1.2 The trade solution put in place

UCTPE and UCTE concentrated on developing coordination and common rules to facilitate cross-border transfers of energy and transmission services. This provided practical means of sharing the burdens of security of supply and system stability as the electricity systems of Europe expanded and became progressively more integrated.

UCTE sought practical solutions to technical issues and promoted common standards. Due to a major supply failure incident in 2003, UCTE changed its processes from a voluntary set of operating guidelines into a defined set of rules, enforced through a legally binding agreement.

UCTE limited its role to transmission system operation. As noted above, market issues, such as cross-border transmission and congestion charging, were from 1999 moved forward by the parallel organization for systems operators, ETSO. UCTE was not therefore directly involved in the development of regional electricity markets in Europe; its role was rather one of continued accommodation of trade initiatives both from the EU and from trading participants.

1.3 Current status and future plans

The original member countries of the UCPTE all now have fully developed and stable power systems. The security and quality of electricity supply in these countries is taken for granted. Although demand growth has slowed, cross-border exchanges have continued to expand. This growth in regional trading has also been a feature observed with newer members from Eastern Europe joining the UCTE synchronous area. By 2008, 12% of demand in the UCTE area was supplied from generation located in another country.

As noted above, from July 2009 UCTE has been subsumed into ENTSO-E, an organization created in response to the EU proposed 3rd Energy Package. Major focuses of ENTSO-E work will include network code coordination and interconnector charging and inter-TSO compensation. However, ENTSO-E is also taking over the main elements of what UCTE had planned to do in the future:

- o **Coordinated planning:** There is a strong case for coordinating the development of grid capacity in the synchronous area. ENTSO-E will now lead the coordination of infrastructure planning, but, as was the case with UCTE, there is no intention to make the planned investments mandatory on the affected TSOs.
- o **Flexible operation:** With the increase in wind farms, their essentially passive control and fault protection systems will need to change to allow better continuity of grid operation.
- o **Geographic expansion** of the former UCTE synchronous areas: UCTE had been investigating a synchronized zone around the whole Mediterranean as well as

linkage with the former Soviet states, including the large Russian synchronous zone that stretches to the Pacific.

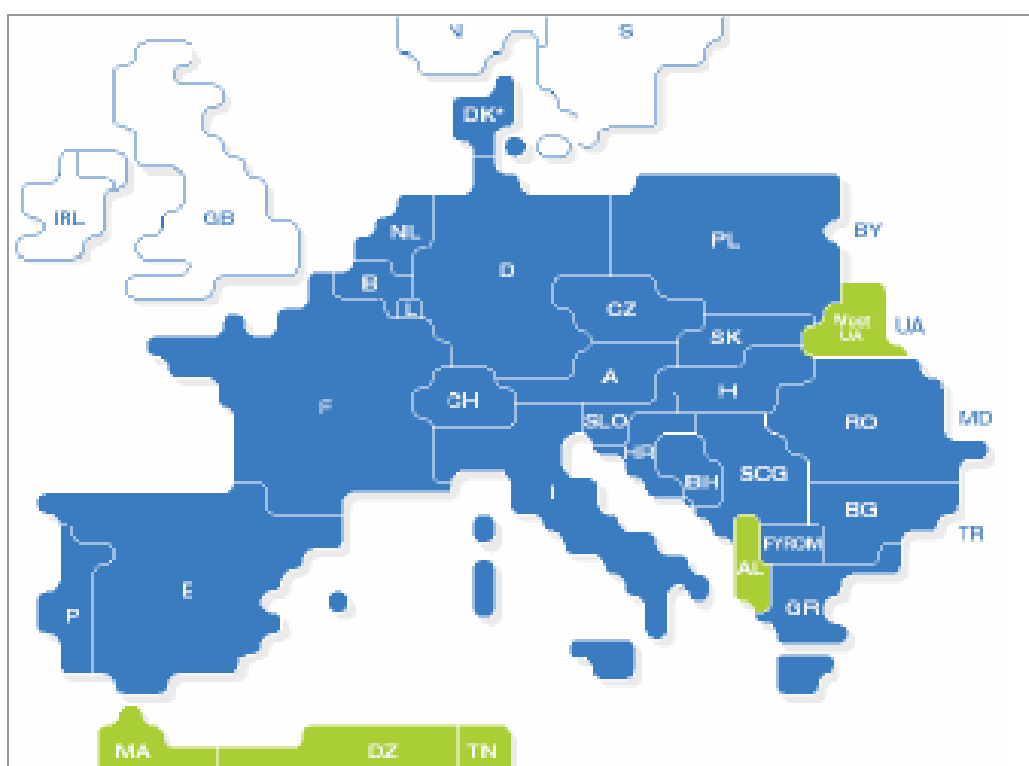
2 Context for trade

2.1 Economic and political context

Economics of the region

The UCTE area as it was in the first half of 2009 is shown in Figure 1. In addition to the 24 member countries (with 29 TSOs), associated areas operate in synchronous mode with the core UCTE area.¹

Figure 1 UCTE Area








































Source: UCTE

Table 1 gives some demographic and economic context to UCTE member countries and neighboring nonmember countries. There is considerable diversity in size and wealth between the countries. Nearly all the UCTE member countries are within the EU or else aspire to membership. The EU seeks to harmonize wealth across its members, with richer countries contributing to development of the poorer ones. This aid can include investment in electricity infrastructure.²

¹ Currently, these areas continue to operate in synchronization with the former UCTE synchronous area, but none have joined ENTSO-E.

² Figure 15 in Annex A1 gives cumulative GDP growth rates for selected countries.

Table 1 Population and GDP of UCTE Member Countries and Surrounding Areas³

Flag	Country	Short	EU Membership	population (m)	GDP (€m)	GDP € per capita
Members						
	Austria	AT	Y	8.33	282,202	33,800
	Bosnia-Herzegovina	BA		3.84	-	-
	Belgium	BE	Y	10.67	344,206	32,400
	Bulgaria	BG	Y	7.64	34,118	4,400
	Switzerland	CH		7.59	335,233	44,600
	Czech Republic	CZ	Y	10.38	148,556	14,200
	Germany	DE	Y	82.22	2,491,400	30,300
	Denmark West	DK_W	Y	5.48	233,331	42,500
	Spain	ES	Y	45.28	1,095,163	24,000
	France	FR	Y	63.75	1,900,085	30,400
	Greece	GR	Y	11.21	242,946	21,600
	Croatia	HR		4.44	47,365	10,800
	Hungary	HU	Y	10.05	105,244	10,500
	Italy	IT	Y	59.62	1,572,243	26,300
	Luxembourg	LU	Y	0.48	36,662	75,100
	Montenegro	ME		-	-	-
	FYROM	MK		2.05	6,507	3,200
	The Netherlands	NL	Y	16.41	594,608	36,200
	Poland	PL	Y	38.12	362,095	9,500
	Portugal	PT	Y	10.62	166,197	15,600
	Serbia	RS		-	-	-
	Slovenia	SI	Y	2.03	37,126	18,200
	Slovak Republic	SK	Y	5.40	64,884	12,000
	Romania	RO	Y	21.53	137,035	6,400
Not Members						
	Albania	AL		3.17	-	-
	Andorra	AD		0.08	-	-
	Belarus	BY		9.69	-	-
	Denmark	DK		-	-	-
	Denmark East	DK_E		-	-	-
	Great Britain	GB		-	1,812,077	29,700
	Morocco	MA		-	-	-
	Republic of Moldova	MD		-	-	-
	Norway	NO		4.74	309,875	65,000
	Sweden	SE		9.18	328,421	35,600
	Republic of Turkey	TR		70.59	498,397	7,000
	Ukraine	UA		-	-	-
	West Ukraine (Buzhityn Island)	UA_W		-	-	-
Special areas						
	CENTREL	CENT		-	-	-
	Slovenia + Croatia	SHR		-	-	-
	Yugoslavia	YUGO		-	-	-

Source: UCTE, Eurostat

³ The countries recorded as Not Members on the UCTE website have some form of interconnector links with the UCTE area. However, the UPS/IPS system has DC links with the UCTE area but was not similarly recorded on the UCTE website.

Legislative arrangements in UCTE member countries

EU membership (or aspiration to join the EU) means that nearly all the UCTE countries are committed to the EU *Acquis Communautaire*.⁴ Central to this is the establishment of competitive nondiscriminatory access to markets. In the context of electricity, which has to provide its own infrastructure for delivery of energy, this requires special attention to rules on transmission and interconnection. The market obligations are enforced through national legislation in each EU member country, but cross-border institutions (such as UCTE had been) need to accommodate the principles set out by EU Directives.

2.2 Supply options

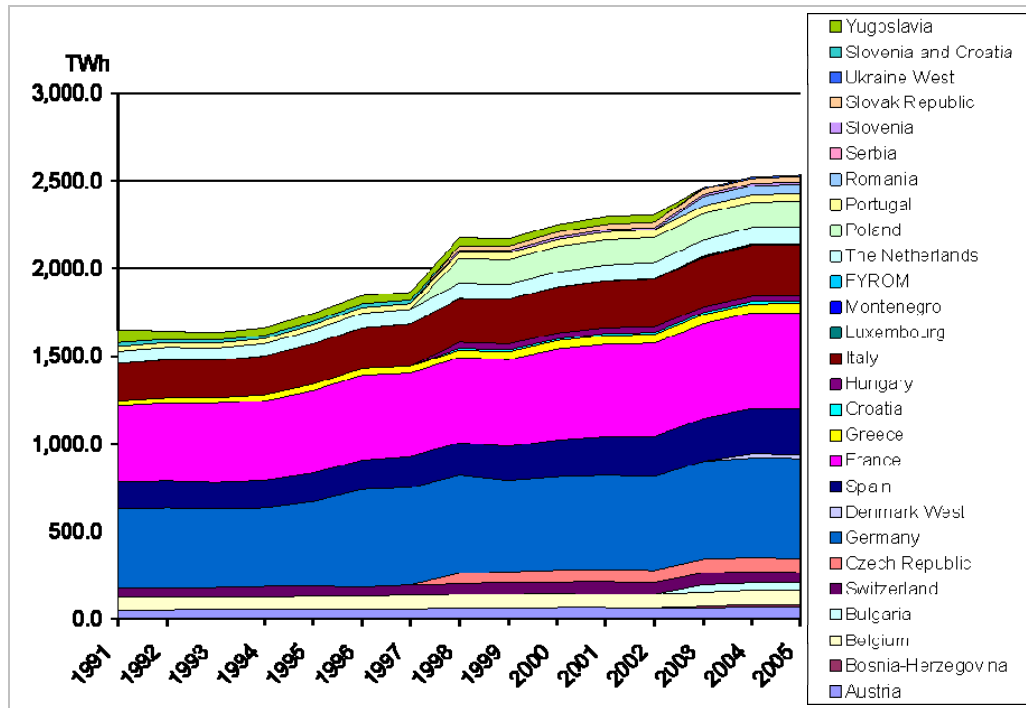
In this subsection we look at whether there has been a resource constraint dictating the pattern of generation in the UCTE area. A constraint in available generation resource could dictate where generation has located and could stimulate cross-border energy transfers.

Through the networks of the UCTE area, about 500 million people are supplied with electrical energy, and annual electricity consumption totals about 2,500 TWh. Figure 2 gives details about generation trends by country.⁵ Due to conflict in the Balkans during the 1990s, the UCTE area was split into two synchronous systems running separately; however, since 2004, the two parts have been reunited – this explains the references to Yugoslavia in earlier years in Figure 2.

⁴ This general statement does not apply to associated nonmember areas such as, for example, Ukraine (Burshtyn Island). However, Switzerland is the only UCTE member country with no EU aspirations, but it nevertheless has rules that are highly compatible with those contained in the *Acquis Communautaire*. It should also be noted that the Austrian utility was one of the original members of UCPT in 1951, which was long before Austrian accession to the European Community; the development of UCPT/UCTE must be considered separately from the development of the EU, although this is not necessarily true for the new organization, ENTSO-E.

⁵ See Table 8 in Annex A2 for the underlying data.

Figure 2 Trend in Annual Generation



Source: UCTE

The installed capacity in the UCTE area as of 31 December 2008 was 672,059 MW, of which 20.0% was located in Germany, 17.5% in France, 14.6% in Italy and 13.2% in Spain.

Table 2 gives a breakdown of capacity stock in each country. There is considerable variation between countries in the type of capacity employed. Several countries have more than 50% of their capacity as hydro (Austria, Bosnia-Herzegovina, Switzerland, Croatia, Luxembourg and Montenegro). Only France has more than 50% of capacity as nuclear (although nuclear supplies more than 20% of the capacity in Belgium, the Czech Republic, Hungary, Slovenia and the Slovak Republic). Other countries are predominantly thermal.⁶

⁶ UCTE statistics did not split between coal and gas in their thermal capacity data.

Table 2 Installed Capacity by Type, 2008 (MW)

Country	Hydro	of which:			Nuclear	RES	of which:		Fossil fuels	Other	Total
		R'voir	Run of river	Pumped storage			Wind	Other RES			
Austria	11,853	5,399	6,454	-	-	985	969	6,944	-	19,182	
Bosnia-Herzegovina	2,064	N.A.	N.A.	N.A.	-	-	-	1,957	-	4,021	
Belgium	1,412		104	1,308	5,825	1,147	352	713	8,395	-	16,719
Bulgaria	2,993	2,035	118	840	2,000	113	112	1	6,929	-	11,629
Switzerland	13,329	7,900	3,700	1,800	3,220	322	12	310	321	241	17,439
Czech Republic	2,175	1,040		1,135	3,537	190	150	40	10,578		14,480
Germany	9,700	N.A.	N.A.	N.A.	20,300	32,400	23,100	4300	72,300	-	134,700
Denmark	9		9		-	2,774	2,417	357	5,049	-	7,832
Spain	18,972	12,969	3,335	2,667	7,465	19,308	15,584	3,724	43,000	83	88,828
France	25,392	13,569	7,577	4,246	63,260	4,283	3,278	981	24,718	-	117,639
Greece	3,177	2,606	-	571	-	940	791	149	8,375	-	12,492
Croatia	2,007	1,643	344	276	-	55	14	37	1,700	-	3,962
Hungary	50	-	50	-	1,822	518	96	422	5,360	791	8,541
Italy	21,125	N.A.	N.A.	N.A.	-	4,274	N.A.	N.A.	73,020	-	98,419
Luxembourg	1,128	17	15	1,096	-	80	49	37	498	-	1,706
Montenegro	660	340	320		-	-			210	-	870
FYROM	903	N.A.	N.A.	N.A.	-	-	-	-	907	-	1,410
The Netherlands	37	N.A.	N.A.	N.A.	485	3,036	N.A.	N.A.	21,702	-	25,260
Poland	2,327	166	375	1,413	-	473	424	49	29,709	-	32,509
Portugal	4,957	2,397	2,561	-	-	3,143	2,652	491	6,855	-	14,955
Romania	5,843	3,648	2,196	-	1,300	7	7	-	9,431	-	16,582
Serbia	2,831	368	1,849	614	-	-	-	-	5,524	-	8,355
Slovenia	879	N.A.	N.A.	N.A.	700	-	-	-	1,315	-	2,894
Slovak	2,478	N.A.	N.A.	N.A.	2,200	61	3	N.A.	2,714	-	7,459
Ukraine-West	27	26	1		-	-			2,347	-	2,374
Total	135,928				182,114	74,109			348,992	1,115	672,059

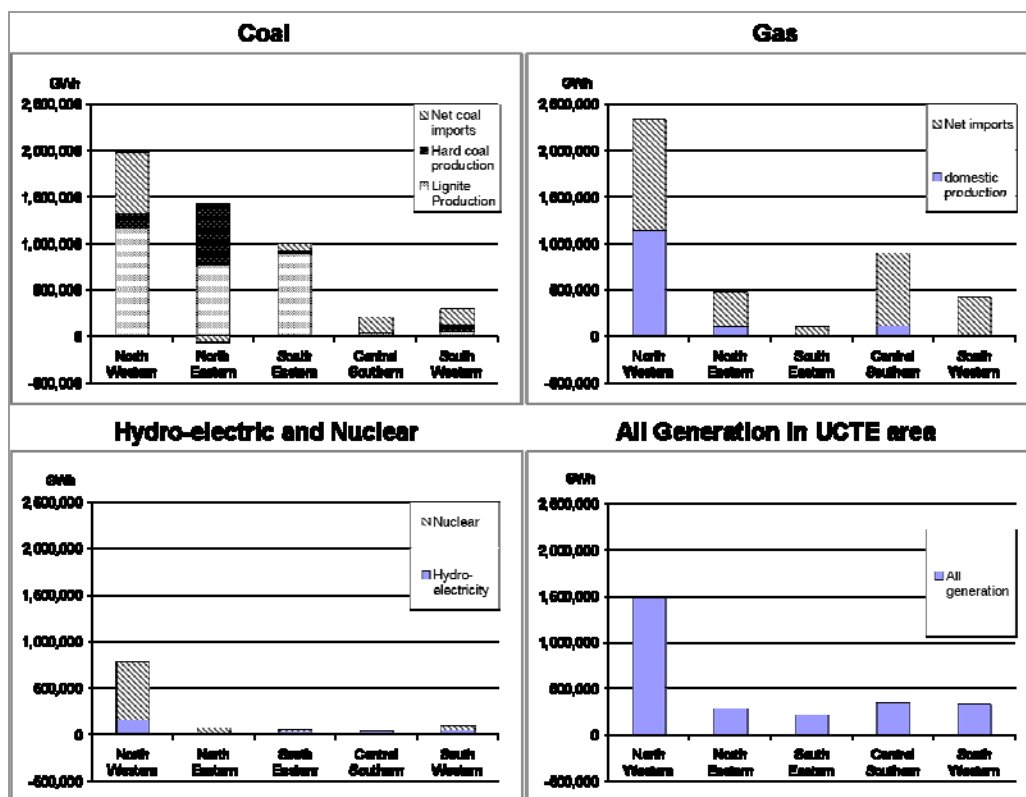
Source: UCTE

To obtain a breakdown of the thermal component into coal and gas, Figure 3 is derived by combining US EIA⁷ and UCTE data using approximate energy conversion factors.⁸

⁷ Energy Information Administration of the USA: <http://www.eia.doe.gov/>.

⁸ It converts both coal and gas into GWh using approximate conversion factors (EIA presents data in weight or volume terms). The figures give the energy content of the coal and gas available and should not be confused with the amount of electricity that could be generated from the coal or gas. The fossil fuel figures are so large compared to total electricity actually generated partly because, while most of the coal will have been used in electricity generation, the gas is shown as the full resource available and not just that used in power generation. In addition, the figure includes charts on generation from hydroelectric resources and from nuclear. UCTE total generation is shown in the figure to give an approximate idea of primary resources available in relation to actual electricity generation.

Figure 3 Energy Resources in the UCTE Area, 2007



Source: US EIA, UCTE

In the UCTE area, there is considerable variation between countries in the contribution of gas and coal (or lignite) to generation; on average, coal-fired capacity contributed 31% of generated energy in 2006, oil-fired capacity contributed 4%, and gas-fired capacity contributed 18%.⁹

Most of the coal used is locally sourced, but there are also significant imports in the northwestern block of countries.¹⁰ Most gas used is imported. Some of the imports will be as LNG, but the majority of imports will be through pipelines. Europe has an integrated pipeline network that takes in gas mainly from Russia and Central Asia. Piped gas is also available from Norway and Algeria.

Overall, Figure 3 can be interpreted as showing:

- o Countries in the UCTE area have developed generation on a mix of indigenous and imported resources and have not been significantly constrained by the specific location of resource.
- o In terms of supply options, the UCTE area has not been constrained, and supply constraints have not been a major driver toward regional electricity integration.

⁹ Based on International Energy Agency (IEA) data: www.iea.org

¹⁰ UCTE statistics group countries into regional blocks; see Annex A4.1

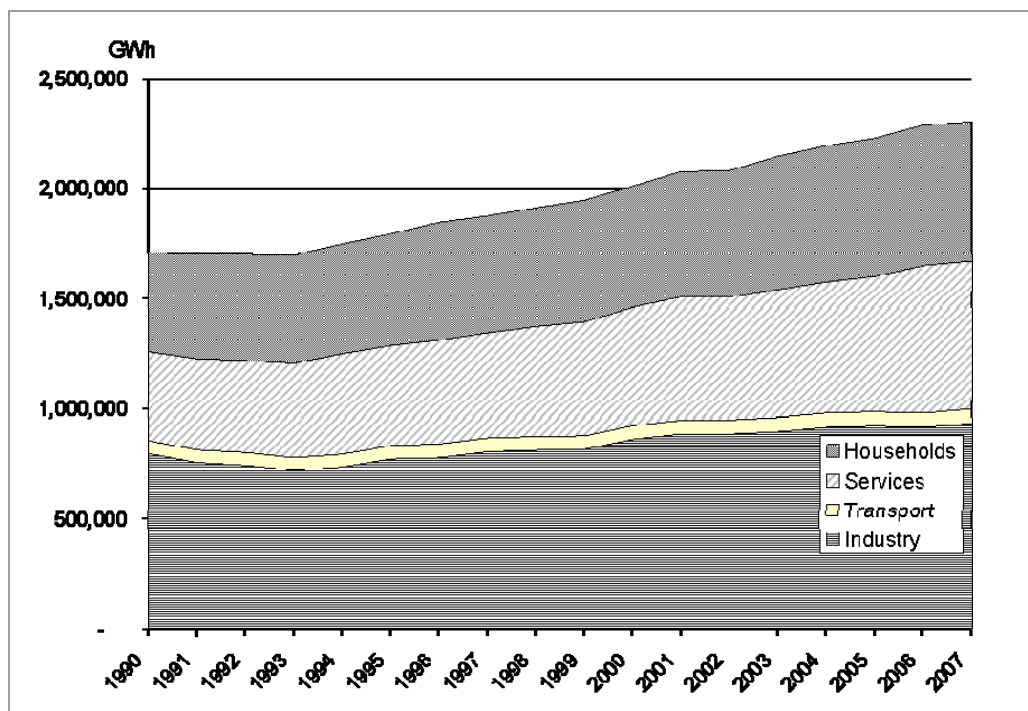
2.3 Demand

In this subsection we review the growth in demand for electricity in the UCTE area. Increases in demand will stimulate the need for new generation or for new transmission or both in order to deliver extra energy to load centers.

2.3.1 Historic demand growth

Figure 4 shows Eurostat data for final energy consumption by main sector.¹¹ It covers countries reported by Eurostat that were also UCTE members but excludes a few of the UCTE member countries. It does, however, give an indication of trends in demand growth. Over the period 1990–2007, the fastest rate of growth in demand (at 3.04% per year) was in services, which accounted for 29% of demand in 2007. Growth in household demand averaged 2.07% per year and households accounted for 27% of demand in 2007. Industrial demand grew more slowly (0.93% per year) but in 2007 remained the largest sector of demand at 41% of the total.

Figure 4 Demand Growth Trends



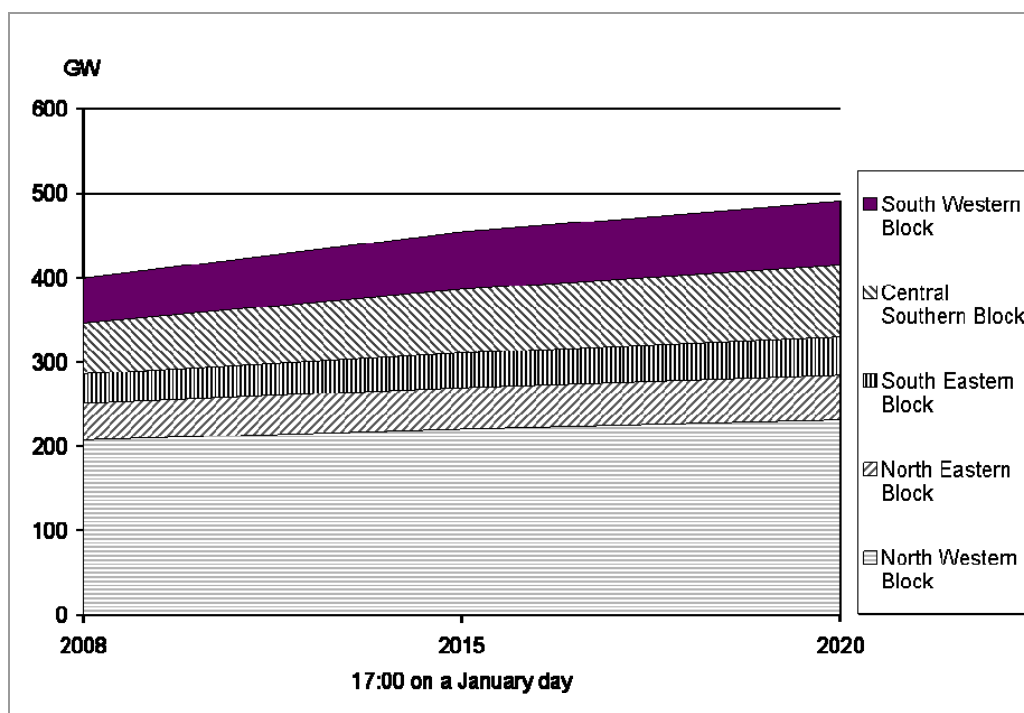
Source: Eurostat

¹¹ See Table 10 in Annex A3 for the data. Annex 3 also gives graphic presentations of some of the data in Figure 16 and Figure 17.

2.3.2 Demand forecasts

One of the UCTE services was the annual collation of system adequacy forecasts. The latest gives a prediction of growth to 2020.¹² Figure 5 shows an average predicted load growth during the hour of peak annual demand (taken as 17:00 on a January weekday) of 1.8% per annum up to 2020 (this is similar to the 1.78% growth seen between 1990 and 2007) but with considerable variation between countries.¹³ The fastest growth is predicted for the southwestern and southern countries (3.0% per annum and 2.9% per annum, respectively) and the slowest for the northwestern countries (where the largest and economically most mature countries are found – 0.9% per annum).

Figure 5 Forecast Peak Demand by UCTE Block¹⁴



Source: UCTE System Adequacy Forecast 2008

In developing its forecasts, UCTE assumed that new generation would be developed to meet the additional load. This is mainly based on indications of new build in national forecasts (up to 2015) but thereafter is based on national best estimates.

There is no evidence to date that this would not be the case, although the newer members from the former Soviet Bloc face a potentially daunting task of rehabilitating old generation, and so sufficient resources for investment in new capacity cannot be guaranteed to be

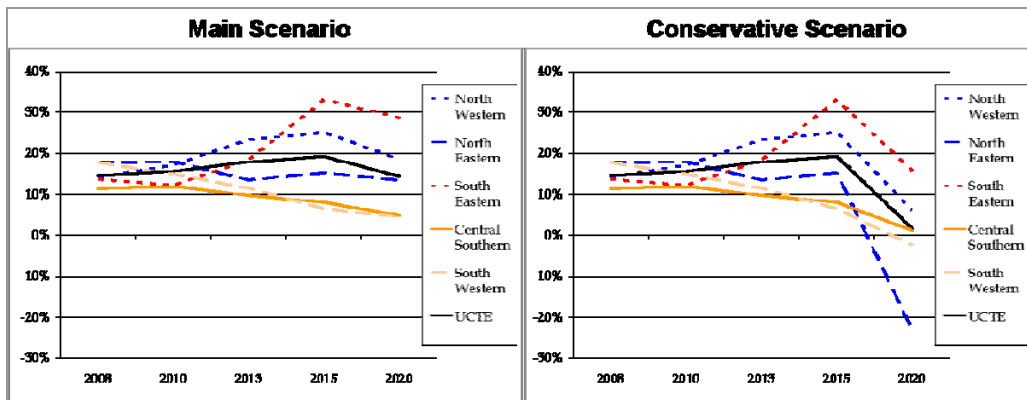
¹² See, for example: *UCTE System Adequacy Forecast 2008-2020* http://entsoe.eu/library/systemadequacy/saf/UCTE_SAF_2008-2020.pdf or *UCTE System Adequacy Forecast 2009-2020* http://entsoe.eu/library/news/UCTE_SAF-2009-2020_Report.pdf. These reports will continue in some form under ENTSO-E.

¹³ See Table 11 in Annex A3 for the data.

¹⁴ See Annex A4.1 for the UCTE classification of countries into Blocks

forthcoming. The forecast growth in capacity to meet demand is summarized in Figure 6. This is based on the UCTE SAF 2008 projections. It shows UCTE's assessment of margin of reliable generation over forecast demand at peak. The conservative scenario is based on projected new build of generation with a high probability of being developed. It shows that the North Eastern area (where there are several former Communist states) will have the most difficulty developing an adequate generation margin but that the South Eastern area, which has both former Warsaw Pact states and former Yugoslav Republics, is expecting to develop healthy generation surpluses.

Figure 6 Projected Generation Margins



Source: UCTE System Adequacy Forecast 2008

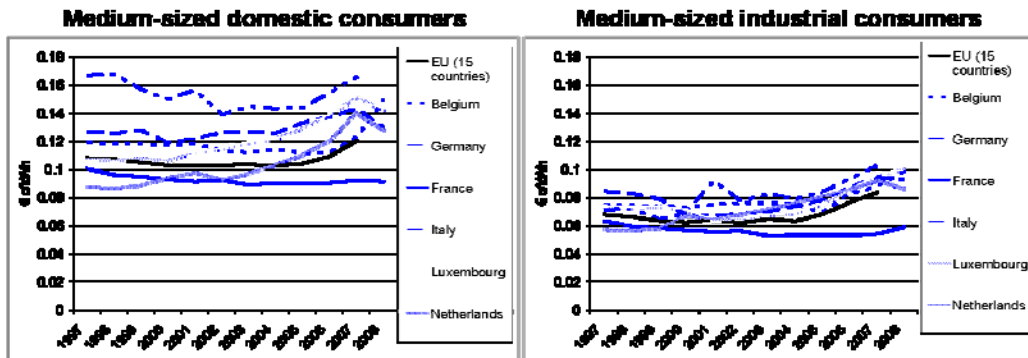
2.4 Energy tariffs

As a transmission-related organization, UCTE was not directly concerned with retail tariffs and so it produced no statistics on this. Nevertheless, in this subsection, the potential impact of UCTE services on competition and electricity prices is explored in order to discover if UCTE facilitated wealth transfer between consumers in different countries. It is acknowledged that only very tentative conclusions can be drawn from this.

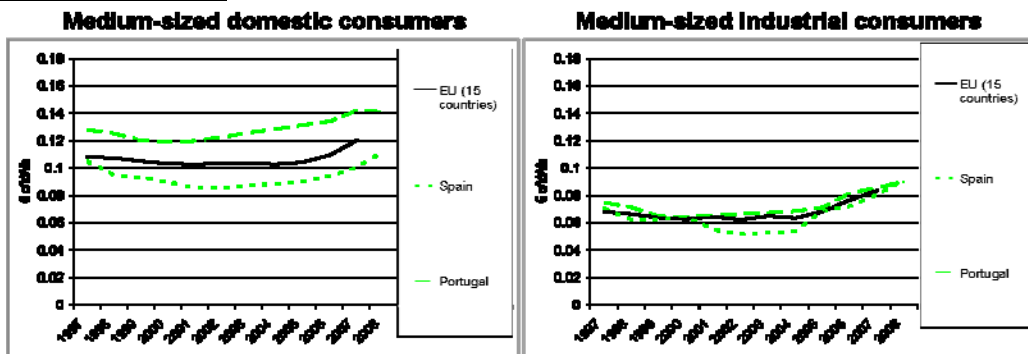
The tariff information given is derived from Eurostat, which monitors tariffs on behalf of the EU to ensure nondiscrimination in tariffs and cross-border competition in supply.

Figure 7 Retail Tariff Trends – Selected UCTE Countries

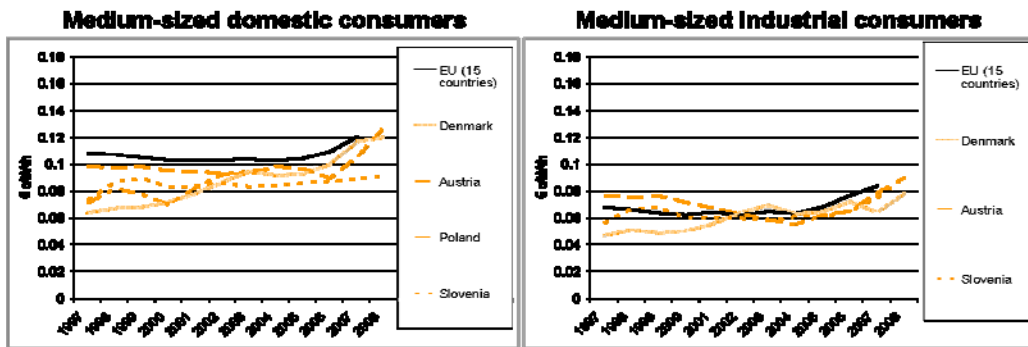
Core countries



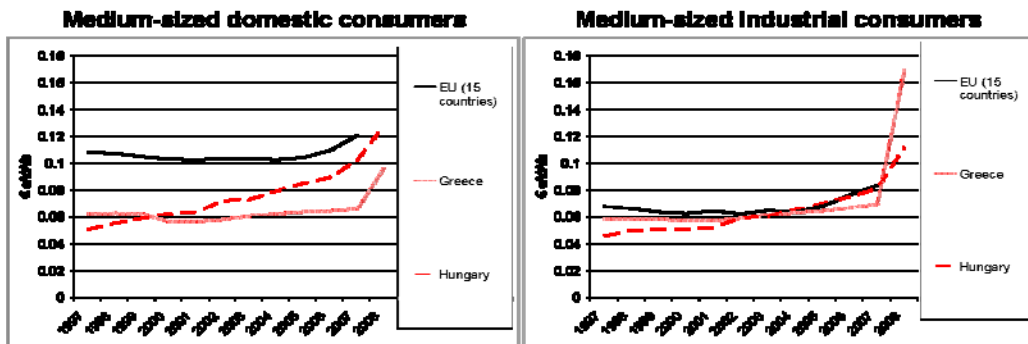
Southwestern countries



Eastern countries



Southeastern countries



Source: Eurostat

Utilities in UCTE member countries were all originally vertically integrated entities with some form of price regulation from government. This regulation had tended to be a cost pass-through with generation costs as a major element.¹⁵ Physical differences between the generation mixes in the various countries would naturally lead to differences in prices as would differences in transmission costs.

EU competition Directives¹⁶ have led to progressively increased freedom of supply in most UCTE member countries. Those countries that aspire to be EU members have adopted similar competition obligations but have until 2015 before domestic consumers must have freedom of supply contract; some form of access for larger consumers is meant to be in place already in these countries.

However, although there is theoretical freedom of retail contract in many UCTE member countries, there remains a high degree of vertical integration such that incumbent supplies will often maintain a dominant position and regulated prices are still common. In these circumstances, the main competitor to a dominant supplier is likely to be a supplier from another country, and the UCTE synchronous area should reduce one barrier to cross-border trading. Removal of physical constraints on interconnection is likely to be just as important; with TSOs as separate organizations seeking to ensure security of supply, constraints between countries are being removed, and price convergence between member countries is an expected result. In theory, therefore, cross-border access to customers should undermine national regulated price controls that are based on local generation costs, and price convergence should result. Figure 7 explores this theory. It is derived from Eurostat data (using Eurostat customer classifications of prices before tax) of countries with UCTE membership. The figure uses Eurostat's composite EU-15 prices as a set of marker prices for comparison purposes.

Figure 7 makes an arbitrary split between the countries on a geographic basis. The results do not particularly support a geographic basis for price differentiation. Nor does the information presented indicate that prices are converging, although such high-level analysis cannot be expected to account for the many factors (additional to taxation) that affect prices. A major factor affecting the figures is the degree to which competitive access to customers is effective in practice with progress varying between countries – as noted, the method of implementation of EU competition Directives is currently determined at the national level.

As is to be expected, however, industrial prices are much closer together than domestic prices, which is partly due to the greater level of contestability in supplying industrial consumers in Europe. There is therefore, partial support for the contention that UCTE has facilitated a degree of price convergence between countries, but the evidence is far from conclusive.

¹⁵ Price regulation will have similarities to an LRMC methodology in many countries but will originally have been more primitive.

¹⁶ See Box 2 on page 35 for EU Directives relevant to transmission; Annex 0 summarizes the obligations of the 2003 EU Directive on the internal market in electricity.

3 History of scheme

3.1 Overview including timeline/chronology

In the aftermath of the Second World War, the Organization for European Economic Cooperation (OEEC) proposed more European cooperation in the electricity sector. France, Italy, Luxemburg, the Netherlands, Austria and Switzerland, encouraged by OEEC, established the Union for Coordination of Production and Transportation of Electricity (UCPTE) in 1951. The UCPTE helped shape an institutional environment so that electricity network managers and engineers from European countries could gather and discuss the electrification of Europe.

Other European institutions were emerging during this period as well. One such institution was the European Coal and Steel Community (ECSC), which was created in 1952 and became the core of the subsequent EU. Although the ECSC developed an energy policy, this proceeded independently from the network building in which UCPTE was engaged.¹⁷

In 1999 UCPTE was transformed into the Union for the Coordination of Transmission of Electricity (UCTE). This development can be mainly attributable to the EC Directive of 1996, which mandated the separation of transmission from generation and supply activities. Like its predecessor, the UCTE started as an association of electricity utilities, each of which intended to develop their systems and enhance security of supply. Viewed in the context of postwar reconstruction, coordination through UCPTE/UCTE was seen as vital by the utilities and was actively encouraged by the governments that owned them. See Table 3.

From 1951 onward, UCPTE/UCTE experienced continuing growth in membership from 7 to 24 countries. This became progressively more in step with the expansion of the EU, but in some cases UCTE expansion predated EU membership. For example, the Balkan countries that aspire to join the EU had already joined UCTE.

Not all of the EU member countries were within UCTE. The UK and the Scandinavian countries are the most notable exceptions; the technical difficulties of synchronization across stretches of sea have prevented AC linkage. In contrast, Switzerland participated in UCTE but has not joined the EU.

¹⁷ Paraphrased from: *History of Electrification in Europe*. Korean Minjok Leadership Academy International Program. Kim, Kyungmook, Term Paper, AP European History Class, December 2007
<http://www.zum.de/whkmla/sp/0809/kyungmook/km2.html>

Table 3 Chronology of UCTE and European Development

Year	Event
1951	Founding of UCPTE. Original members were the grid companies (or utilities) of Austria, Belgium, France, Federal Republic of Germany, Italy, Luxembourg and the Netherlands; Denmark joined slightly later Founding of the European Coal and Steel Community (ECSC)
1957	ECSC transformed into the European Economic Community
1987	Portugal, Spain, Yugoslavia and Greece join UCPTE
1990	EU Directive on transit of electricity requires nondiscriminatory terms
1995	Poland, Czech and Slovak Republics, Hungary synchronized
1996	Membership of UCPTE changed to interconnected companies EU Directive on establishing an internal market in electricity
1996-7	Romania and Bulgaria connected to UCPTE Maghreb synchronized
1998	First “Florence” Forum on electricity deregulation in the EU
1999	UCPTE becomes UCTE Establishment of European Transmission System Operators organization (ETSO)
2001	UCTE gains civil status as an international association under Belgian law with permanent secretariat located in Brussels
2003	Western Ukraine synchronized Major network failure, affecting Italy in particular, highlights deficiencies in TSO coordination, leading to a need for greater standardization of operational practice within UCTE
2004	Western Europe and Southeast Europe become one grid again
2005	UCTE Operational Handbook becomes legally binding on UCTE members, each of whom must sign a Multilateral Agreement
2007	UCTE Compliance Monitoring and Enforcement Processes (CMEP) come into regular operation Launch of EU 3 rd Energy Package
2008-9	Establishment of ENTSO-E (European Network of Transmission System Operators)
2009	From 1 July 2009, ENTSO-E formally replaces UCTE and other associations of TSOs (, ATSOI, BALTSO, NORDEL, UKTSOA and ETSO) ¹⁸

Source: ECA based on UCTE, ENTSO-E information

¹⁸ ATSOI: Association of the Transmission System Operators of Ireland, BALTSO: Baltic Transmission System Operators association, NORDEL: Organisation for the Nordic Transmission System Operators, UKTSOA: UK Transmission System Operators Association, ETSO: European Transmission System Operators association

3.2 Project concept, objectives, and development

At its inception in 1951, UCPTÉ's mission was to contribute to the development of economic activity through the more effective use of energy resources allowed by the interconnection of electricity networks. The goals of its successor organization, UCTE, were to ensure reliability and security of supply in Europe and to reduce transmission costs by coordinating electricity flows and sharing reserve capacities within the synchronous area. UCTE facilitated the functioning of a nondiscriminatory market and was in charge of opening up the national systems of member countries for international exchanges. UCTE furthermore wished to enlarge the existing market by extending the interconnected area.

UCTE's declared mission was to provide the basis for a functioning electricity market.¹⁹ This meant:

- o Technical and operational coordination in the synchronous area
- o Controlling the short-term security of the system with regard to load, frequency control and stability
- o Monitoring the medium to long-term adequacy between generation and load (3, 5, 10 years)
- o Responsibility for the development of the synchronous area.

However, UCTE objectives cannot be divorced from the objectives of EU energy policy. The TSO members of UCTE increasingly used UCTE standards and systems to fulfil obligations laid on them by the EU (*see Box 2*). Therefore, in addition to its direct objectives of security and quality of supply, UCTE had an indirect role in facilitating trade and competition. UCTE's TSO members are not parties to the market, but instead provide infrastructure and system management services.

UCTE's responsibilities were essentially operational and required trans-national coordination within a synchronous area. UCTE did not have a direct role in development of the transmission infrastructure – financing and development of infrastructure is bound up with national price control arrangements and so cannot be easily managed by a trans-national organization such as UCTE.

With the development of the EU market, the EU perceived a need for a TSO organization covering commercial issues and encouraged the existing TSO organizations (UCTE, ATSOI, UKTSOA and Nordel) to form the European Transmission System Operators organization (ETSO). In 2001, ETSO was transformed into an association with direct TSO membership.

TSOs coordinated issues related to infrastructure costs and charging through ETSO, which played a role in developing agreements that comply with EU policy in the area of cross-border charging and congestion management. ETSO was influential in developing EU policy in this regard and played a more active role than UCTE in areas such as balancing rules coordination.

¹⁹ UCTE Presentation: "UCTE Security Package," Jakub Fijalkowski, Vienna, 20 February 2009. <http://www.energy-community.org/pls/portal/docs/250193.PDF>

UCTE worked in parallel with ETSO, which concentrated on specific issues such as congestion management. ETSO had a broader geographic coverage than UCTE because it was not bounded by the limits of synchronicity. However, ETSO membership did not impose standards on its members; it was more of a club than an operational scheme.

3.3 Feasibility studies done

UCTE carried out feasibility analyses in two main areas: system operation and system extension. Some examples follow:

System operation studies

- o UCTE Transmission Development Plan (*annual report*)
http://entsoe.eu/_library/publications/ce/otherreports/tdp09_report_ucte.pdf

This report summarizes planned interconnections and reinforcements between member countries and with neighboring countries. It is intended to identify requirements for additional investments.

- o Requirements to generating units
http://entsoe.eu/_library/news/Technical_Paper-Requirements_to_generators.pdf

A set of reporting, connection and operation standards with which generators must comply in order to provide sufficient information to allow stable operation of the interconnected system. More particularly, the standards that individual TSO members must impose on their connected generators.

- o UCTE Frequency Investigation Report
http://entsoe.eu/_library/publications/ce/otherreports/090330_UCTE_FrequencyInvestigationReport_Abstract.pdf

In the last few years the UCTE grid was experiencing increasing frequency variations at hour boundaries, multiple times per day, mainly during the ramping periods in the morning and in the evening. Statistics showed an increase of these system frequency variations, both in number and in size. There is a real risk that a further increase could create frequency deviations inside the UCTE area which could, simultaneously with a large outage, put the stability of the entire grid in danger. This paper gives the abstract of an investigation by an expert team from UCTE, including a risk analysis and recommendations to work toward greater frequency stability.

- o Final Report of the first phase of the European Wind Integration Study (EWIS)
http://entsoe.eu/_library/publications/ce/otherreports/2007-01-15-Final-report-EWIS-phase-I-approved.pdf

The support of renewable energy sources (RES) is one of the key issues in European energy policy. In order to cope with this challenge, European transmission system operators launched a Europe-wide grid study on the integration of wind power, focusing on measures needed to be taken by

legislators, regulators, grid operators and grid users, aiming at establishing a harmonized set of rules for the integration of wind power. This set of rules is vital for the secure and reliable operation of the electricity networks in the presence of variable generation. The scope of work covers all the technical, operational and market aspects related to the integration of large-scale wind power all over Europe. Attention will later be focused on system interaction with various wind turbine types, the effects of their variable power output on the system, and their ability to provide system service to enable the stable operation of an electricity grid. The final objective is to obtain the necessary information for the technical and operational measures for risk mitigation and the secure operation of the European electricity grid identified by the steady-state and dynamic investigations on electricity grid models which are established within the study. For this, market and regulatory aspects will be taken into consideration.

System extension studies

- o European, CIS and Mediterranean Interconnection – Joint UCTE and Eurelectric report
http://entsoe.eu/_library/publications/ce/otherreports/SSTINTApril2007FinalMainpartAnnexes-2007-030-0428-2-.pdf
- o Feasibility Study: Synchronous Interconnection of the IPS/UPS with the UCTE²⁰
http://www.ucteipsups.org/Pdf/Download/englisch/UCTE-IPSUPS_SoIaC_glossy_print.pdf

The Final Report provides an overview of the work performed as well as presenting the findings and results of this study. A number of recommendations on further possible activities are also given in the report. The results of the project can be used as a basis for any further decision making by the stakeholders concerned in system development on either side. Therefore, no final recommendation to synchronize is made in the report, but a list of what would need to be in place is offered.

ENTSO also did numerous studies on transmission-related topics. The following are some examples:²¹

- o **Inter-TSO compensation for cross-border transfers.** ENTSO current ITC model and possible development
http://entsoe.eu/_library/publications/entso/Current%20ITC%20model%2005.pdf .
- o **Congestion management.** ENTSO-Europex Final Report
http://entsoe.eu/_library/publications/entso/ENTSO-EuroPEX%20report-25-02-09.pdf

²⁰ UPS is the Unified Power System of Russia, IPS is the Integrated Power System (of former Soviet Republics outside Russia): Ukraine, Kazakhstan, Kyrgyzstan, Belarus, Azerbaijan, Tajikistan, Uzbekistan, Georgia, Moldova and Mongolia.

²¹ See <http://entsoe.eu/association/history/entso/> for a fuller list of reports and studies.

- o **Balance management.** Regional Balancing Mechanism for SEE
<http://www.energy-community.org/pls/portal/docs/36317.PDF>
- o **Tariffs.** "Overview of Transmission Tariffs 2007" (*annual report*)
[http://entsoe.eu/library/publications/ets/11.a.%20Final Synthesis 2007 18-06-08.pdf](http://entsoe.eu/library/publications/ets/11.a.%20Final%20Synthesis%202007%2018-06-08.pdf)

ENTSO-E is expected to continue and extend the work done by UCTE and ETSO.

Other organizations that have undertaken significant studies include the regulator group ERGEG/CEER.²² The regulators are leading the EU Initiatives toward regional pools; the idea behind these regional groupings is to solve issues such as balancing and cross-border access at a regional level prior to evolving to a full European market.

3.4 Assets built and planned resulting (directly and indirectly) from UCTE

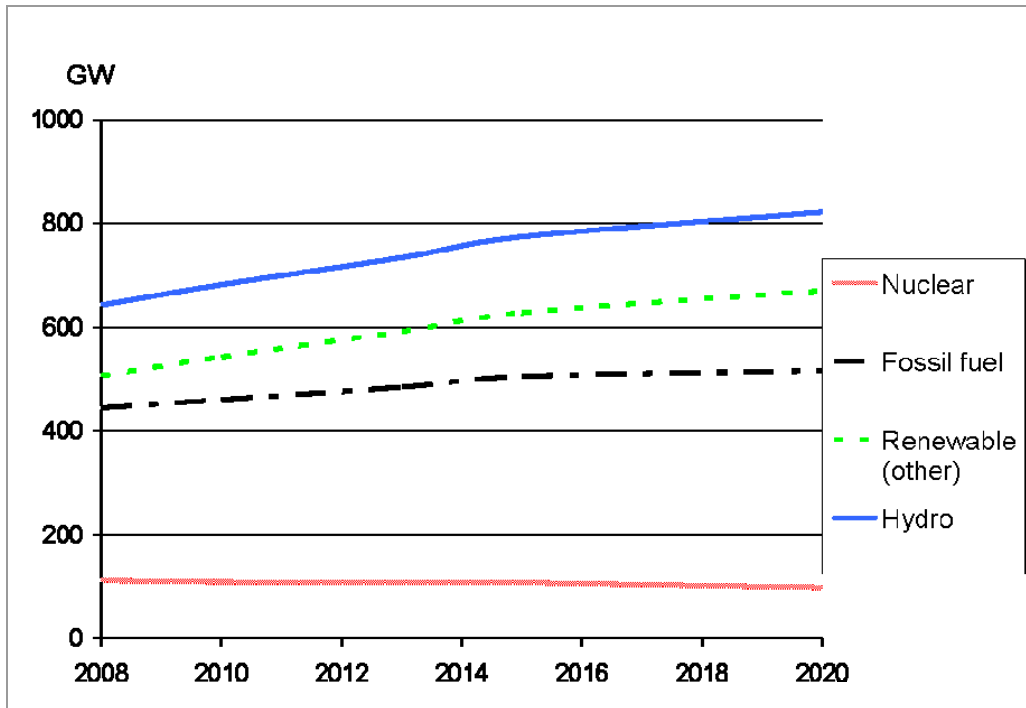
As stated above, UCTE had no direct role in investment in generation or transmission infrastructure. It set a standard for operation in a single synchronous area, and this implied the level of investment that UCTE members needed to undertake in order to comply with their obligations as UCTE members. In this section, we therefore look at the extent of these developments without necessarily attributing them to UCTE membership.

3.4.1 Generation development

UCTE projections of capacity stock were made in the annual System Adequacy Forecasts (SAF). As shown in Figure 8, in the period 2008–2020 some growth in renewables (other than hydro) is anticipated, but growth is mainly expected to be from new thermal plants. Generation from nuclear is expected to decline.

²²See http://www.energy-regulators.eu/portal/page/portal/EER_HOME. ERGEG is European Regulators' Group for Electricity and Gas and CEER is the Council of European Energy Regulators; see Section 4.3.

Figure 8 Projected Generation in the UCTE Area



Source: UCTE System Adequacy Forecasts 2008

Table 4 summarizes investments in new generation in the main regional blocks into which UCTE statistics were divided in the UCTE SAF publications. In the table, the figures relating to the South Eastern Block countries have been estimated because of changes in UCTE membership in that region between 2000 and 2008. Forecast growth is quite variable between regions:

- o Fast development is expected in the South Western and South Eastern regions, driven by fast demand growth; in the South Eastern region this is partly attributable to recovery from the impact of the Balkan wars.
- o Slow growth is expected to continue in the North Eastern region; this area is dominated by former Warsaw Pact countries, which have seen a large fall in heavy industrial production and so continue to have the generating capacity previously developed to service this load.
- o The Central Southern area has relatively fast demand growth but tends to rely on imports to service this consumption.
- o The large North Western region contains most of the more economically developed countries. Growth in this area is predicted to be at a faster rate than had been observed historically.

Table 4 does not give evidence that UCTE membership was likely to make a significant influence on either the level or the location of generation investments.

Table 4 Additions to Generation Capacity in the UCTE Area, 2000-2013

Regional Block	2000-2008		2008-2013 (f'cast)	
	GW Added	% Annual Growth	GW Added	% Annual Growth
North Western	49.3	2.0%	47.4	2.8%
North Eastern	4.4	0.9%	3.8	1.1%
South Eastern	7.1 (est)	3.9% (est)	9.9	3.3%
Central Southern	23.0	3.1%	8.5	1.6%
South Western	45.1	7.4%	21.9	4.1%
Total UCTE	129.0 (est)	2.9% (est)	91.5	2.7%

Source: UCTE System Adequacy Forecasts

3.4.2 Transmission development

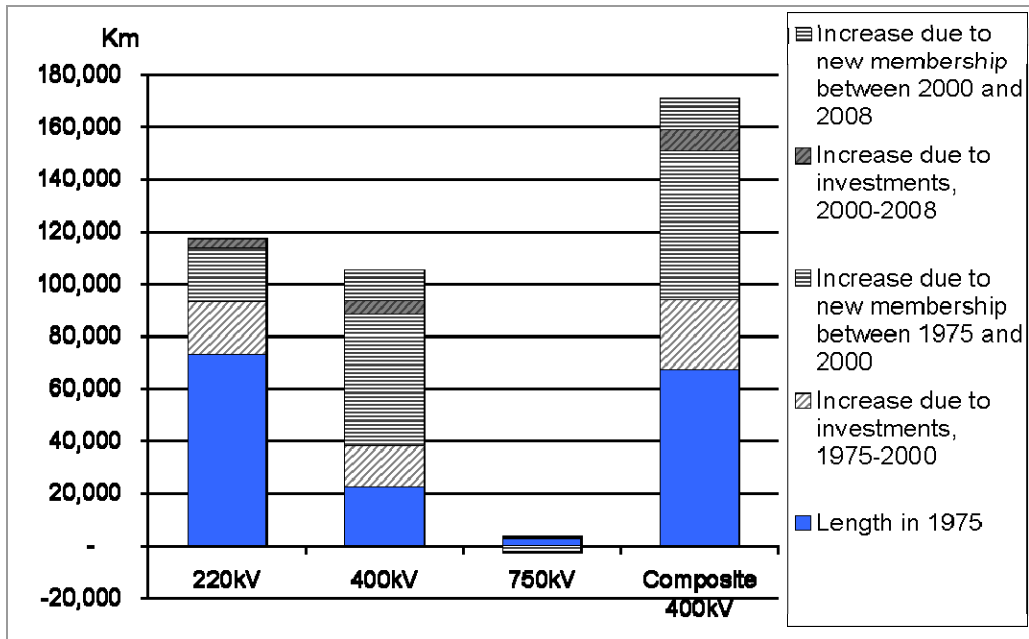
The transmission companies that were UCTE members are individually responsible for the development of their transmission systems. Figure 9 sets out what they have collectively done in this respect.²³ The diagram seeks to separate out the summated growth due simply to new countries joining UCTE and growth due to transmission investment. For illustrative purposes we have developed a crude "Composite 400 kV" calculation to indicate the effect of upgrading of lines that has also taken place.²⁴ Overall, 20% of the UCTE network can be considered to have been developed since 1975 due to new connections or upgrades, with the remainder of the overall increase due to extension into new countries.

Between 1975 and 2000, development of the total network (other than through new UCTE memberships) was at a rate of about 1.4% per year, while demand growth was nearer 1.8% per year. Since 2000, network development has been at a rate of around 0.6% per year on the Composite 400 kV measure while demand growth has been over 2% per year. This is indirect evidence of efficiency savings in transmission investment that can be at least partly attributable to UCTE through the ability of UCTE members to share the burden of provision of security of supply.

²³ See Table 9 in Annex A2 for data on network development in individual countries

²⁴ The composite measure grosses up or down the km of lines at the different voltage levels to a 400 kV equivalent. For example, a km of 220 kV line is considered to be equivalent to $(220 \div 400)$ km of 400 kV line. This is not a proper measure of the change in power that can be transmitted but is still useful for illustration.

Figure 9 Development of AC Transmission Lines in the UCTE Area, 1975-2008²⁵



Source: UCTE, ECA

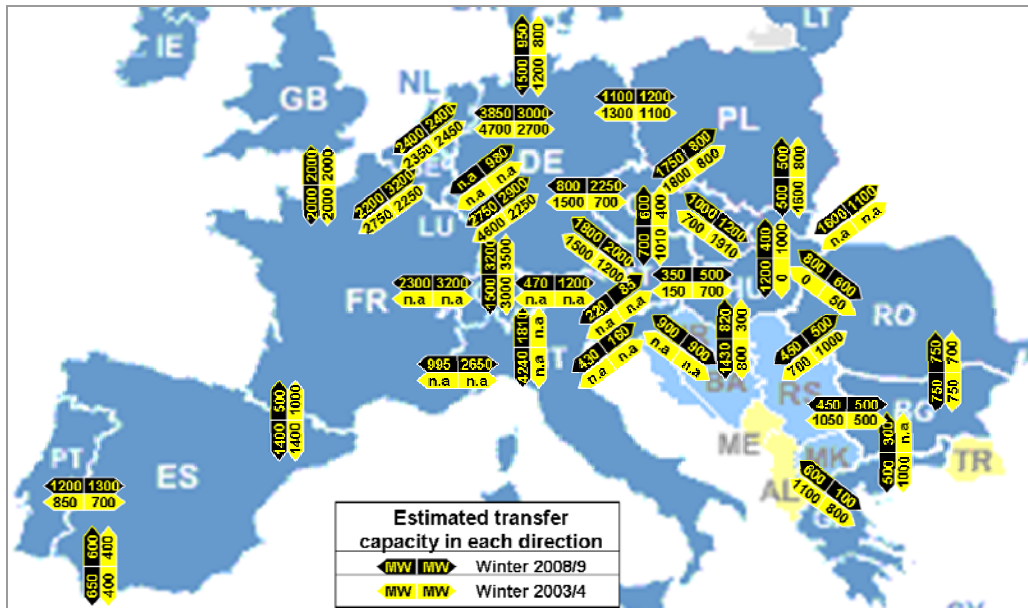
3.4.3 Cross-border transit capacity development

Within the overall development of the transmission system in the UCTE area some of the developed capacity will facilitate cross-border exchange. Figure 10 shows the change between the winters of 2003–2004 and 2008–2009 in the available transfer capacities across the main national borders in the UCTE area.²⁶ In a highly meshed synchronous zone, the amount of available transfer capacity at any border is not a simple function of additional investment in interconnection. Transfer capacity is also dependent on the ability of the importing zone to safely absorb any energy transferred. In many cases, limits will be placed due to constraints in countries not directly linked to a particular border being measured. Additional constraints due to reactive power limits can also restrict transit flows. Therefore, many of the border capacity limits actually fall between 2003/4 and 2008/9 despite additional investment in transmission.

²⁵ The data on network development in individual countries is given in Table 9 in Annex A2.

²⁶ The figure ignores capacities within the Balkan area and a few other minor interconnections.

Figure 10 Available Transfer Capacity (MW) at National Borders



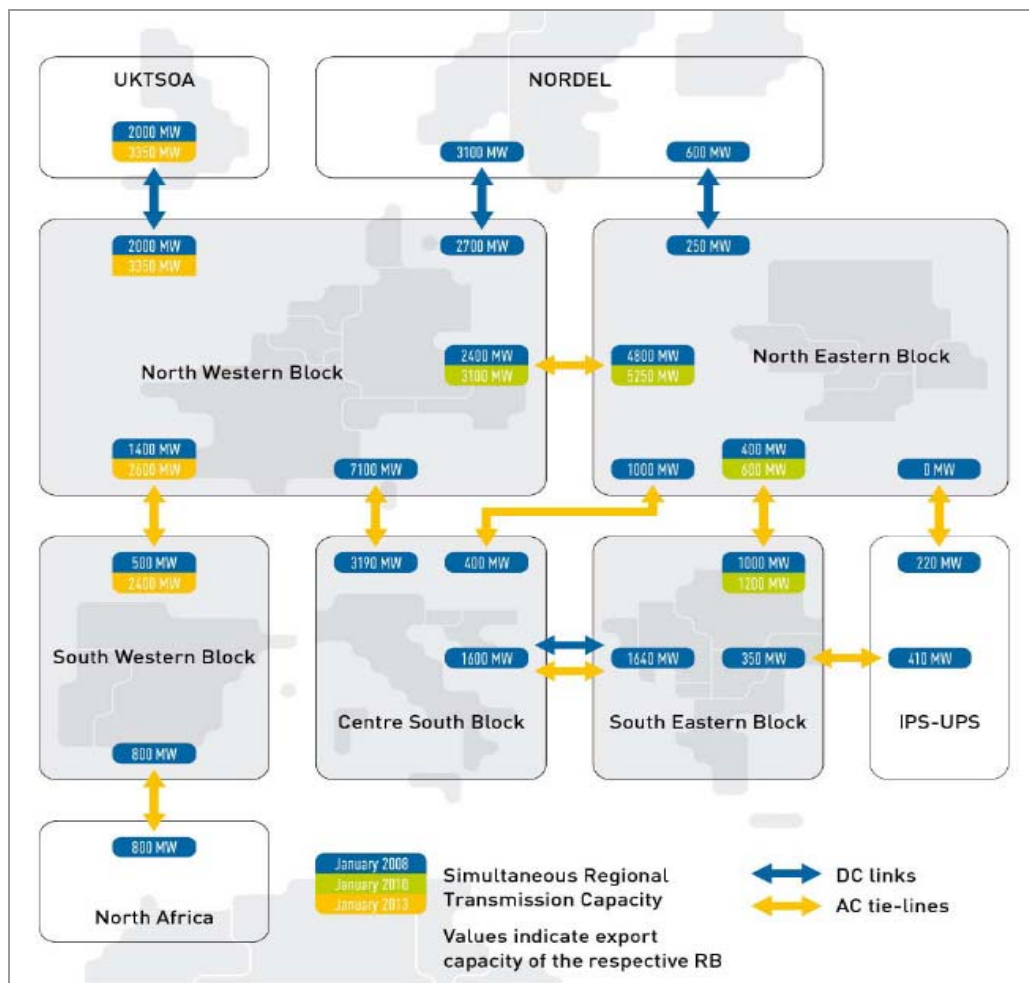
Source: ECA analysis of ENTSO-E data

3.4.4 Planned transit increases

Figure 11 gives the planned increases in cross-border transit capacity as given in the latest UCTE System Adequacy Forecast. The capacities represent the amount of power that can be exported across borders. The figures are affected by the ability of the importing network to absorb the extra power, and so it is common to see a greater export capacity on one side of a border than is available in the opposite direction. The data for new capacity are summarized in Table 5. The planned increases in interconnections are dominated in total volume terms by interconnection additions to the import and export capacity of the large North Western Block. This is, however, inflated by the planned increases in DC interconnections with the UK area, which is mainly to support demand growth in the UK. The other area to see significant growth is the peripheral South Western Block.

These figures cannot be directly compared with the data given in the preceding section, which was expressed in kilometers of additional transmission line. They suggest a significant investment to relieve specific constraints to electricity transit. Actual energy transfers are reviewed in the next section.

Figure 11 Planned Increases in Transit, 2008-2013



Source: UCTE SAF

Table 5 Incremental Additions to Transit Capacity Planned by 2013 (MW)

Regional Block	AC		DC		AC and DC		% of existing capacity	
	Exp't	Imp't	Exp't	Imp't	Exp't	Imp't		
North Western	1,900	2,350	1,350	1,350	3,250	3,700	21%	27%
North Eastern	650	900	-	-	650	900	7%	12%
South Eastern	200	200	-	-	200	200	7%	8%
Central Southern	-	-	-	-	-	-	-	-
South Western	1,900	1,000	-	-	1,900	1,000	146%	45%
Total UCTE	4,650	4,450	1,350	1,350	6,000	5,800	18%	16%

Source: UCTE SAF

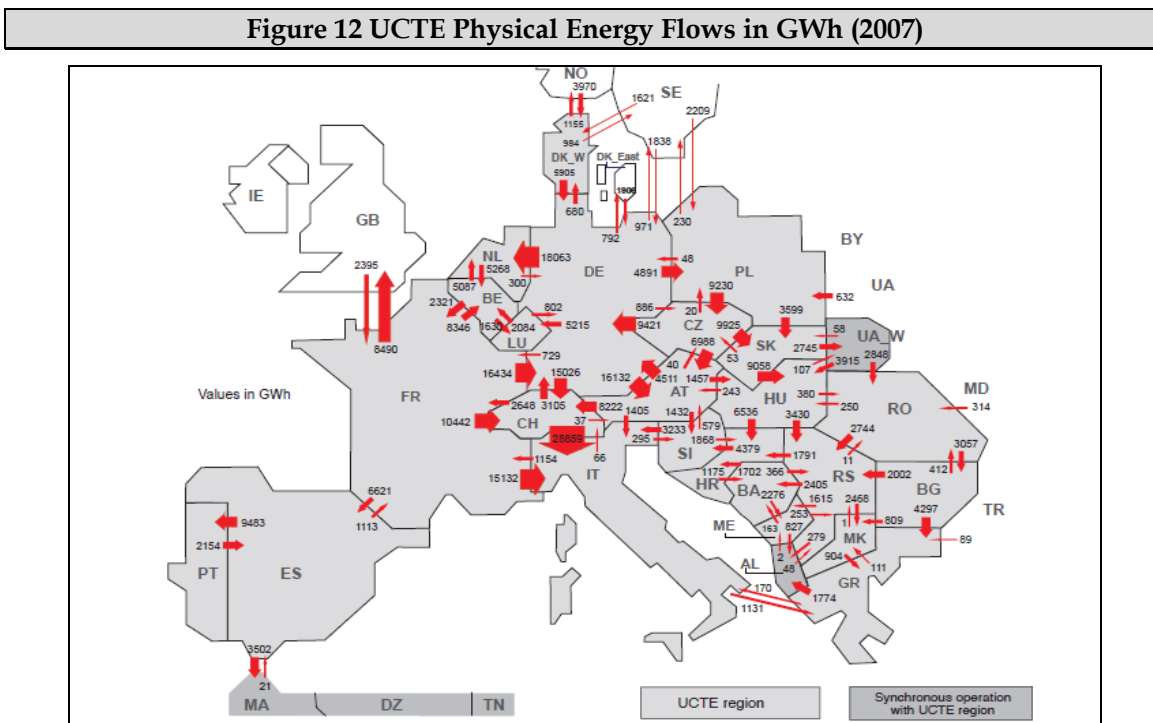
3.5 Interconnections and electricity trade

The balance of exchange between UCTE member countries and volumes of exchanges with third parties are summarized in Table 6. Exchanges within the UCTE area have grown at a rate of 8% per year – well ahead of the growth in demand.

Year	Exchanges within UCTE (TWh)	Exchanges with Third Parties (TWh)
2000	178	30
2001	236	33
2002	251	37
2003	264	36
2004	255	44
2005	299	49
2006	297	46
2007	304	47

Source: UCTE Statistics Yearbook, 2007

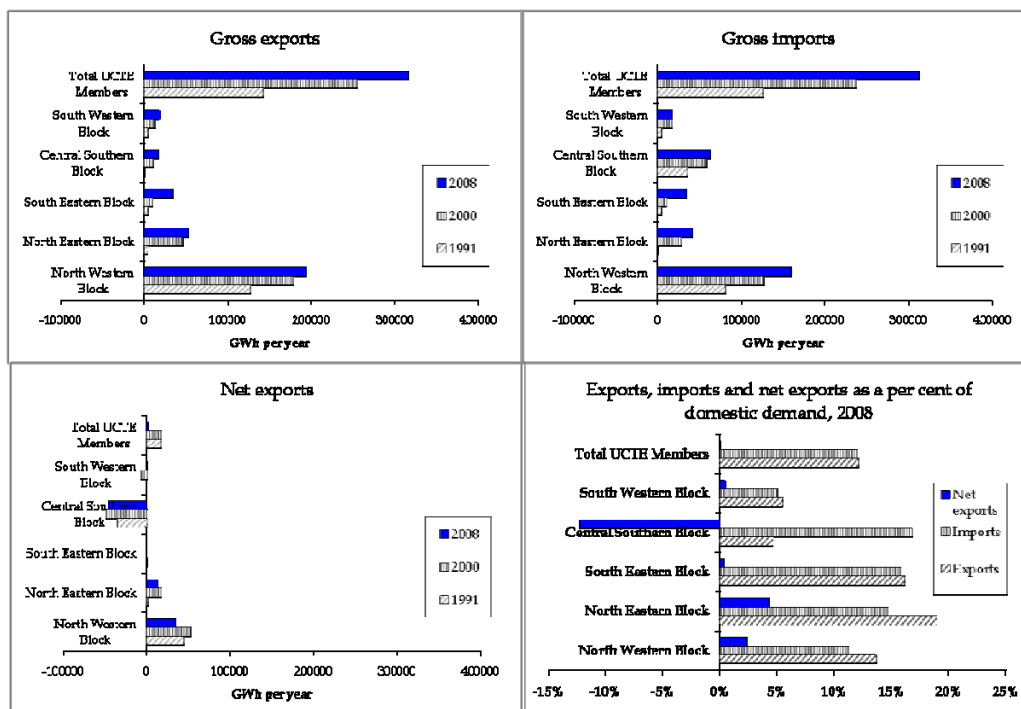
Figure 12 shows the energy flows within the UCTE area for 2007.



Source: UCTE Statistics Yearbook, 2007

UCTE also published detailed information on cross-border transfers. Annual data for this is shown in Figure 13; the Block classification used in the figure is based on the classifications applied by UCTE in its System Adequacy Forecasts.²⁷ Figure 13 shows the sum of exports and imports of countries in each of the Blocks and so includes growth in trade within blocks as well as between blocks.

Figure 13 Trends in Cross-Border Transfers of UCTE Regions (GWh)



Source: UCTE

For most of the UCTE area, either exports or imports of energy exceeded 10% of domestic demand in 2008. The exception is the South Eastern Block, which was only re-synchronized with the rest of the UCTE network in 2004; in this block, cross-border trade was only about 5% of domestic demand.

With the exception of the Central Southern Block, exports and imports of each block as a whole tend to balance each other off. This suggests that much of the observed exports and imports are to and from countries within the same block. In the case of the Central Southern Block, imports far exceed exports.

With the exception of the North Western Block, trends in the growth of exports and imports need to be viewed cautiously because some of the growth simply reflects collection of data as new countries have joined UCTE. However, comparison of data for 2000 and 2008 gives a reasonable picture of underlying growth (except for the case of the South Eastern Block). Table 7 does this comparison and shows a picture of expansion of either exports or imports

²⁷ Figure 13 data are derived from the country data given in Annex A4 on page 53 (see Table 12). See also Table 13 for exports and imports as a percentage share of demand in individual countries.

(or both) at a more rapid rate than the underlying growth in domestic demand, showing the increasing development of cross-border trade. The North Western Block is discussed in more detail in Box 1.

Table 7 Growth in Electricity Demand, Exports and Imports, 2000 to 2008

	Electricity Demand	Electricity Exports	Electricity Imports
North Western Block	6%	9%	27%
North Eastern Block	2%	16%	49%
<i>South Eastern Block²⁸</i>	132%	253%	248%
Central Southern Block	29%	70%	7%
South Western Block	31%	59%	-2%
UCTE Average	16%	24%	32%

Source: UCTE

Some of the reasons for growth in electricity trade are discussed in Box 1. It is not possible to definitively attribute this growth to UCTE because UCTE's role is to facilitate cross-border electricity transfer and not to explicitly invest in such transfers. However, a frequent impediment to trade is lack of confidence in the continuous availability of power from another country, and UCTE seems to have been successful in removing this as a problem. It should also be noted that the EU approach to market opening was always likely to increase the extent of cross-border trading.

²⁸ The data for South East Europe are distorted by the geographic expansion of UCTE within this area during the period covered by the table.

Box 1 Development of Trade in the UCTE North Western Block

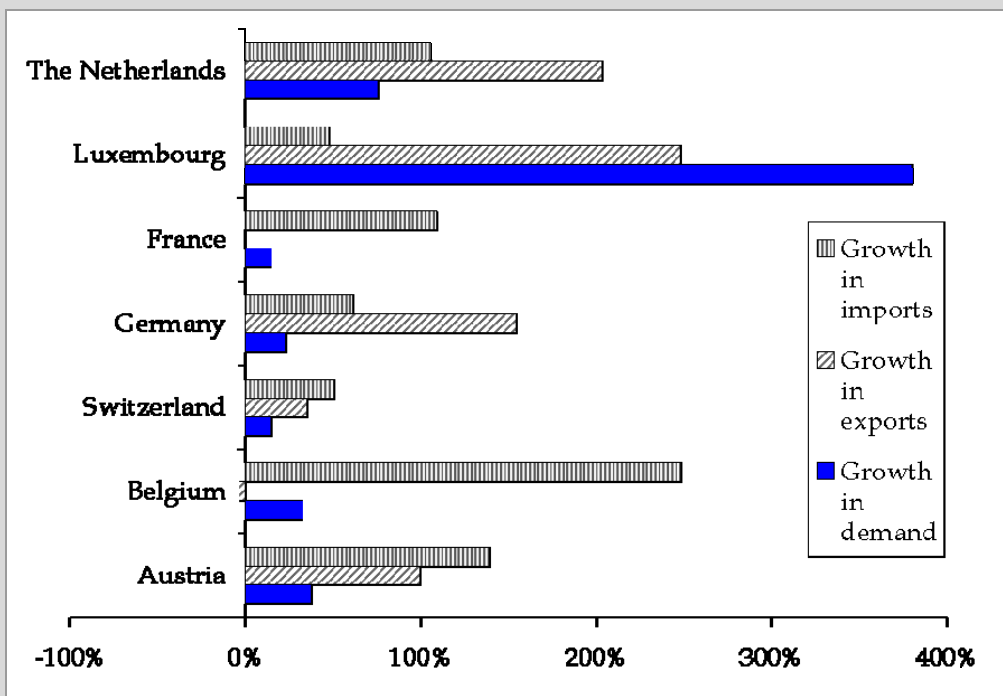
Background

The UCTE North Western Block included the countries that had been UCTE members for the longest period of time. These countries are: Austria, Belgium, France, Germany (although this was originally just West Germany), Luxembourg, The Netherlands and Switzerland.

These countries are the most economically mature of all the UCTE member countries. Some of the implications of this are:

- o They have ceased the rapid growth phase that characterized reconstruction after the Second World War;
- o They have reduced the proportion of heavy industry in their GDP and in their electricity consumption, relying more now on the service sector;
- o They have well-developed electricity trading systems.

Growth in Demand and in Cross-Border Electricity Trade, 1991-2008



Source: UCTE

Growth in electricity demand in most of the countries in the North Western Block has been moderate, averaging 1.2% per year between 1991 and 2008. Demand in Luxembourg grew much faster but was only 0.5% of the overall demand of this North Western Block in 2008 and so could not significantly affect the overall growth in demand in the block.

Therefore, there is no a priori reason to expect rapid growth in cross-border

electricity trade. But as the figure shows, in several of the countries growth in either exports or imports has been significantly faster than growth in electricity demand.

The figure shows an annual picture; it does not, therefore pick up seasonal and within-day patterns. UCTE published monthly cross-border exchange volumes but not within-day values. It therefore fails to reflect cross-border activity on short-term trading exchanges, which increasingly cater for bids from entities across borders.

The North Western Block demonstrates the extent to which cross-border energy flows and even cross-border flows for balancing markets are likely to grow even in otherwise mature markets. This is very much in keeping with UCTE objectives that facilitate cross-border flows not only for bulk energy transfer but also for the energy needed to enhance short-term security of supply.

3.6 Environmental and social issues

Most of the member countries of UCTE are Annex 1 signatories of the Kyoto Protocol.²⁹ These countries have explicit commitments to the reduction of greenhouse gas emissions. These commitments are formalized and also extended through European Union Directives. This did not directly impact UCTE.

However, a significant effect of these commitments is the promotion of energy from renewable sources, with wind power becoming a major contribution to generation from renewables. The unpredictability and intermittency of wind generation poses a problem for transmission operation, and this was being addressed by UCTE. In Section 3.3, we described the European Wind Integration Study being undertaken.³⁰ Although it is at an early stage, the study has identified the need to move beyond the current national approach to renewables targets and to bring wind generation into the mainstream of electricity balance by providing efficient incentives for wind projects. On the technical level, the report has identified the benefits of requiring fault-ride capability and responsibility for voltage support from wind power producers in order to protect networks at high levels of wind generation. ENTSO-E is committed to taking this work forward.

²⁹ The exceptions to this are Bosnia and Herzegovina, Macedonia, Montenegro, Serbia

³⁰ See also *Final Report of the first phase of the European Wind Integration Study (EWIS)*

<http://entsoe.eu/library/publications/ce/otherreports/2007-01-15-Final-report-EWIS-phase-I-approved.pdf> and Annex A4.2

4 Institutional arrangements

4.1 Governance arrangements

4.1.1 TSOs in the governance framework

UCTE operated in a legislative environment that was dominated by the EU (the EU legislative framework is summarized in Annex A6.1; the main TSO responsibilities are summarized in Box 2). Within the EU framework, transmission system operators (TSO) are responsible for the operations of the physical electricity system. These functions are performed at the national level, but there is a need for a high degree of coordination, which was undertaken through UCTE within its area of control.

Not all of the EU geographic area is covered by UCTE. Other geographic areas have developed similar organizations. For example, NORDEL coordinates a synchronous area in Scandinavia with a highly developed trading system.

Developments in late 2008 involved the amalgamation of UCTE with other TSO organizations (e.g., ETSO as well as the grid coordination organizations for Scandinavia and the Baltics) into ENTSO-E. This new organization began operation on 1 July 2009, and it is obviously too early to assess its performance. However, ENTSO-E has developed partly as a response to a move within the EU for greater regional (as opposed to national) control over the energy market, and it has an extended scope.³¹

4.1.2 UCTE governance framework

This section covers the governance framework of UCTE that had evolved by 2009.

Prior to 2005, enforcement of UCTE rules was on a voluntary basis, relying on the common interests of all members in maintaining secure operation within the synchronous zone. However, following a major network failure in 2003, when supply to much of Italy in particular was temporarily lost, it was clear that system security had become more complex. UCTE had also grown geographically such that member interests had possibly become less homogeneous. Therefore, UCTE initiated a project to develop a legally enforceable framework. From 2005, as a condition of membership, each UCTE Member had to sign a **Multilateral Agreement**.

The main term of the Multilateral Agreement was compliance with an **Operational Handbook**, which had been developed covering:

- o Load-Frequency Control and Performance
- o Scheduling and Accounting
- o Operational Security
- o Coordinated Operational Planning

³¹ ENTSO-E objectives are set out in Annex A5.2

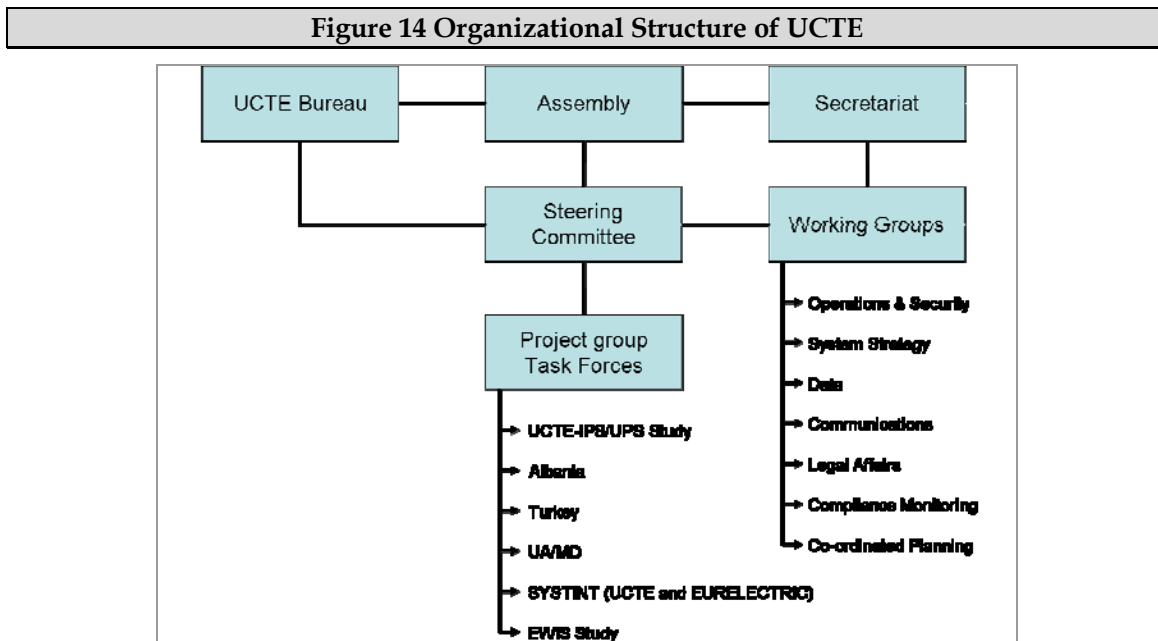
- o Emergency Procedures (Operations)
- o Communication Infrastructure
- o Data Exchanges
- o Operational Training

The Operational Handbook is a substantial document that will continue to evolve under ENTSO-E. In 2007, the Compliance Monitoring and Enforcement Processes (CMEP) came into regular operation to gather information about member compliance with the Operational Handbook and to impose penalties or remedial measures on transgressors. The UCTE Steering Committee had ultimate responsibility for enforcement. This enforcement was, however, on a civil contractual basis and not on a statutory basis.

Coordinated planning was the latest evolving element of the UCTE Operational Handbook. Investment plans were reported to UCTE, whose technical personnel assessed the plans and forecasts of its members in order to produce the annual System Adequacy Forecasts. The transmission investment framework implied by these forecasts was not binding on UCTE members. This will be a major element of ENTSO-E activities and will have enhanced impetus due to the obligation expected to be placed on EU members to coordinate planning. However, the transmission investments resulting from such planning will not be obligatory.

4.1.3 UCTE organizational structure

Figure 14 illustrates the organizational structure of UCTE and lists the working groups and project groups as of the first half of 2009.



Source: UCTE

The operations of UCTE were governed by several different bodies:

- o The **UCTE Bureau** consisted of the president and the vice-president of the association, the chairman of the Steering Committee, and the secretary-general. It was responsible for the external representation of the organization as well as for the coordination of the other major bodies.
- o The **Assembly** was the ultimate decision-making body of the organization and comprised representatives from each TSO member and each country. It met once a year to determine:
 - o Membership and associate membership: admission, withdrawal, exclusion of members and associate members;
 - o Modifications or amendments to the Articles of Association or the Internal Regulations;
 - o The annual budgets and accounts;
 - o General strategy of UCTE;
 - o Designation of the members of the bureau;
 - o The establishment, staffing and organization of the Secretariat;
 - o Referrals made by the Steering Committee.
- o The **Secretariat** managed day-to-day functioning but had no executive power.
- o The **Steering Committee** was comprised of one national representative per country, and the committee was responsible for technical issues and recommendations. These included adaptations of rules and compliance. It had responsibility for:
 - o Establishing the Working Groups, directing their activities and deciding on their recommendations;
 - o Decisions on technical rules and on compliance with those rules;
 - o Decisions on development of the UCTE Synchronous Area;
 - o Decisions in areas not covered by the Assembly.
- o Finally there were several **Working Groups** which handled issues such as legal affairs, operations and security as well as coordination and planning and reported these to the Steering Committee as well as to Project Task Forces assembled to address specific issues.

4.2 Role of national governments and regional institutions

The EU Commission has been granted a central role in all areas related to electricity markets. National governments have allowed the EU wide powers to develop rules that facilitate the

Institutional arrangements

competitive market but have accepted the task of implementation of EU rules at the national level.

The key elements of the EU directives relating to transmission are listed in Box 2. There is a limited set of such obligations, but in many cases membership of an organization such as UCTE/ENTSO-E can assist in the information provision requirements and the planning and security elements of these obligations.

Box 2 EU Legislation Relevant to Transmission

Internal market (*see Annex 0 for fuller text*)

- o Independence of TSO
- o Nondiscrimination in network access
- o Information provision to system users
- o Reciprocity in access across borders

Network access for cross-border exchange (*see Annex 0 for fuller text*)

- o Compensation mechanism for hosting cross-border flows paid by the TSO of the network from which the flow came
- o Nondiscriminatory network congestion solutions with appropriate information provision
- o Participant obligation to inform TSO of intended use of the interconnector
- o TPA exemptions may apply but only to DC interconnectors

Network development – TEN-E Guidelines (*see Annex A6.5 for fuller text*)

- o Speedy completion of projects
- o Cooperation guidelines on specified projects of common interest

Security of supply (*see Annex A6.6 for fuller text*)

- o TSOs must set minimum standards for quality and availability
- o Member states are responsible for providing network operators with information to inform investment

Renewables (*see Annex A6.7 for fuller text*)

- o Transportation guarantees for RES-E projects
- o Potential for network operators to bear some of the connection costs

4.3 Regulatory agencies

Within the EU framework, regulation is a national responsibility, and so each system operator has a direct relationship with the national regulator that will have licensed it.³² Therefore, formal enforcement action on TSOs is performed at the national level.

Regulators have formed their own transnational organizations: the European Regulators' Group for Electricity and Gas (EREG) and the Council of European Energy Regulators (CEER).³³ These bodies are intent on evolving the essentially national electricity markets into a set of regional balancing and trading markets. In addition, the EU will impose a new regulators organization: the Agency for Cooperation of Energy Regulators (ACER), but its effective responsibilities relative to those of the national regulators will need to be established.

UCTE was active in assisting in regulatory initiatives on behalf of its members. Although it is convenient for TSOs to act through a regional body such as UCTE in promoting their interests within such regulatory initiatives, there was also a technical requirement to ensure that such initiatives remain compatible with the UCTE Operational Handbook (or else to change the Operational Handbook in a considered and measured way to reflect such regional changes).

Regulators also worked with ETSO on their regional initiatives but sometimes preferred to work through UCTE because any regulation that UCTE agreed to became legally enforceable on UCTE members.

The EU Commission currently takes on some roles that might be deemed to be regional regulator roles. It has ultimate enforcement powers in areas covered by EU Directives. Most EU policies will have a system operator dimension, and UCTE had a role in assimilating the relevant parts of EU legislation into its Operational Handbook. The areas where transmission operation can be impacted by EU legislation is summarized in Box 2.

4.4 Role of outside agencies

As noted above, UCTE was an independent association of interconnected system operators. However, as also noted, it worked within the transnational EU framework and actively participates in regional technical fora as well as, to an extent, political fora. ETSO can be similarly described.

Outside agencies other than the EU did not play a direct role in the governance or policies of UCTE and ETSO. This basic situation does not change with the formation of ENTSO-E.

³² In the EU model, all regulators should be independent and be responsible for licensing entities in the electricity industry. There are exceptions to this among UCTE members, including those that are also EU members, but the overall licensing and regulatory principles still tend to apply.

³³ CEER was a voluntary grouping of 10 regulators founded in 2000. EREG was created by the EU Commission in 2003 as an advisory body on cross-border regulatory issues. Both groupings have effectively converged. Neither body has statutory powers.

5 Contractual, financial and pricing arrangements

5.1 Contracts

5.1.1 Transmission contracts

The primary standard that UCTE governed was the operation of the European network as a synchronous zone. To achieve this it moved away from an approach whereby it determined the obligations and individual members then worked out how to meet those obligations. Increasingly, UCTE developed toward a common rulebook covering issues such as grid connection, security levels, fault levels and overall planning. This was set out in the **Operational Handbook**, which had been in force since 2005 and was put into effect through a **Multilateral Agreement** that each system operator member had to sign. The Multilateral Agreement can be seen as an inter-TSO multilateral transmission contract.

The Operational Handbook evolved into the area of system planning coordination. This had potential to place specific investment obligations on UCTE members in the area of interconnection. At present, investment obligations on UCTE/ENTSO-E TSOs are implicit: members must meet security standards and so must invest in appropriate congestion management to ensure security of supply within their own control areas, including being able to import energy where local generation is inadequate.

However, the current arrangements involve essentially national balancing markets, and TSOs must operate within rules where they are obliged to take responsibility for balance within their control areas. Therefore, the contract between the TSO and the trading participants in the market remains separate for each country.

The EU seeks to develop this into the area of uniform network codes for system balancing arrangements. This is a new area to be addressed by ENTSO-E.

5.1.2 Energy contracts

The EU Directive on the single market stipulates a requirement for bilateral retail contracting. To be effective in a multi-country environment like the EU single market, bilateral wholesale contracting is also needed. Bilateral wholesale contracting is particularly important because there are different models governing the balance markets in different control areas. The majority of EU markets have developed as bilateral physical contract markets with residual balancing markets, but some markets operate on a gross pool basis.³⁴

The contracts in the market are now essentially commercial with few being simple power transfers between integrated utilities. Even where markets are still dominated by vertically integrated utilities:

³⁴ A bilateral contract market with residual balancing is known as a “net pool” market. It is characterized by generators self scheduling and will usually be accompanied by a balancing market in which generators submit bids to the TSO to modify dispatch so that the TSO can procure physical real time balance. There are a few “gross pool” national markets in Europe, in which generators submit bids to a central market operator in order to be scheduled to operate.

- o Within the whole European framework new generation is increasingly developed on a commercial basis.³⁵
- o Spot and forward power exchanges are becoming institutions with cross-border capabilities, with short-term transfer becoming common.
- o As distribution companies lose their captive customer base, competitive supply companies that need to access wholesale markets for their energy are common in most countries.

5.1.3 Interconnection contracts

In a synchronized network, interconnection usage could be treated in the same way as national transmission capacity. This happens to an extent in areas with implicit auctions of capacity (see below), but in general in the UCTE area, interconnector access rights are separate from transmission access – interconnector users must pay the cost of congestion on the interconnector, while congestion costs within national transmission systems are averaged across all users.

EU legislation governs terms of interconnection, which is again on a commercial basis (regulation specifies nondiscriminatory access, but tariffs are not regulated). In some areas there is experiment with regional auctions of short-term interconnection capacity.

Nondiscriminatory third-party access to interconnections is a universal requirement. In most cases capacity is allocated by explicit or implicit auction:

- o **Explicit auctions** are clearing markets operated by the TSOs in which participants bid for an allocation of cross-border capacity. Such auctions are almost always applied on DC interconnections, but they can also be used on AC transfers. The following interconnections within the UCTE area have capacity allocation based on explicit auctions:

Austria-Switzerland	Czech-Poland	France-Italy
Austria-Czech	Czech-Slovak	Croatia-Hungary
Austria-Hungary	Germany-Denmark	Croatia-Slovenia
Austria-Italy	Germany-France	Hungary-Romania
Austria-Slovenia	Germany-Luxembourg	Hungary-Slovak
Bulgaria-Romania	Germany-Netherlands	Poland-Slovak
Switzerland-Germany	Germany-Poland	Romania-Serbia
Czech-Germany	Spain-France	

³⁵ Some national governments or regulators do still have powers to tender for additional generation, but these powers are increasingly difficult to enforce because the utilities who would have to buy the contracted power are progressively losing their regulated customer base – all consumers in the area covered by EU legislation (which also includes countries that are not members of the EU) will shortly be able to be supplied by any commercial supplier.

In most cases, these auctions are based on an assessment of all available capacity, but in a few cases, the available capacity is restricted due to priority rights being given to preexisting contracts between utilities. This applies mainly in Eastern Europe.

- o **Explicit auctions with multi-border clearing** is a specific subset of explicit auctions being proposed for South East Europe. This will replace arrangements that are currently dominated by long-term bilateral contracts between existing vertically integrated utilities.³⁶ In the current arrangements in South East Europe some (but not all) such utilities are given priority access to interconnector capacity sufficient to satisfy existing public supply obligations. With these countries committed to universal competition in supply, the role of public service supplier will diminish and the right to priority access to interconnection will cease to be sustainable. Therefore, the region is experimenting with an auction office that will operate a clearing auction across several interconnections with a simultaneous settlement that optimizes use of all available transfer capacities. The borders affected are as follows:

Bosnia–Croatia	Bulgaria–Macedonia	Montenegro–Serbia
Bosnia–Montenegro	Bulgaria–Serbia	Macedonia–Serbia
Bosnia–Serbia	Croatia–Serbia	

- o **Implicit auctions** are common in Scandinavia, but they have recently been introduced in a market-coupling agreement between the Belgian Belpex, Netherlands APX and French Powernext power exchanges. With market coupling the daily cross-border transmission capacity between the various areas is not explicitly auctioned among the market parties, but is implicitly made available via energy transactions on the power exchanges on either side of the border (hence the term *implicit auction*). It means that the buyers and sellers on a power exchange benefit automatically from cross-border exchanges without the need to explicitly acquire the corresponding transmission capacity. The arrangement is also known as "market splitting" to reference the fact that price differentials between the exchanges result when congestion occurs. The following interconnections are affected by this arrangement:

Belgium–France	Belgium–Netherlands	France–Luxembourg
Belgium–Luxembourg		

A mix of implicit and explicit arrangements can be found on the Italy–Slovenia border.

In a few cases other allocation arrangements apply (Spain–Portugal, Switzerland–France), sometimes in combination with implicit auction arrangements (Switzerland–Italy).

Finally, at a few borders, there is no congestion and so no allocation method is needed (Austria–Germany, Switzerland into France).

³⁶ I.e., they operate a discriminatory access arrangement in temporary contravention of their obligations to the EU under a treaty they have signed with the EU.

In summary, therefore, there is no uniform methodology for allocation of scarce interconnector capacity, but the EU Directive is being interpreted in a way that ensures that all traders get a fair chance at access to cross-border capacity. Therefore, lack of competition in some countries is due to dominance in access to consumers and not due to inability to access transmission.

5.2 Ownership and finance

Transmission and interconnection

In many cases in the UCTE area, independent TSOs are still owned by integrated utilities, which are in turn owned by national governments. This is changing, with the utilities becoming public companies (with a reduced or nonexistent government stake) and the TSOs being floated as independent companies (again possibly with a government stake) reliant on transmission charges to fund their activities.

TSOs own all the interconnections and will tend to be responsible for physical infrastructure on their geographic territories. In some cases this ownership is hived off to a separate company (for example the DC interconnector from France to the UK, which is outside the UCTE area), and in such cases the interconnector may be treated as a commercial venture rather than as part of the TSO's regulated asset base. However, in nearly all cases interconnectors are financed by TSOs as part of their regulated asset base. In an AC system with many interconnections and parallel flows between several different countries it can be difficult to distinguish between assets used for interconnection and those used for internal transmission, and so TSO ownership of interconnectors and integration of them into the TSO asset base is usually inevitable. This does not prevent revenues from interconnection being dependent on auction income rather than on set tariffs.

To date there are no fully independent commercially financed interconnectors in continental Europe.

Distribution and supply assets

There is a wide variety of ownership structures for distribution assets in the UCTE area. In many cases, the assets are still owned as part of integrated utilities that can have an element of government ownership. However, ownership of distribution no longer guarantees access to customers because competitive supply has been separated from distribution for all consumers. By 2015 at the latest, all residential consumers will be able to take supply from competing suppliers; in many countries, this retail competition is already in place.

Generation

There is a wide variety of ownership structures for generation assets. In principle, generation is a commercial venture in which any company may engage. In many countries, however, generation assets are still predominantly owned by the former monopoly utility.

Even where there is domination by one company in generation, there are often remedial measures to promote competition. In France, for example, a series of Virtual Power auctions have been required whereby the dominant company, EDF, must sell contracts for sale of the output from a proportion of its generation assets.

New generation in the UCTE area is frequently developed by commercial entities – usually for sale under long-term contract but sometimes on a semi-merchant basis.

5.3 Pricing arrangements

5.3.1 Transmission and distribution

With a competitive wholesale and retail market developed across the UCTE region, transmission costs must be separated out from energy costs and charged to market participants on a nondiscriminatory basis. Transmission and distribution tariffs must be regulated so as to recover the costs of provision of the service but not to earn additional income. However, different countries have their own methodologies for applying charges to recover these costs: some areas will charge on the basis of peak MW throughput and others on the basis of energy throughput (or a combination of the two); some will charge on injection of energy into the system and others on exit (or again charges may apply to both). There are also different ways of calculating and setting charges for transmission losses.

However, a common theme in charging is that a competitive supplier can provide a service to consumers whereby transmission and distribution charges are no different from those applied by an incumbent supplier, and they will reflect the cost of provision of the service without discrimination.

5.3.2 Interconnector charges

A central theme of the European cross-border charging regime is that, within the synchronous area, there should be no “pancaking” of transmission charges so that energy that contractually flows across several borders should not face a charge for the use of each of the transmission systems across which it contractually flows. The favored methodology is for single charges for injection of energy into one transmission system with another charge for offtaking energy in the destination transmission system. However, the overall rules in this area are subject to change.

For individual interconnections, there is no single charging mechanism in place. Nondiscriminatory third-party access rules are mandated, but interconnector capacity can be sold either on a regulated tariff or through an auction. As noted in Section 5.1.3, capacity in the majority of interconnections is sold through implicit or explicit auctions. The revenue from this cannot guarantee to pay the costs of the interconnection.

5.3.3 Wholesale energy and generation capacity

There is no single regime governing wholesale pricing. Energy is predominantly sold under bilateral contract (either as physical contract or using a financial instrument). These contracts are essentially national in nature, reflecting the national balancing or pooling regimes in which such contracts are registered for balancing settlement (or, in the case of financial contracts in gross pool markets, the reference price by which the contract will be settled will be derived from the national market).

However, there is freedom of wholesale contract and there are no impediments to cross-border exchange. Therefore, wholesale prices in contracts will reflect prices earned on short-

term exchanges, which cover most markets in Western Europe and some markets in the East as well.

Therefore, short-term prices will reflect the marginal cost of generation in the whole region.

5.3.4 Retail tariffs

The EU is developing a competitive market, and as such retail tariffs are set by this competition.³⁷ EU regulation does not allow for cross-subsidy so that, where social tariffs apply at the retail level, then these are meant to be financed from national resources outside the electricity industry.

In Western Europe, the EU objectives are substantially met with regard to larger customers such that retail tariffs reflect the cost of generation at a regional level and not the specific cost base of the local integrated utility. However, in Eastern and South Eastern Europe, regulated tariffs remain. There will be elements of regulation of tariffs, with domestic consumers facing regulated prices and with some of them being cross-subsidized. However, cross-subsidization is being progressively eliminated, and all consumers will soon face common regional prices.

³⁷ The EU Commission has cited Greece, Lithuania and Romania as regulating non-household consumer prices without adequate justification (see <http://europa.eu/rapid/pressReleasesAction.do?reference=MEMO/09/296&format=HTML&aged=0&language=EN&guiLanguage=en>), but all other EU countries have full retail competition. The Commission states: "The current Community legislation provides the possibility to impose energy prices to protect vulnerable customers or to ensure public service obligations, provided they respect certain conditions, to ensure that they are clearly defined, transparent, non discriminatory, etc. However, such regulated prices should be the exception and not the rule in a competitive environment."

6 Future plans

The development of ENTSO-E and the allocation of tasks to it by the EU mark the end of UCTE as an independent transmission organization. However, UCTE's fundamental roles of cross-border system operation (including planning forecasts) and expansion of its synchronous network both remain largely the same in the new organization. The future plans envisaged by UCTE that are being carried forward by ENTSO-E include:

- o **Coordinated planning**

There is increasing advantage seen in coordinated development of the transmission system. UCTE had planned to increase the accuracy of its System Adequacy Forecasting processes in order to highlight where transmission investments were required. The Continental synchronous area (which was the UCTE area) is highly interconnected. The transfer capacities at interconnections are dependent on the capabilities of the grids of the interconnected countries and often on the capabilities of third-country grids. There is clearly a prima facie case for coordinated development of grid capacity. ENTSO-E will carry on the work of coordination of infrastructure planning. However, there are no plans to make the resulting investments mandatory on the affected TSOs.

- o **Flexible operation**

The development of renewable source electricity in Europe seems likely to require a continued expansion of wind generating capacity. This was a new area for system control in the UCTE Operational Handbook because the connection standards of intermittent wind generation differ from the enforced standards applying to larger generators (thermal and nuclear, but also most hydroelectric plants). ENTSO-E is taking forward principles for connection standards that are consistent with EU legislation that suggests elements of discrimination in favor of renewables. The resolution of the issue of the extent to which system operation requirements (fault protection, reactive power operation and frequency response) can be placed on intermittent generators will involve some issues of political will.

- o **Extension of the synchronous area**

In Section 3.3, feasibility studies are listed for potential extension to:

- o The eastern and southern Mediterranean, which would be in separate phases extending east into Turkey – but also to other CIS countries such as Georgia and Armenia – with potential development westward from the current synchronous area in Morocco and eventually ringing the full Mediterranean;
- o The UPS/IPS, which is a large synchronous system that extends into Russia, Belarus and Ukraine but also includes the Baltic states, which are EU members.

All these areas will continue relatively unchanged under the supervision of ENTSO-E, suggesting a continued role for a technical organization of the type that UCTE had become. ENTSO-E has does have added roles less fundamental to system operation, including:

- o **Network code coordination** (developing common rules for timing and access rights across interconnections)
- o **Interconnector charging and inter-TSO compensation** (to provide a common charging model to allow traders in one country to effectively access consumers in another without undue transmission charges).

In one area, development is likely to have been retarded. UCTE had ambitious plans to elevate the status of compliance monitoring to ensure adherence to its rule book. This was seen as vital to the continued stability of the synchronous transmission system. The status of this work under ENTSO-E is more uncertain because the underlying compliance enforcement in the new organization is less clear-cut.

From this analysis, it cannot therefore be concluded that the absorption of UCTE into ENTSO-E was an inevitable development in the context of regional trade. The UCTE role within ENTSO-E remains largely intact. UCTE maintained a technical role necessary for real-time system operation over a large area, ensuring stability and enhancing supply security. Within this framework, market development and cross-border trading were facilitated but not deliberately promoted by UCTE. Innovations such as cross-border real-time power exchanges are made possible, but it is difficult to assess the extent to which UCTE actually contributed to the expansion of other forms of cross-border energy trade seen across the UCTE area.

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http://entsoe.eu/_library/systemadequacy/saf/UCTE_SAF_2008-2020.pdf

“UCTE System Adequacy Forecast 2009–2020.”

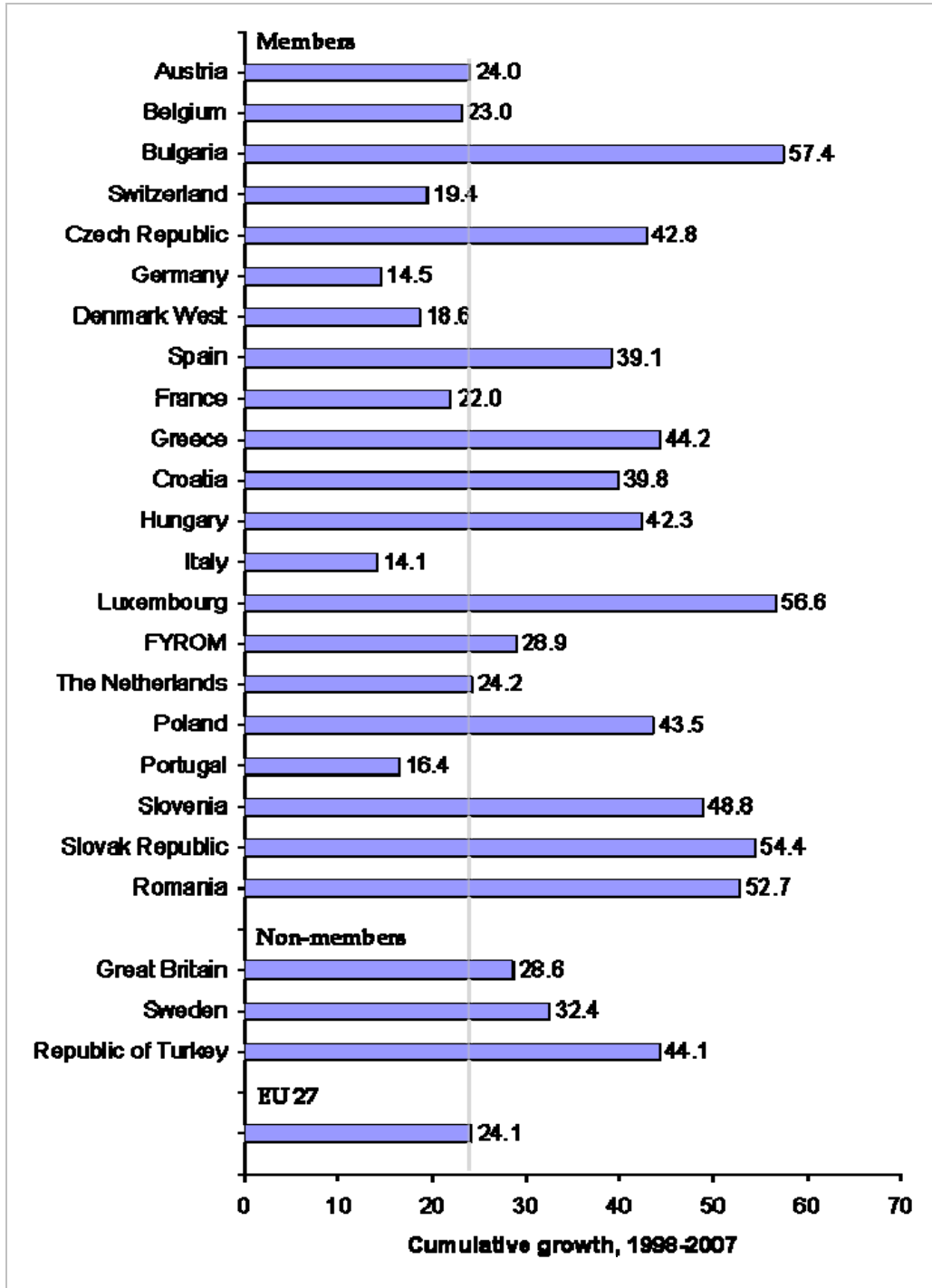
http://entsoe.eu/_library/news/UCTE_SAF-2009-2020_Report.pdf

“UCTE Transmission Development Plan.”

http://entsoe.eu/_library/publications/ce/otherreports/tdp09_report_ucte.pdf

A1 Economics and demographic environment

Figure 15 Growth in GDP by Country



Source: UCTE, Eurostat

A2 Electricity supply

Table 8 Annual Generation by Country (TWh)

Country	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Austria	49.7	49.4	51.1	51.0	54.4	53.6	55.8	56.4	59.5	61.9	62.2	61.0	57.6	67.2	63.6	63.0	63.8	66.8
Bosnia-Herzegovina	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.3	12.7	12.6	13.3	11.8	13.2
Belgium	69.7	68.4	67.1	68.6	70.6	72.4	75.1	79.5	80.8	80.2	76.1	78.5	81.6	82.2	83.4	81.9	85.1	80.6
Bulgaria	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	42.7	41.1	44.3	43.9	38.2	40.6
Switzerland	56.1	57.3	59.3	63.7	60.4	51.1	60.6	60.9	66.7	65.4	70.1	64.9	63.3	63.5	57.9	62.1	65.9	67.0
Czech Republic	0.0	0.0	0.0	0.0	0.0	0.0	0.0	60.3	59.4	67.7	68.8	70.4	76.7	77.9	74.2	77.9	81.4	77.1
Germany	454.1	438.6	440.3	450.1	483.1	554.8	554.0	561.4	521.1	534.0	540.0	536.1	559.9	569.3	574.1	587.8	594.0	587.3
Denmark	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	24.5	21.9	24.2	25.6	22.7
Spain	150.3	132.8	151.3	155.1	160.8	166.7	177.7	183.1	194.0	208.0	219.3	226.8	243.9	252.2	260.5	268.0	277.9	288.8
France	432.7	440.4	449.1	452.2	470.9	466.5	487.5	487.5	495.1	519.6	527.6	532.6	540.9	546.6	549.2	549.1	544.7	549.1
Greece	30.3	32.7	33.6	35.8	36.5	37.3	38.1	40.9	44.0	47.6	48.9	49.5	52.1	49.2	49.9	50.4	52.5	51.9
Canada	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.3	11.3	9.8	11.3	11.3	11.9	12.4	11.6	11.4	11.1	11.4
Hungary	0.0	0.0	0.0	0.0	0.0	0.0	0.0	34.2	34.2	32.4	33.6	32.9	31.5	30.8	33.1	33.4	37.3	31.0
Italy	210.5	214.4	211.4	220.2	224.2	230.6	239.9	247.0	232.7	242.4	243.9	270.3	280.2	290.1	290.8	301.5	301.4	303.2
Luxembourg	1.4	1.2	1.1	1.2	1.3	1.3	1.3	1.3	1.0	1.2	1.3	3.7	3.6	4.1	4.1	4.2	3.9	3.5
Montenegro	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.1	2.7
NEDOM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.3	6.2	6.5	6.6	6.1	5.9
The Netherlands	68.5	70.1	68.3	69.2	77.6	81.8	83.0	87.6	83.2	85.6	90.4	92.4	92.6	94.6	94.4	94.7	99.3	104.4
Poland	0.0	0.0	0.0	0.0	0.0	0.0	0.0	142.6	140.9	149.0	148.6	146.2	150.8	141.8	144.0	148.9	146.4	144.4
Portugal	27.6	27.5	28.4	28.0	31.0	32.5	31.7	36.6	40.4	40.8	44.2	43.3	44.3	41.5	43.6	46.0	44.6	43.4
Romania	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	51.5	51.9	54.8	57.4	56.4	59.8
Serbia	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	38.9	39.4
Slovenia	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.0	12.3	13.2	13.2	13.7	12.9	14.2	13.2	13.1	13.1	14.3
Slovak Republic	0.0	0.0	0.0	0.0	0.0	0.0	0.0	24.2	26.0	28.7	29.7	30.6	28.9	28.3	29.1	29.0	26.1	27.4
Ukraine West	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.4	7.7	8.1	8.4	8.2	8.2
Slovenia and Croatia	22.0	19.5	19.0	18.9	19.3	21.2	20.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Yugoslavia	24.9	46.2	41.1	42.8	41.1	47.7	46.0	46.5	44.9	42.8	43.5	42.9	0.0	0.0	0.0	0.0	0.0	0.0
Total	1,658.7	1,608.6	1,610.0	1,657.5	1,740.2	1,841.4	1,861.3	2,172.3	2,165.4	2,246.3	2,290.0	2,404.8	2,454.9	2,517.1	2,593.0	2,578.3	2,655.7	2,650.1

Source: UCTE

Table 9 Transmission Development (km)

Country	220kV			400kV			750kV			Composite '400kV'		
	1975	2000	2008	1975	2000	2008	1975	2000	2008	1975	2000	2008
Austria		3,266	3,770	3,770	488	2,530	2,530	-	-	-	2,284	4,604
Bosnia-Herzegovina			1,544			867						1,716
Belgium	228	395	425	488	1,252	1,325	-	-	-	613	1,469	1,599
Switzerland	-	5,008	4,868	-	1,597	1,796	-	-	-	-	4,351	4,473
Czech Republic		1,505	1,909		3,376	3,436					4,424	4,486
Germany	15,689	21,045	15,930	6,007	18,587	19,760	-	-	-	14,636	30,162	28,522
Denmark West			39			847						868
Spain	12,925	16,095	16,930	4,715	14,673	17,227	-	-	-	11,824	23,525	26,539
France	22,688	27,152	27,227	6,222	20,900	21,097	-	-	-	18,700	35,834	36,072
Greece	4,738	7,861	11,608	580	2,153	4,332	-	-	-	3,197	6,477	10,716
Croatia		1,224	1,145		1,157	1,159					1,830	1,789
Hungary		1,488	1,545		1,956	2,395			268		2,774	3,747
Italy	14,365	12,386	12,273	-	9,791	11,084	-	-	-	7,901	16,603	17,834
Luxembourg	168	242	270	-	-	-	-	-	-	92	133	149
FYROM			70			397						436
The Netherlands	398	676	654	474	1,998	2,397	-	-	-	693	2,370	2,757
Poland		8,116	7,919		4,914	5,428			114		9,378	9,597
Portugal	1,542	2,418	3,177	-	1,235	1,588	-	-	-	848	2,565	3,335
Romania			4,129			4,626			155			7,188
Slovenia		328	328		510	508					690	688
Slovak Republic		964	962		1,677	1,752					2,207	2,281
Ukraine West			594			381			209			1,099
Yugoslavia		2,723			2,143						3,641	-
Gross length	72,761	113,292	117,316	22,256	88,407	104,932	2,530	-	746	67,018	150,718	170,854
From new membership		20,517	371		50,418	11,550	-	2,530	382		56,959	12,470
Incremental development		20,014	3,653		15,733	4,975			364		26,741	7,666

Source: UCTE

A3 Electricity demand

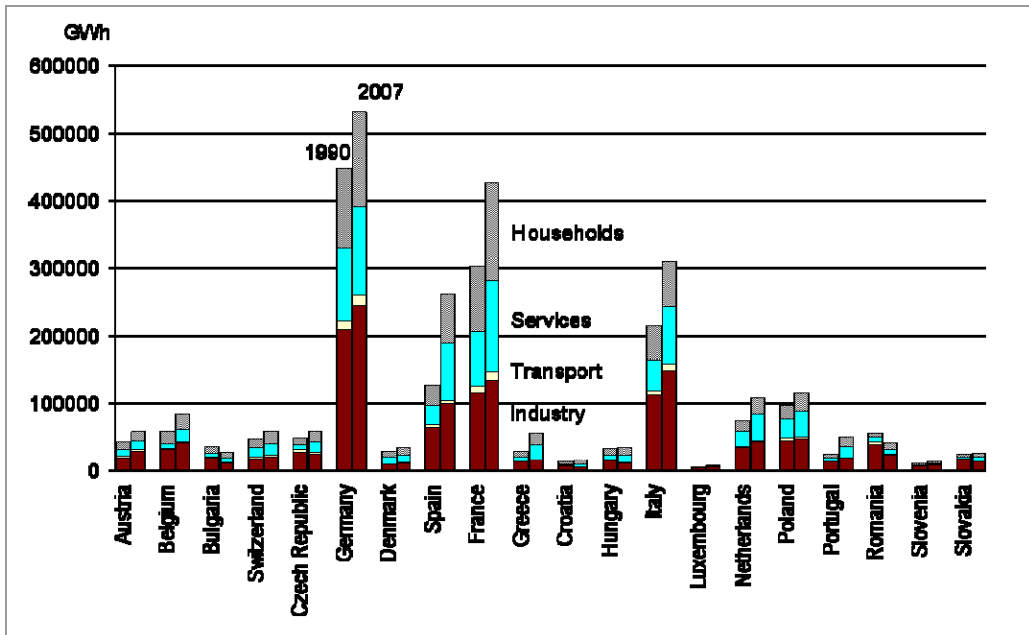
Table 10 shows Eurostat data for final energy consumption. It covers countries reported by Eurostat that were also UCTE members but excludes a few of the UCTE member countries. It does, however, give an indication of trend demand growth.

Table 10 Final Energy Consumption, Approximate UCTE Area

	Industry	Transport	Services	Households	Total
1990	798,205	56,844	404,329	446,161	1,705,539
1991	757,399	57,349	413,259	471,491	1,699,498
1992	744,682	58,300	417,378	478,423	1,698,783
1993	723,095	56,898	427,511	486,887	1,694,391
1994	736,952	58,511	455,926	492,822	1,744,211
1995	774,353	58,972	453,994	502,808	1,790,127
1996	780,293	60,232	471,371	530,536	1,842,432
1997	806,636	60,299	477,546	527,212	1,871,693
1998	813,549	59,974	499,356	535,708	1,908,587
1999	817,809	59,286	517,404	548,027	1,942,526
2000	861,727	61,322	535,970	547,960	2,006,979
2001	884,899	61,669	560,022	567,051	2,073,641
2002	884,953	62,458	559,082	571,720	2,078,213
2003	895,696	63,572	582,583	601,244	2,143,095
2004	915,278	63,627	597,118	615,654	2,191,677
2005	921,246	63,518	616,068	624,049	2,224,881
2006	915,724	62,046	671,266	635,674	2,284,710
2007	933,486	62,824	672,446	632,047	2,300,803
Annual average growth 1990-2007	0.93%	0.69%	3.04%	2.07%	1.78%

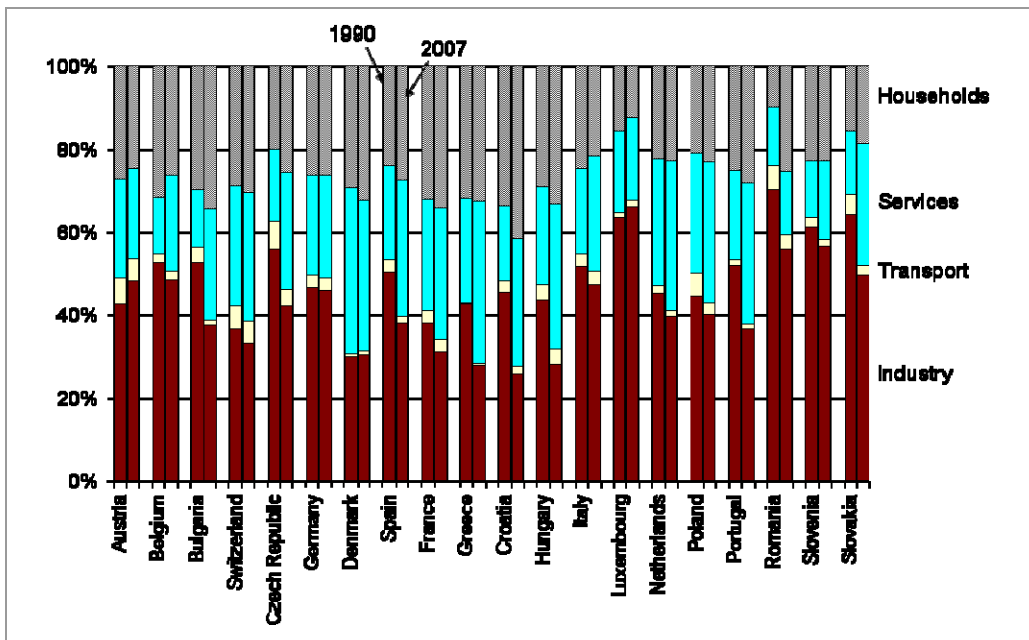
Source: Eurostat

Figure 16 Consumption by Country and Type, 1990 and 2007



Source: Eurostat

Figure 17 Share of Consumption by Category, 1990 and 2007



Source: Eurostat

Figure 16 and Figure 17 give Eurostat consumption data by consumption category for 1990 and 2007. As can be seen, there is considerable diversity across the region in final energy consumption.

Table 11 is replicated from the UCTE SAF 2008 report. It shows central-case demand forecasts for individual UCTE countries.

Table 11 UCTE Demand Forecast to 2020

GW	2008			2010			2013			2015			2020		
	January		July	January		July	January		July	January		July	January		July
	11:00	19:00	11:00	11:00	19:00	11:00	11:00	19:00	11:00	11:00	19:00	11:00	11:00	19:00	11:00
AT	9.1	8.9	7.8	9.4	9.3	8.1	10.0	9.9	8.6	10.4	10.3	9.0	11.5	11.3	9.9
BA	1.9	2.1	1.7	2.0	2.2	1.8	2.1	2.3	1.9	2.2	2.4	2.0	2.4	2.7	2.2
BE	12.5	13.2	10.9	12.9	13.6	11.3	13.2	13.9	11.5	13.5	14.2	11.7	14.0	14.8	12.2
BG	6.3	6.8	4.0	6.5	7.0	4.2	6.7	7.2	4.3	6.8	7.3	4.4	7.2	7.4	4.6
CH	10.0	9.5	8.1	10.3	9.8	8.4	10.5	10.0	8.6	10.7	10.2	8.7	11.1	10.6	9.0
CZ	10.1	10.3	7.5	10.2	10.4	7.6	10.9	11.1	8.1	11.2	11.5	8.4	11.8	12.1	8.9
DE	75.0	75.4	67.4	76.1	76.4	68.7	75.5	76.3	68.3	76.6	77.7	69.8	79.2	79.8	71.9
ES	42.7	44.7	42.2	45.9	47.9	45.3	51.3	53.3	50.7	55.1	57.1	55.1	61.0	63.0	62.0
FR	80.0	81.8	59.0	81.7	83.5	60.2	83.4	84.9	62.0	85.3	86.6	63.3	89.9	90.9	66.3
GR	8.1	8.4	9.6	8.6	9.0	10.2	9.5	9.8	11.0	10.0	10.4	11.5	11.3	11.8	12.9
HR	3.1	2.9	2.4	3.4	3.3	2.7	3.5	3.5	3.5	4.3	4.1	3.4	5.5	5.3	4.3
HU	5.7	5.8	5.4	5.9	6.0	5.6	6.3	6.4	5.9	6.5	6.6	6.1	7.2	7.3	6.8
IT	54.9	55.2	56.9	59.8	59.9	62.4	65.6	65.8	67.2	68.7	68.9	70.3	76.9	76.9	77.8
LU	0.9	0.8	0.9	1.1	0.9	1.0	1.1	0.9	1.1	1.2	1.0	1.1	1.3	1.0	1.2
ME	0.7	0.7	0.5	0.7	0.8	0.6	0.7	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.7
MK	1.5	1.6	1.0	1.6	1.7	1.0	1.7	1.8	1.1	1.8	2.0	1.2	1.9	2.3	1.4
NL	17.6	17.4	16.6	18.3	18.1	17.3	19.5	19.3	18.5	20.2	20.0	19.2	22.3	22.1	21.3
PL	21.1	22.2	18.3	22.0	23.0	19.8	23.3	24.4	21.0	24.1	25.3	21.8	26.1	27.4	23.6
PT	8.1	8.6	7.3	8.6	9.2	7.8	9.5	10.1	8.6	10.1	10.8	9.1	11.9	12.7	10.7
RO	8.1	8.6	7.0	8.8	9.3	7.8	9.6	10.2	8.6	10.3	10.9	9.1	12.0	12.7	10.6
RS	6.6	6.9	3.9	6.7	7.0	4.1	6.9	7.3	4.5	7.0	7.4	4.6	7.4	7.9	5.0
SI	2.2	2.2	2.0	2.3	2.3	2.1	2.4	2.4	2.2	2.5	2.5	2.4	2.7	2.8	2.6
SK	3.8	3.9	3.2	4.0	4.1	3.3	4.1	4.3	3.5	4.3	4.4	3.6	4.6	4.7	3.9
UA-W	1.0	1.0	0.6	1.0	1.1	0.6	1.0	1.1	0.7	1.0	1.1	0.7	1.1	1.2	0.7
UCTE	399.9	399.0	344.3	407.7	415.6	361.7	428.2	436.9	381.8	444.4	453.5	397.0	480.9	489.5	430.5

Source: UCTE System Adequacy Forecast 2008

A4 Cross-border transfers

Table 12 Annual Energy Transfers of UCTE Countries (TWh)

	Gross exports			Gross imports			Exports minus imports		
	1991	2000	2008	1991	2000	2008	1991	2000	2008
North Western Block									
Austria	89	15.4	165	9.2	198	22.0	- 0.9	1.6	- 5.5
Belgium	68	7.3	66	4.9	11.5	17.0	1.9	- 4.2	- 10.5
Switzerland	22.6	29.4	30.5	20.2	23.6	30.5	2.3	5.7	0.0
Germany	24.7	42.6	62.7	25.0	49.5	40.2	- 0.3	- 0.9	22.5
Denmark West	3.9	6.3	8.8	0.1	0.5	7.8	3.8	5.8	1.0
France	37.0	71.3	56.5	4.9	3.1	10.2	32.1	68.9	46.3
Luxembourg	0.7	0.7	2.5	4.6	6.4	6.8	- 3.9	- 5.7	- 4.4
The Netherlands	3.1	4.0	9.3	12.2	22.9	25.0	- 9.1	- 18.9	- 15.7
North Eastern Block									
Czech Republic	2.9	18.7	20.0	0.3	8.7	8.5	2.6	10.0	11.5
Hungary	0.4	6.1	8.9	0.4	9.5	12.8	- 0.0	- 3.4	- 3.9
Poland	-	9.6	9.7	-	2.7	9.0	-	6.9	0.7
Slovak Republic	-	9.0	8.9	-	6.4	9.4	-	2.7	- 0.5
West Ukraine (Burehtyn Island)	-	1.9	5.4	-	0.2	1.3	-	1.7	4.1
South Eastern Block									
Bosnia-Herzegovina	-	2.7	5.0	-	1.1	3.4	-	1.6	1.7
Bulgaria	0.3	2.0	8.4	0.3	0.5	3.1	0.0	1.5	5.3
Greece	0.6	1.5	2.0	1.3	1.7	7.6	- 0.7	- 0.2	- 5.6
Montenegro	-	-	1.5	-	-	3.4	-	-	- 1.9
FYROM	-	-	1.2	-	-	3.9	-	-	- 2.7
Romania	-	0.8	7.0	-	0.5	2.6	-	0.3	4.4
Serbia	-	-	8.6	-	-	9.1	-	-	- 0.6
Yugoslavia	4.5	2.6	-	2.2	5.7	-	2.3	- 3.1	-
Central Southern Block									
Croatia	-	2.5	5.7	-	7.1	12.2	-	- 4.6	- 6.6
Italy	0.3	0.5	3.4	34.4	44.9	43.3	- 34.2	- 44.5	- 39.9
Slovenia	-	7.0	7.8	-	5.6	6.2	-	1.3	1.6
South Western Block									
Spain	3.8	7.4	16.5	3.1	12.2	5.9	0.7	- 4.8	10.6
Portugal	1.6	3.8	1.3	1.7	4.6	10.6	- 0.1	- 0.8	- 9.3
Countries outside UCTE (net trade with UCTE area)									
Albania	1.2	0.2	0.2	0.5	1.0	2.6	0.8	- 0.8	- 2.4
Morocco	-	-	0.0	-	-	4.2	-	-	- 4.2
Belarus	-	-	0.6	-	-	-	-	-	0.6
Denmark East	-	-	2.0	-	-	0.8	-	-	1.2
Great Britain	-	-	0.9	-	-	12.4	-	-	- 11.5
Republic of Moldova	-	-	0.8	-	-	-	-	-	0.8
Norway	-	-	8.0	-	-	0.8	-	-	7.2
Sweden	-	-	6.9	-	-	1.9	-	-	5.1
Republic of Turkey	-	-	-	-	-	0.0	-	-	- 0.0
Ukraine	-	0.6	0.8	-	-	-	-	0.6	0.8

Source: UCTE

Table 12 uses the area classifications applied by UCTE in its System Adequacy Forecast (SAF) publications.³⁸ One minor change to this classification should be noted: Denmark West

³⁸ See UCTE System Adequacy Forecast 2008-2020 http://entsoe.eu/library/systemadequacy/saf/UCTE_SAF_2008-2020.pdf or UCTE System Adequacy Forecast 2009-2020 http://entsoe.eu/library/news/UCTE_SAF-2009-2020_Report.pdf

is included in the North Western Block on the table, although it is not defined as such in the current SAF publication. It should be noted that the SAF publication does not treat some UCTE nonmembers consistently in its classification; for example, Morocco is treated as external to the UCTE system despite being synchronized with UCTE, whereas Western Ukraine (Burshtyn Island) – also not a member of UCTE – is included within the North Eastern Block.

Table 13 National Cross-Border Trading, 2008

Regional Block	Country	Exports GWh/yr	Exports as % of national demand	Imports GWh/yr	Imports as % of national demand
North Western	Austria	14,528	24%	25,033	32%
	Belgium	4,561	7%	17,036	19%
	Switzerland	50,523	47%	30,454	47%
	Germany	62,833	11%	6,243	7%
	Denmark West	8,739	41%	7,764	36%
	France	54,455	11%	10,176	2%
	Luxembourg	2,464	37%	6,819	102%
	The Netherlands	9,282	8%	25,023	21%
North Eastern	Czech Republic	14,926	31%	5,524	13%
	Hungary	8,867	23%	15,772	33%
	Poland	9,704	7%	5,021	6%
	Slovak Republic	8,889	32%	5,414	34%
	West Ukraine (Burshtyn Island)	5,366	129%	1,274	31%
South Eastern	Bosnia-Herzegovina	5,004	43%	2,334	29%
	Bulgaria	8,440	24%	5,036	9%
	Greece	1,964	3%	7,373	13%
	Montenegro	1,834	32%	2,378	74%
	FYROM	1,203	14%	2,920	45%
	Romania	7,042	13%	2,609	5%
	Serbia	8,374	22%	5,136	23%
	Yugoslavia	0	0%	0	0%
Central Southern	Croatia	5,669	32%	15,247	69%
	Italy	2,394	1%	42,384	13%
	Slovenia	7,827	62%	6,233	49%
South Western	Spain	14,433	6%	5,894	2%
	Portugal	1,315	3%	10,397	20%

Source: UCTE, Miscellaneous information

A4.1 UCTE classification of countries by regional block

The following classification of countries was used by UCTE in its System Adequacy Forecasts. In some statistics in this report, Denmark (West) and Western Ukraine (Burshtyn Island) are omitted.

North Western Block:

Austria
Belgium
Denmark (West)
France
Germany
Luxembourg
Netherlands
Switzerland

North Eastern Block

Czech Republic
Hungary
Poland
Slovak Republic
Western Ukraine (Burshtyn Island)

South Eastern Block

Bosnia & Herzegovina
Bulgaria
Greece
Montenegro
Macedonia
Romania
Serbia

Central Southern Block

Croatia
Italy
Slovenia

South Western Block

Portugal
Spain

The term “Block” is used in the UCTE SAF to designate groupings of countries but has no operational significance.

A4.2 European Wind Integration Study conclusions³⁹

This is a technical study undertaken primarily by ETSO as it has implications for all TSOs and not just for UCTE members. The study recommendations include:

³⁹ See also *Final Report of the first phase of the European Wind Integration Study (EWIS)*
<http://entsoe.eu/library/publications/ce/otherreports/2007-01-15-Final-report-EWIS-phase-I-approved.pdf>

- o **Harmonization of European support scheme for renewables.** The current national allocation approach is leading to additional congestions in the systems. A harmonized support scheme in Europe will ensure the utilization of the most efficient sites and lead to more evenly spread installation of wind power capacity.
- o **Speeding up the approval procedures for new grid infrastructure.** Often the approval procedures for grid infrastructure take too much time, delaying the required grid expansion. Therefore the legal framework and administrative procedures have to be set properly to speed up the licensing of grid infrastructure.
- o **Adjustment of market rules for imbalance management.** To let the market solve the problem of imbalance management, wind generation should be made responsible for imbalances they create and provide adequate resources for balancing from the market.
- o **Improvement of connection requirements for wind turbines.** In the event of slight voltage or frequency drops in the transmission network – even if it is correctly cleared by the protection systems – the protection of wind generators may cause instantaneous disconnection of a significant number of wind farms with the consequent loss of power generation. The increasing share of wind power and the regional concentration in certain areas might lead to grid situations with sudden capacity losses of more than 3,000 MW, which could be followed by large-scale blackouts. Wind power producers should be obliged to meet certain operational requirements such as fault-ride through capability or voltage support.
- o **Reexamination of priority rules for RES electricity.** Large long-distance load flows require a sufficient capacity of conventional generation for maintaining system stability. Investigation shows a change in power flows due to the need to transport the energy from remote wind power production areas to regions with high electricity demand. In order to maintain sufficient conventional capacities as well as their reasonable allocation over the respective grid areas, the existing priority rules for the transport of RES electricity need to be reexamined. Furthermore it should be noted that national priority rules become legally questionable as they discriminate not only against conventional electricity but also against “green” electricity from other EU member states. Volatile generation should be regulated at the European and national levels to ensure that TSOs can reduce or switch off wind generation when the security and stability of the transmission grid are endangered.

UCTE clearly supported ETSO in promoting a reexamination of important areas of environmental legislation. The focus of this approach is to identify the system costs of wind generation and to allocate those costs to wind producers; this balances current EU policy, which seeks to determine a cost of greenhouse gas emissions (GHG) and to allocate that cost to fossil-fuel generation (and other emitters of GHG).

A5 Regulatory developments – ENTSO-E

A5.1 The creation of ENTSO-E and its role in the EU

The European Commission plans are essentially to complete its single market project. It foresees that in some areas, supranational institutions will be needed, and it was keen to create a single transnational TSO organization to oversee relevant developments. However, the current EU model remains that of a series of national markets in which competitive traders from any country can easily participate. In fulfilling its objectives, the EU legislation adopted in the 3rd Energy package has created a specific legal role for European Network of Transmission System Operators for Electricity (and another for gas). This made the transition from UCTE to ENTSO-E almost inevitable. ENTSO-E seeks to facilitate this competitive market by putting in place the rules needed for interconnections and TSO compensation.

A5.2 ENTSO-E Objectives⁴⁰

ENTSO-E took over from UCTE and ETSO on 1 July 2009. In a recent presentation of objectives,⁴¹ it is emphasized that the creation of this new TSO organization is in anticipation of EU adoption of the so-called 3rd integrated energy market package, which will amend Regulation EC/1228/2003.⁴² The key changes listed are:

- o *“Article 4: European network of transmission system operators for electricity*
 - o *Completion and functioning of the internal market in electricity and cross-border trade*
 - o *Optimal management, coordinated operation and sound technical evolution of the European electricity transmission network.*
- o *Article 6: Establishment of network codes*
- o *Article 8: Tasks of the ENTSO for Electricity*
 - o *Network codes*
 - o *Common network operation tools*

⁴⁰ <http://entsoe.eu/>

⁴¹ Konstantin Staschus, Ph.D., ENTSO-E Secretary-General: ENTSO-E and how we can use this new body in the future in terms of market, planning and operations, 13 May 2009. Presentation to CIM user group meeting, Genval, Belgium http://cimug.ucauiug.org/Meetings/Genval2009/Presentations/090513_ENTSO_E%20Presentation_CIMug_13th_May_v1.ppt

⁴² See Annex 0 for a summary of the provisions of the current Regulation and <http://eur-lex.europa.eu/LexUriSero/LexUriSero.do?uri=OJ:L:2003:176:0001:0010:EN:PDF> for the full text of the current regulation dated June 2003.

- o *Non-binding Community-wide 10-year network development plan, ("network development plan"), including a European generation adequacy outlook, every two years*
- o *Work programme, annual report, summer/winter outlooks, monitoring"*

Beyond the cross-border objectives specified by the EU, there was no intrinsic requirement for an EU member state to participate in UCTE. Therefore, the organization was reliant on providing a beneficial service to its members in order for it to thrive. When the EU 3rd Energy Package becomes established as EU legislation (in March 2011), those ENTSO-E members which are also EU members (or aspire to become EU members) will effectively need to participate in ENTSO-E, which will be tasked by the EU to develop coordinated network codes governing market trading in each TSO area.

However, one notable change with the move from UCTE to ENTSO-E is the status of the Operational Handbook, which can no longer be enforced through a multilateral agreement. The current statement on the ENTSO-E website⁴³ is as follows:

"The Members of the Association can enter into multilateral agreements to formalise and enhance their cooperation in specific areas. The Association can act as a facilitator in the establishment of such agreements and in the monitoring and arbitration of their implementation.

Rule-setting and other activities of ENTSO-E will be carried out in close consultation with stakeholders. ENTSO-E will continuously exchange views with stakeholders on issues related to power system planning, operation and market facilitation."

Obviously, those members of ENTSO-E which are not synchronized with the former UCTE area will want to follow rules established for their own synchronous areas. Former UCTE members will have an interest in continued coordination; they are free to sign a multilateral agreement covering the former UCTE Members Handbook, and they will probably all have signed such an agreement already. However, the disciplinary sanctions for any TSO breaching this agreement are less clear cut because expulsion from ENTSO-E would no longer be an option.

While ENTSO-E will continue the work planned by UCTE (set out in Section 6), it will also develop in the following areas:

- o **Network code coordination**

Common rules for timing and access rights across interconnections are needed in order for trading participants to effectively participate in the national scheduling and balancing arrangements of TSOs in different countries. This also applies in the provision of ancillary services. Common rules in network codes describing how trading participants may access cross-border markets will make this effective. It should be noted, however, that cross-border participation in some markets is already a reality.

⁴³ See <http://entsoe.eu/association/mission/>

These rules will provide an effective model for interconnector access as well. EU legislation allocates responsibility for development of the network code to ENTSO-E.

- o **Interconnector charging and inter-TSO compensation**

One impediment to cross-border trade is the rules applying to access to interconnections. A common charging model is needed to allow traders in one country to effectively access consumers in another without undue transmission charges. It is not certain whether an implicit auction model (where the differences between spot market prices in the different national markets are used as a means of setting congestion charges) or an explicit auction model whereby trading participants acquire physical access rights to interconnectors by auction (or conceivably by a set tariff) will be preferred.

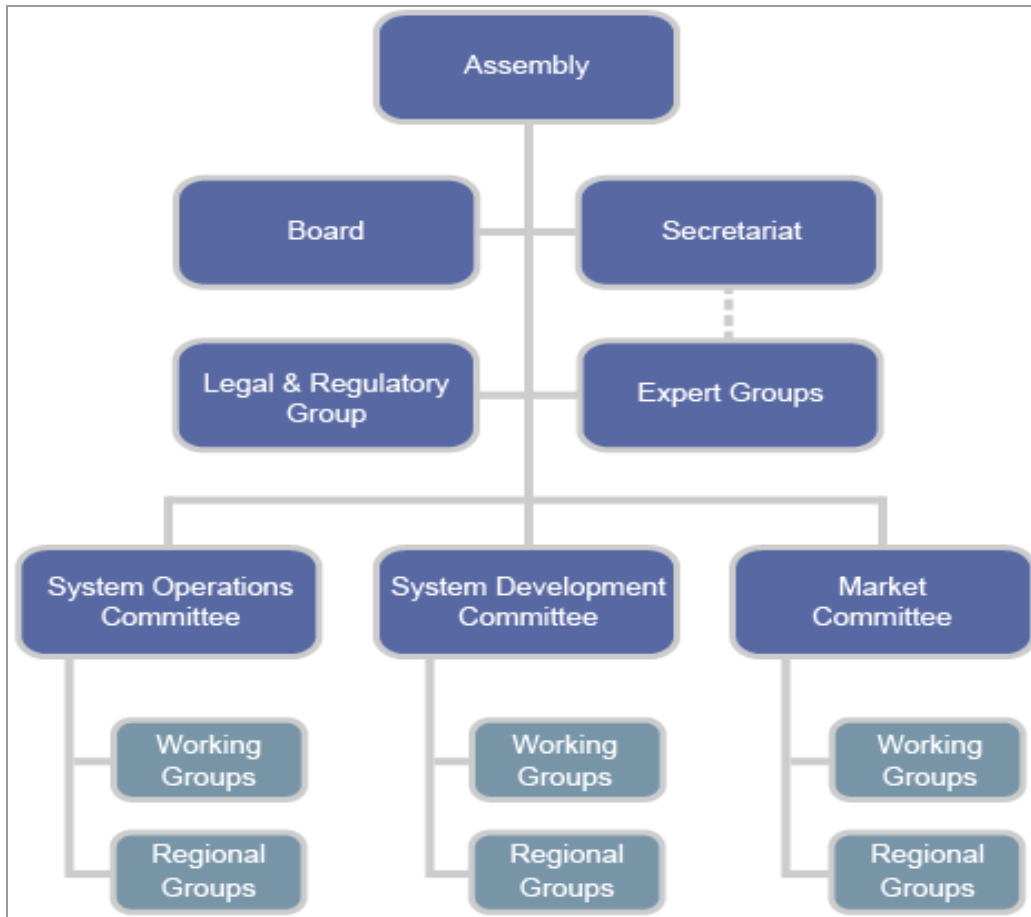
For this charging regime, an associated problem of allocation of revenues to TSOs has not yet been resolved fully, although clear plans were in place as proposed by one of ENTSO-E's predecessor organizations: ETSO.

A5.3 ENTSO-E Organizational structure

Figure 18 gives the organizational structure of ENTSO-E. It is very much based on the UCTE structure but is, perhaps, more streamlined. The parts that are similar to UCTE are:

- o A **Board** with 12 elected members, equivalent to the UCTE Bureau
- o An **Assembly** with representation from each of the 42 member TSOs
- o A **Secretariat** that currently works from the UCTE offices but which includes specific advisors and support staff for the main committees.

Figure 18 ENTSO-E Organizational Structure



Source: ENTSO-E Website

The structure of these committees is more focused than UCTE. The three areas covered are:

- o **System Operations Committee** in charge of technical and operational cooperation of the TSOs. This committee very much continues the core UCTE work covering synchronization and maintenance of rules. There will be a regional structure reflecting the reality of different synchronous areas.
- o **System Development Committee** in charge of TSO cooperation regarding the network development and planning. This takes over the UCTE role of developing the analysis of long-term system adequacy and *ad hoc* work to enhance operation (such as the wind stability study referenced above). The committee will oversee regional groups covering the different synchronous areas covered by ENTSO-E, which will also take over the UCTE work on system extension of the UCTE synchronous area.
- o **Market Committee** in charge of facilitating competitive markets. This will include development of network code conformity with a single standard as envisaged by the EU.

A6 EU context and summaries of relevant EU legislation

A6.1 EU legislative framework

Nearly all UCTE former member countries are also EU members or aspire to join the EU. This means that they are committed to the EU *Acquis Communautaire* as set out in the relevant EU Directives on energy and the environment.⁴⁴ Switzerland is a notable exception to this norm. There is no evidence that Switzerland finds the EU focus of most other UCTE area countries burdensome.

UCTE energy policy has, at times, been an important element in EU development, but it should be viewed as subordinate to the central aims of establishing a single market.

The EU is a multilayered institution. Its powers derive from treaties between nation states. It has a **Council of Ministers** and an elected **European Parliament**, but the most important institution from a TSO point of view is the **European Commission**, which implements decisions, proposes changes and monitors progress with EU Directives. For the present, implementation of the Directives is devolved to national governments. These governments are bound by treaty to enforce EU Directives but may have to answer to the **European Court** if infringement proceedings are brought against them by the European Commission.

This framework has the effect of making Europe a series of national markets setting their own operating rules but opened to cross-border competition and with competition standards set by EU Directives.

A6.2 EU Energy Policy Principles

The EU is both a political union and a common market of nation-states. The geographic spread of the EU is similar to that of UCTE, but there are notable differences. The EU includes UK and Ireland as well as the Scandinavian countries (except Norway) and the Baltic States. At the same time, the Balkan countries were members of UCTE but are not yet in the EU.

The central objectives of the EU embrace a close political union within a single trading area. EU law extends into many areas of operation of its member countries. The original EU-related treaty created the European Coal and Steel Community in 1951, but for much of the evolution of the EU as a common market, energy policy was not a major area of development. This changed in 1990 when policies on electricity transit were developed, but the concept of a common market in electricity was most fully formulated under the Florence Forum process, which began in 1998. This ushered in a process whereby member countries had to put in a structure comprising:

- o Regulators independent from the industry they regulated
- o Functional separation of transmission operation

⁴⁴ Summaries of the most important legislation, extracted from the EU Website, are replicated in Annex A5.

- o Nondiscriminatory access to transmission and distribution grids for competing generators and suppliers
- o Nondiscriminatory access to cross-border transmission interconnectors
- o Competition in retail supply

This is an evolutionary process. Currently, the EU Commission does not itself implement EU Directives but devolves this to national governments. Progress in different countries has varied. The EU is now working toward closer harmonization in areas such as balancing rules, seeking to impose a uniform element to rules that affect the ability of cross-border traders to participate on the same basis as traders based in the country to which the rules apply.

A6.3 Directive 2003/54/EC of the European Parliament and of the Council of 26 June 2003 concerning common rules for the internal market in electricity⁴⁵

This Directive establishes common rules for the generation, transmission and distribution of electricity. It lays down the rules relating to the organisation and functioning of the electricity sector, access to the market, the criteria and procedures applicable to calls for tenders and the granting of authorisations and the operation of systems.

Public service obligations and customer protection

Electricity undertakings must be operated in accordance with commercial principles, with no discrimination between undertakings as regards either rights or obligations. The objective is to achieve a competitive, secure and environmentally sustainable market in electricity.

Member States must:

- o impose on undertakings operating in the electricity sector public service obligations which may relate to security, including security of supply, regularity, quality and price of supplies and environmental protection, including energy efficiency and climate protection;
- o ensure that all household customers and small enterprises, at least, enjoy the right to be supplied with electricity of a specified quality within their territory at reasonable, easily and clearly comparable and transparent prices;
- o take appropriate measures to protect end-users and vulnerable customers, including measures to help them avoid disconnection;
- o ensure the implementation of a system of third party access to the transmission and distribution systems for all eligible customers;
- o inform the Commission upon implementation of this Directive.

Tendering for new capacity

Member States must ensure the possibility of providing for new capacity or energy efficiency/demand-side management measures through a tendering procedure or any procedure equivalent in terms of transparency and non-discrimination, on the basis of published criteria.

Details of the tendering procedure for generating capacity and energy efficiency/demand-side management measures must be published in the Official Journal of the European Union at least six months prior to the closing date for tenders.

⁴⁵ Extract taken from <http://europa.eu/scadplus/leg/en/lvb/l27005.htm>. For full text, see link in Bibliography under European Parliament and Council of European Union, Directive 2003/54/EC of 2003-06-26.

Designation of transmission and distribution system operators

Member States must designate, or require the undertakings owning transmission or distribution systems to designate, one or more transmission or distribution system operators for a period to be determined by Member States having regard to considerations of efficiency and economic balance.

Each transmission system operator is responsible for:

- o ensuring the long-term ability of the system to meet reasonable demands for the transmission of electricity;
- o contributing to security of supply through adequate transmission capacity and system reliability;
- o managing energy flows on the system, taking into account exchanges with other interconnected systems;
- o providing the operator of any other system to which its system is interconnected with sufficient information to ensure secure and efficient operation;
- o ensuring non-discrimination between system users;
- o providing system users with the information they need for efficient access to the system.

The tasks of the distribution system operator are:

- o to maintain a secure, reliable and efficient electricity distribution system in its area with due regard for the environment;
- o to ensure non-discrimination between system users;
- o to provide system users with the information they need for efficient access to the system;
- o to give priority to generating installations using renewable energy sources or waste or producing combined heat and power;
- o to procure the energy they use to cover energy losses and reserve capacity in their system according to transparent, non-discriminatory and market-based procedures;
- o to take energy efficiency/demand-side management and/or distributed generation measures that supplant the need to upgrade or replace capacity.

The minimum criteria which must be applied to safeguard the independence of transmission or distribution system operators are that:

- o they may not participate in the integrated electricity undertaking responsible, directly or indirectly, for the day-to-day operation of the generation, transmission or supply of electricity;
- o appropriate measures must be taken to ensure that the professional interests of the persons responsible for the management of the distribution system operator are taken into account so that they are capable of acting independently;
- o they must have effective decision-making rights, independent from the integrated electricity undertaking, with respect to assets necessary to operate the network;
- o they must establish a compliance programme, which sets out the measures taken to exclude discriminatory conduct, and make sure that it is adequately monitored.

Unbundling of accounts

Electricity undertakings must keep separate internal accounts for each of their transmission and distribution activities, as they would be required to do if the activities in question were carried out by separate undertakings, with a view to avoiding discrimination, cross-subsidisation and distortion of competition.

Until 1 July 2007 they must keep separate accounts for supplies to eligible and to non-eligible customers.

Market opening and reciprocity

Member States must ensure that the following are regarded as "eligible customers":

- o until 1 July 2004, the eligible customers specified in Directive 96/92/EC. Member States must publish by 31 January each year the criteria for the definition of these eligible customers;
- o from 1 July 2004 at the latest, all non-household customers;
- o from 1 July 2007, all customers.

Reporting

The Commission will monitor and review application of this Directive and submit an overall progress report to the European Parliament and the Council before the end of the first year following the entry into force of the Directive and, thereafter, on an annual basis.

A6.4 Regulation (EC) No 1228/2003 of the European Parliament and of the Council of 26 June 2003 on conditions for access to the network for cross-border exchanges in electricity⁴⁶

The purpose of the Regulation is to stimulate cross-border exchanges in electricity by establishing a compensation mechanism for transit flows of electricity and by introducing harmonised principles on cross-border transmission charges and the allocation of available interconnection capacities between national transmission systems.

Compensation mechanism between operators of transmission systems

Transmission system operators (TSOs) receive compensation for costs incurred as a result of hosting cross-border flows of electricity on their network. This compensation is paid by the operators of national transmission systems from which the cross-border flows originate. Compensation received by TSOs for hosting cross-border flows will be calculated based on the costs of the infrastructure "used" for the flows.

Charges applied by network-operators for access to networks are transparent and take into account the need for network security and reflect actual costs incurred.

Information on interconnection capacities

TSOs install coordination and information exchange mechanisms to ensure security of the networks in the context of congestion management. Network congestion problems are addressed with non-discriminatory solutions, i.e. methods that do not involve a selection between contracts of individual market participants.

General principles of congestion management

Market participants must inform the transmission system operators concerned whether they intend to use allocated capacity a reasonable time ahead of the relevant operational period. Any allocated capacity that will not be used is reattributed to the market in an open, transparent and non-discriminatory manner.

New interconnectors

New direct current interconnectors may, under certain strict conditions, benefit from exemptions. In this context, the Commission has to monitor Member States' decisions regarding exemptions and the restrictive way these measures are to be interpreted.

Guidelines

The guidelines specify in particular:

⁴⁶ Extract taken from <http://europa.eu/scadplus/leg/en/lvb/l27041.htm>. For full text see link in Bibliography to European Parliament and Council of European Union: Regulation (EC) No. 1228/2003, 26 June 2003.

- o details of methods for determining the quantity of cross-border flows hosted and the magnitudes of such flows;
- o details of the treatment in the context of the inter-TSO compensation mechanism of electricity flows originating or ending in countries outside the European Economic Area (EEA);
- o harmonised, appropriate and efficient locational signals at European level.

Provision of information and confidentiality

Member States and the regulatory authorities provide the Commission, on request, with all necessary information. The Commission fixes a reasonable time limit, taking into account the complexity of the information required and the urgency with which the information is needed. The Commission does not disclose this information which is covered by the obligation of professional secrecy.

Penalties

The Member States lay down the rules on penalties applicable to infringements of the provisions of this Regulation and take all measures necessary to ensure that they are implemented. The Member States notify those provisions to the Commission by 1 July 2004 at the latest.

A6.5 Decision No 1364/2006/EC of the European Parliament and of the Council of 6 September 2006 laying down guidelines for trans-European energy networks⁴⁷

The new guidelines for trans-European energy networks (TEN-E) list and rank, according to the objectives and priorities laid down, projects eligible for Community assistance. They also introduce the concept of “project of European interest.”

Defining the objectives of the TEN-E

The interconnection, interoperability and development of trans-European networks for transporting electricity and gas are essential for the **effective operation of the internal energy market** in particular and the internal market in general. Users should have access to higher-quality services and a wider choice as a result of the diversification of energy sources, at more competitive prices. Closer links should therefore be established between national markets and the EU as a whole. With that in mind, the new Member States are now fully incorporated into the Community TEN-E guidelines.

TEN-E also play a crucial role in ensuring the **security and diversification of supply**. Interoperability with the energy networks of third countries (accession and candidate countries and other countries in Europe, in the Mediterranean, Black Sea and Caspian Sea basins, and in the Middle East and Gulf regions) is essential.

Access to TEN-E also helps to reduce the isolation of the less-favoured, island, landlocked or remote regions, thus strengthening territorial cohesion in the European Union (EU).

The interconnection of TEN-E also promotes **sustainable development**, in particular by improving the links between renewable energy production installations and using more efficient technologies, thus reducing losses and the environmental risks associated with the transportation and transmission of energy.

Projects of common interest, priority projects and projects of European interest

Decision 1364/2006/EC lists projects eligible for Community assistance under Regulation (EC) No 2236/95 and ranks them in three categories.

Projects of common interest relate to the electricity and gas networks referred to in the Decision meeting the objectives and priorities laid down in it. They must display potential economic viability. The economic viability of a project is assessed by means of a cost-benefit analysis in terms of the environment, the security of supply and territorial cohesion. Projects of common interest are listed in Annexes II and III to the Decision.

Priority projects are selected from among the projects of common interest. To be eligible, they must have a significant impact on the proper functioning of the internal market, on the security of supply and/or the use of renewable energy sources. Priority projects, which are

⁴⁷ Extract taken from <http://europa.eu/scadplus/leg/en/lvb/l27066.htm>. For full text, see link in Bibliography under European Parliament and Council of European Union: Regulation (EC) No. 1228/2003, 26 June 2003.

listed in Annex I to the Decision, have priority for the granting of Community financial assistance.

Certain priority projects of a cross-border nature or which have a significant impact on cross-border transmission capacity are declared to be projects of European interest. Also listed in Annex I, **projects of European interest** have priority for the granting of Community funding under the TEN-E budget and particular attention is given to their funding under other Community budgets.

A favourable framework for the development of TEN-E

The Community guidelines for TEN-E stress the importance of facilitating and speeding up the completion of projects, in particular projects of European interest.

The Member States must take all measures necessary to minimise delays while complying with environmental rules. The authorisation procedures must be completed rapidly. The third countries involved must also facilitate the completion of projects partly situated on their territory in accordance with the Energy Charter Treaty.

The new guidelines also establish a framework for closer cooperation, in particular for projects of European interest. They provide for an exchange of information and the organisation of coordination meetings between the Member States for implementing the cross-border sections of networks.

The intervention of a European coordinator is provided for where a project of European interest encounters significant delays or implementation difficulties. His or her tasks include facilitating coordination between the various parties involved in implementing the cross-border section of a network and monitoring the progress of the project.

A European coordinator may also intervene in the case of other projects relating to TEN-E at the request of the Member States concerned.

The exceptional nature of the aid

The budget allocated to the TEN-E (around EUR 20 million per year) is mainly intended for financing feasibility studies. Other Community instruments may also step in to part-finance investments, for example the Structural Funds in the convergence regions. However, such financial assistance is exceptional and may not lead to any distortion of competition. As a rule, the construction and maintenance of energy infrastructure should be subject to market principles.

A6.6 Directive 2005/89/EC of the European Parliament and of the Council of 18 January 2006 concerning measures to safeguard security of electricity supply and infrastructure investment⁴⁸

Subject matter and scope

This Directive establishes measures aimed at safeguarding security of electricity supply so as to ensure the proper functioning of the EU internal market for electricity, an adequate level of interconnection between Member States, an adequate level of generation capacity and balance between supply and demand.

Member States must define general, transparent and non-discriminatory policies on security of electricity supply compatible with the requirements of a competitive single market for electricity. They must define and publish the role and responsibilities of competent authorities and different players in the market.

When adopting policy implementation measures, Member States must take certain elements into account, in particular the need to:

- o ensure continuity of electricity supplies;
- o study the internal market and the possibilities for cross-border cooperation in relation to security of electricity supply;
- o reduce the long-term effects of growth of electricity demand;
- o introduce a degree of diversity in electricity generation in order to ensure a reasonable balance between different primary fuels;
- o promote energy efficiency and the use of new technologies;
- o continuously renew transmission and distribution networks to maintain performance.

Operational network security

Transmission network operators must set minimum rules and obligations to ensure continuous operation of the transmission and, where appropriate, the distribution network under foreseeable circumstances. Member States may decide that these rules and obligations must be approved by the competent authorities and, where appropriate, also respected by the transmission network operators.

The network operators must set and meet quality of supply and network security performance objectives. Curtailment of supply in emergency situations must be based on

⁴⁸ Extract taken from <http://europa.eu/scadplus/leg/en/lvb/l27016.htm>. For full text see link in Bibliography under European Parliament and Council of European Union: Directive 2005/89/EC of 18 January 2006.

predefined criteria and the relevant measures taken in consultation with other transmission system operators concerned.

Balancing supply and demand

The Directive provides for specific measures necessary to maintain the balance between electricity demand and available generation capacity, to avoid Member States taking more interventionist measures which are incompatible with competition. They will need to have a clear policy in place to maintain the balance between supply and demand. In particular Member States need to encourage the establishment of wholesale markets, require network operators to ensure that an appropriate level of generation reserve capacity is maintained, facilitate the development of new generation capacity, or encourage energy conservation and technology for demand management in real time.

Network investment

Investment is crucial for competition and the future security of electricity supply in the EU. Member States must lay down a framework for providing information to network operators which facilitates investment.

Reports

Member States or competent authorities, in cooperation with transmission network operators, must prepare a report on security of supply, as provided for in the Directive on the internal electricity market. This report must contain information on operational network security, projected balance of supply and demand, prospects for security of supply within the medium term and investment intentions of transmission system operators as regards provision of cross-border interconnection capacity.

On the basis of this information, the Commission prepares a report and sends it to the Member States, the competent authorities and the European Regulators Group on Electricity and Gas.

A6.7 Directive 2001 /77/EC of the European Parliament and of the Council of 27 September 2001 on the promotion of electricity from renewable energy sources in the internal electricity market⁴⁹

Background

The promotion of electricity from renewable energy sources (RES) is a high European Union (EU) priority for several reasons, including the security and diversification of energy supply, environmental protection and social and economic cohesion.

The Directive follows up the 1997 White Paper on renewable energy sources which set a target of 12% of gross inland energy consumption from renewables for the EU-15 by 2010, of which electricity would represent 22.1%. With the 2004 enlargement, the EU's overall objective became 21%. The Directive also constitutes an essential part of the package of measures needed to comply with the commitments made by the EU under the Kyoto Protocol on the reduction of greenhouse gas emissions.

European companies are currently among the world leaders in developing new technologies connected with RES electricity. The Directive aims to give a boost to stepping up the contribution of these energies while respecting the principles of the internal market.

Scope

The Directive concerns electricity produced from non-fossil renewable energy sources such as wind, solar, geothermal, wave, tidal, hydroelectric, biomass, landfill gas, sewage treatment gas and biogas energies. The definitions in Directive 96/92/EC concerning common rules for the internal market in electricity are also applicable to this Directive.

National targets for consumption of electricity from renewable sources of energy

The Member States which joined the EU in 2004 must apply the provisions of Directive 2001/77/EC on producing electricity from renewable energy sources. Their Accession Treaty sets national indicative targets for the proportion of electricity produced from RES (RES-E) in each new Member State the result of which is an overall objective of 21% for the EU-25.

The Member States must adopt and publish, initially no later than 27 October 2002 and then every five years, a report setting the indicative Member State targets for future RES-E consumption for the following ten years and showing what measures have or are to be taken to meet those targets. The Member State targets must take account of the reference values set out in the Annex to the Directive for Member States' indicative targets concerning the share of electricity produced from renewable energy sources in gross electricity consumption in 2010. They must also be compatible with all the national commitments entered into as part of the commitments accepted by the Community in Kyoto.

⁴⁹ Extract taken from <http://europa.eu/scadplus/leg/en/lvb/l27035.htm>. For full text see link in Bibliography under European Parliament and Council of European Union: Directive 2001/77/EC of 27 September 2001.

Evaluation of national targets and measures

This evaluation will be undertaken at national and Community level.

Evaluation at national level

Member States were required to publish on 27 October 2003, and every two years subsequently, a report which includes an analysis of success in meeting the national targets. The report was also to indicate what climatic factors are likely to affect meeting the targets and to what extent the measures taken are consistent with national commitments regarding climate change.

Evaluation at Community level

At Community level, the Commission is to publish a biannual report, the first on 27 October 2004, based on the national reports assessing the extent to which:

- o the Member States have progressed towards achieving the national targets;
- o the national indicative targets are compatible with the global indicative target of 12% of gross domestic energy consumption in 2010, and in particular with the indicative share of 22.1% of electricity from renewable energy sources out of the total electricity consumption of the Community in 2010.

Should the Commission's report conclude that the national targets are liable to be inconsistent with the main objectives of the Directive, the Commission may present proposals to the European Parliament and to the Council with respect to the targets, including, if need be, proposals for obligatory targets.

Support schemes

The Commission was to present, by 27 October 2005 at the latest, a report on the experience gained concerning the application and coexistence of the different support schemes in the Member States. This report evaluates the success, including the cost-effectiveness ratio, of the support schemes for the promotion of RES-E consumption. This report was to be accompanied, if necessary, by a proposal for a Community framework for support schemes for RES-E.

Guarantee of origin of RES-E

The Directive provides for a system concerning the guarantee of origin of RES-E in order to facilitate exchanges of RES-E and to increase transparency while facilitating consumer choice. The guarantees of origin indicate both the renewable energy source from which the electricity is produced and the date and place of production and, in the case of hydroelectric installations, also state the capacity.

The system was to be set up at national level and put in place by 27 October 2003 at the latest. The Member States define objective and non-discriminatory criteria and issue the guarantees when requested. They can designate one or more competent bodies independent of production and distribution to supervise the issuing of guarantees.

In addition, taking account of the principles of the internal market and in order to permit RES-E electricity exchanges in the Community, the guarantees of origin are to be mutually recognised by the Member States. Any refusal to recognise the certificates, such as for reasons linked to fraud prevention, must be based on objective, transparent and non-discriminatory criteria. In order to ensure that mutual recognition works properly, the Member States are required to put into place appropriate mechanisms to ensure that their certification system is both accurate and reliable. These mechanisms must be set out in detail in the report describing national targets and measures. Any disputes are to be settled by the Commission.

Administrative procedures

One major barrier to the further development of RES-electricity is the administrative and planning procedures that potential generators must respect, which is particularly a problem for small and medium-sized companies (SMEs), which make up a significant proportion of companies in this sector.

With this in mind, Member States are required to review their existing legislative and regulatory frameworks concerning authorisation procedures in order to reduce regulatory and non-regulatory obstacles, to rationalise and speed up administrative procedures and to ensure that the rules are transparent and non-discriminatory. What is more, it is important for the rules to take account of the particular characteristics of the different technologies using renewable energy sources.

Member States were to publish, at the latest on 27 October 2003, a report on this review procedure defining action to be taken to reduce obstacles in this area. This report was to give an overview of progress in particular on:

- o coordination between the different administrative bodies involved concerning time limits, reception and handling of authorisation requests;
- o the establishment of possible guidelines for activities connected with targets, so as to improve administrative procedures and the feasibility of speedy planning for the RES-E producers;
- o the appointment of an authority to act as a mediator in disputes between the authorities responsible for issuing authorisations and requesters.

In the Commission's final report on the implementation of the Directive and on the basis of the Member States' reports, the Commission will evaluate the best practices for reducing regulatory and non-regulatory barriers to increasing RES-E production.

Grid connection issues

Connection to the grid can be costly to the producers of RES-E. Care must be taken to ensure that the high costs of connection do not hamper either the development of RES-E – which has economic and other advantages, such as that of environmental protection – or the functioning of the internal market, which must guarantee fair conditions to all producers.

To this end, Member States are to put in place a legal framework or are to require transport and distribution system operators:

- o to guarantee the transport and distribution of RES-E. The Member States may agree on priority access for RES-E. As regards the distribution of electricity by production installations, priority will be given to installations using renewable energy sources to the extent permitted by the national electricity system;
- o to define and publish standard rules on responsibility for the costs of technical adaptations needed to enable a new RES-E producer to feed their electricity into the interconnected grid. The Member States may require operators to bear some or all of the costs;
- o to define and publish standard rules on sharing the costs of the system installations among all the producers benefiting from it, such as for the strengthening of the grid;
- o to supply new producers who wish to be connected to the grid with a complete and detailed estimate of the connection costs. The Member States may allow producers to call for tenders for connection work.

Member States must ensure that the transport and distribution costs do not in any way discriminate against RES-E.

In the context of the report on administrative procedures mentioned under 7, the Member States are also required to examine the measures to be taken to facilitate the access of RES-E to the grid, considering in particular the need to introduce two-way metering (the possibility of purchasing electricity from the grid when RES-E production is not sufficient).