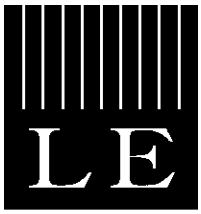

London Economics Review of European Union Electricity Markets

April 2003

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1 Introduction

1.1 Overview

This report presents the results of a London Economics review of European Union electricity markets. It also includes new London Economics' research based on a survey of 11 leading electricity utilities in Europe. The survey results are comprised of the views of a sample of leading European electricity utilities on the regulatory openness of various markets for new investment and the impact of recent market developments on the investment climate.

The report begins by presenting an overview of the electricity markets in the European Union on a country-by-country basis. The status of the electricity sector in the EU has been undergoing rapid change in recent years due to the EU energy directives and changes in government policies in the member states. The EU electricity directive requires (with some exceptions) that countries' utilities open electricity supply for their largest customers (28% rising to 30%) to competition. The directive sees a unified electricity market as the final goal of the policies, but the current status is that national boundaries in many cases still define the relevant economic market across much of Europe's power industry.

Individual European countries have adopted different approaches to electricity liberalisation, as well as differential degrees of zeal in embracing new competition. Therefore, the landscape of power market reform across Europe remains far from homogeneous. These differences in regulatory policy and perceived openness to new investment are likely to have had an impact on the speed and timing of new investment.

A wide range of factors influence the attractiveness to investors of individual electricity markets. These include:

- Consistency with investors overall strategy
- Availability of finance
- Evaluation of potential returns and risks
- Degree of current and anticipated competition in the market
- Overall size and scale of market opportunities.
- Government / regulatory openness to incoming investment.

This report does not attempt to examine all of the factors influencing investment but rather focuses on the regulatory environment. It also presents some views on overall attractiveness of individual markets which inter alia reflects the regulatory regime and the size of market opportunities.

The views of European electricity utilities surveyed suggest that North America, Australia and New Zealand and European countries were the most open to new investment. Within the EU a number of countries were perceived as particularly open from a regulatory perspective to new investment including UK, Sweden, Netherlands, Ireland, Finland and Spain.

After the country-by-country reviews, the report looks at various pertinent topical and timely issues in international electricity markets, such as the impacts of the Enron demise, the Californian electricity crisis, and the availability of risk management products.

The new survey results presented in this report represent results from leading European electricity utilities. These utilities had 89,000 employees and 28,093 MW of installed capacity.

1.2 Report structure

The structure of the report is as follows. Section 2 is comprised of a review of the regulatory regimes in the EU member states. Section 3 presents the results on the views of the comparative openness of certain markets to new investment. Section 4 considers developments in the investment climate for European electricity utilities. Section 5 presents the views of utilities on the impacts of the Enron developments. Section 6 examines the issue of approaches to hedging power prices. Finally, Section 7 reviews regulatory issues and the California energy crisis.

2 Market and Regulatory Review of Individual EU Countries

2.1 Austria

2.1.1 Market and Regulatory Overview

Austria's power grid and electricity system sits at a crossroads in Europe's interconnected grid. Its power system relies on imports to a much greater extent than other countries. Austria's imports are about 23% of consumption; compared to Germany's 10%[1]. Austria generated 59.8 TWh of electricity in 1999 (IEA), of which about 66% was hydropower. The collapse of Enron affected wholesale trading in Austria as Enron was a major player and market maker and was expected to provide liquidity on Austria's newly launched wholesale power exchange.

The basic structure of the market prior to EU liberalisation was that the federal electricity authority (Verbund), as primary electricity producer and operator of the national grid, sold wholesale electricity to the nine regional utilities and largest municipalities under long-term contracts[2]. The regional utilities, in turn, supply smaller community utilities. The opening of market to competition means that the regional utilities and largest industrial customers are entitled to choose their electricity suppliers.

Customers have had full choice in Austria since October 2001, but according to E-Control only about 1% of customers had switched suppliers after four months of competition.

Austria's market participant structure is more complicated than several other EU countries. The market participants include:

- Grid operators,
- Suppliers
- Balancing group representatives
- Settlement agencies/balancing group coordinators
- Control area managers
- Exchange
- Customers

1 E-Control, "The Austrian Electricity Market" 2001.

2 See "FT Country Briefs: Austria", FT online edition.

At the beginning of 2001, Austrian power stations had a total maximum capacity of 18,230 MW. Austria has a large proportion of its power generated by hydropower stations, with a combined capacity of 11,660 MW or an exceptional 64% of the total. Some 40 MW of maximum installed capacity is accounted for by wind farms and photovoltaic power plants. The total maximum installed capacity of the thermal power stations is 6,535 MW (36%). All power utilities (PU) together have a maximum capacity of 16,525 MW, or 91% of total Austrian installed capacity, while autoproducers (AP) account for 9%.

2.1.2 Degree of Regulatory Openness to New Incoming Investment in Austria

The views of European electricity utilities surveyed by London Economics on the degree of regulatory openness to new incoming investment in Austria are provided in Table 2.1. Most of the utilities felt that Austria was neither open nor restrictive reflecting the specific features of the Austrian market and the stage of the market opening process.

Table 2.1: Views on Openness of Austria to New Incoming Investment – Percentage of Respondents

Extremely Open	0.0
Very Open	0.0
Open	25.0
Neither Open nor restrictive	65.5
Restrictive regulator policy regime	12.5
Very Restrictive regulatory policy	0.0
Extremely restrictive regulatory policy	0.0

Source: London Economics Survey of European Utilities 2002

2.2 Belgium

2.2.1 Market and Regulatory Overview

There have been a number of recent reforms in Belgium to implement the EU directives on electricity liberalisation, however, competition and liberalisation in Belgium is proceeding slowly. According to the 2001 annual report of the Commission de Régulation d'Electricité et du Gaz (CREG), "Competition is nonexistent in the electricity and gas markets." Only about 3% of eligible customers had switched electricity suppliers in Belgium according to CREG.

In 2001, 30% of Belgium's electricity customers were eligible to switch supplier. This represents clients with total demand above 100GWhs per annum. Other clients will successively gain the right to choose their suppliers, but full customer choice is not envisaged until 2007. There will also be a differential in liberalisation speed across regions within Belgium, with Flanders liberalising fully in 2003, in advance of francophone Wallonia and the Capital and Federal regions (2007).

A series of legislation and royal decrees have been put in place to implement the EU directives into Belgian law, including tariff structures for transmission system use, customer eligibility, and participants' codes. In the electricity market regulation, the federal government is responsible for generation, transmission and pricing, while the regional governments are in charge of distribution, energy efficiency and promoting the use of combined heat and power production, and of renewables. However, by the start of 2002 the independent transmission system operator had not been designated. Belgium has put in the framework for access to the grid, initially negotiated third party access, however, and will adopt a regulated third party access system. Belgium also has adopted policies to require suppliers to purchase a minimum percentage of their electricity from renewable sources.

Belgium, like many other EU countries, has seen its generation capacity margin decrease significantly over the 1990's with the advent of liberalisation: from 22% to about 15%. 2001 total electricity production was about 75.95 GWh, which was about 6% less than total production in 2000. The sector is highly concentrated with Electrabel, a private company, and SPE, a public enterprise, comprising the majority of production and capacity.

Belgium, as a small country situated bordering several larger EU nations, has a highly interconnected transmission system with interconnections with the Netherlands, France, and Luxembourg. The Belgian grid administrators have also put in place agreements with Germany's E.ON grid company for the allocation of interconnection space for the purposes of wheeling power between Germany and Belgium. The IEA reports that Belgium's position as an energy "transit" country has been expanding in the last decade and it is forecast that this trend will continue[3].

2.2.2 Degree of Regulatory Openness to New Incoming Investment in Belgium

The views of European electricity utilities surveyed on the degree of regulatory openness to new incoming investment in Belgium are provided in Table 2.2. None of the utilities felt that Belgium was either extremely or very open to new incoming investment. However 25% of companies surveyed felt the market was open to new investment but most believed it was neither open nor restrictive, while the balance rated Belgium regulatory regime as restrictive.

Table 2.2: Views on Openness of Belgium to New Incoming Investment – Percentage of Respondents

Extremely Open	0.0
Very Open	0.0
Open	25.0
Neither Open nor restrictive	50.0
Restrictive	25.0
Very Restrictive	0.0
Extremely restrictive	0.0

Source: London Economics Survey of European Utilities 2002

3 IEA country reports, Belgium 2001.

2.3 Denmark

2.3.1 Market and Regulatory Overview

Denmark, the smallest of the Scandinavian countries, is in the process of opening their electricity market to retail competition. Partial opening had already occurred in 1999. Denmark, perhaps following the lead of Norway and Sweden's success in the NordPool arrangements, joined NordPool in 2001. Denmark had pursued the liberalisation of the sector in advance of the EU directive's requirements.

Denmark's electricity sector is perhaps unique in several aspects. Most of all, Denmark has been a clear leader in green energy development. Denmark is one of a small number of EU countries that are well on their way to implementing green energy trading certificates. Also, Denmark has successfully been employing a significant amount of wind capacity.

Annual gross production in Denmark is expected to be about 40TWh, in 2002[4]. About 40% of Denmark's electricity comes from coal-fired thermal units, while about 25% comes from gas, and 10% oil. About 10% comes from wind, with wind penetration expected to reach about 13% of generation in 2005 (IEA 2001). Waste and other renewables represent the remainder. In contrast to their Scandinavian neighbours, Denmark has very little hydro, and zero nuclear capacity.

2.3.2 Degree of Regulatory Openness to New Incoming Investment in Denmark

The views of European electricity utilities on the openness of the regulatory regime in Denmark to new incoming investment are presented in Table 2.3. The table shows that 25% of respondents felt that Denmark was open to new incoming investment while 37.5 felt it was neither open nor restrictive. The balance viewed the regulatory regime as restrictive or very restrictive.

Table 2.3: Views on Openness of Denmark to New Incoming Investment – Percentage of Respondents

Extremely Open	0.0
Very Open	0.0
Open	25.0
Neither Open nor restrictive	37.5
Restrictive	12.5
Very Restrictive	25.0
Extremely restrictive	0.0

Source: London Economics Survey of European Utilities 2002

4 IEA and LE forecasts.

2.4 Finland

2.4.1 Market and Regulatory Overview

Finland, as part of NordPool, was one of the Scandinavian nations at the vanguard of electricity market liberalisation. Finland's entry into the NordPool trading arrangements followed the initial successes of Norway and Sweden.

Finland's electricity sector is structured somewhat uniquely in that there is a great number of small electricity producers and vendors, especially relative to the market size. Since 1998, the competitive part of the electricity retail supply market has increased. The Energy Market Authority is yearly collecting information on the amount and share of electricity being distributed in the distribution networks that is purchased under competitive prices and under list prices (these prices are applied to those customers who have not asked for tenders from either their local traditional retail seller or a competing retail seller and continue to buy electricity from the local retail seller on the basis of prices that are applied to customers under obligation to supply). In 2000, the total consumption of electricity in Finland amounted to 79,1 TWh of which about 40 TWh was used by customers via the distribution networks. The rest was used by industrial users that are connected either to regional networks or the national grid.

As regards the share of electricity that is being traded under contract prices within distribution networks, in 2000 little more than one half (54%) of the electricity traded via distribution networks was purchased under contract prices (so to speak in the competitive market) in comparison with that of one third in 1998. Regarding the large industrial customers, practically all the electricity is bought under contract prices. Of the electricity bought by household customers, 23% was purchased under contract prices either from the local or another retail supplier.

In Finland, electricity is generated by about 400 power plants. There are about 120 electricity producers and vendors in the country. The number of power plants is large, but the three largest producer groups are responsible for three fourths of electricity production. The largest three producers are Fortum Power and Heat Oy (with a share of about 40%), Pohjolan Voima Oy (with a share of about 23%), and the separate power producers of distribution companies (with a share of about 21%)[5].

Since no licence is required for selling electricity, anyone can act as an electricity vendor in Finland. Small-scale electricity users have had the right to solicit tenders from electricity suppliers since the autumn of 1998 without the requirement of hourly metering. Large-scale electricity users have not surprisingly been most active in using competitive tenders.

5 EMV website.

2.4.2 Degree of Regulatory Openness to New Incoming Investment in Finland

The views of electricity utilities surveyed on the regulatory openness to new incoming investment in Finland are presented in Table 2.4. The figures show that most companies surveyed felt that the Finnish system was open or very open to new incoming investment.

Table 2.4: Views on Openness of Finland to New Incoming Investment - Percentage of Respondents

Extremely Open	0.0
Very Open	20.0
Open	25.0
Neither Open nor restrictive	30.0
Restrictive	0.0
Very Restrictive	0.0
Extremely restrictive	0.0

Source: London Economics Survey of European Utilities 2002

2.5 France

2.5.1 Market and Regulatory Overview

France's electricity system is one of the most advanced, and in terms of peak-demand by a single centrally despatched system, the largest in the world. France has the largest amount of nuclear generating capacity in the EU, and also relies on considerable amounts of pumped storage and hydro. At the end of 2000, France had about 63GW of installed nuclear capacity, 21GW of installed hydro capacity, and 26 GW of installed thermal capacity (total 110GW of installed capacity)[6].

However, market liberalisation in France has been slow to develop. France was the last European country (without a derogation) to implement its market liberalisation law transposing the EU directives into national law. France passed its liberalisation legislation in 2000. France has now opened up about 30% of its market to customer choice, or customers with annual demand in excess of 16GWh. The degree of market opening is proposed to double by 2004. In addition, in an effort to kick-start the competition process, EdF has auctioned capacity to alternative suppliers.

In November 2001, the Powernext electricity trading market was launched in France. Powernext auctions standard hourly contracts for physical delivery of electricity to business customers under responsibility of the RTE and guaranteed by Clearnet, a subsidiary of the Euronext stock exchange. Powernext aims to trade 10% of the French market by 2003-2004, and also to act as a price reference for the electricity market. In an additional liberalizing step, in accordance with the terms of EdF's acquisition of a controlling stake in Germany's EnBW, EdF sold 1200 megawatts (MW) of virtual power capacity to some 20 competitors (generators, traders, etc.) in 2001[7].

France's electricity sector is heavily concentrated with Electricité de France (EdF) the major player. EdF is a government owned and vertically integrated utility.

6 Source, US Department of Energy Website,
http://www.eia.doe.gov/pub/international/iea2000/table64.xls

7 See US DOE, "Country Reports", France, January 2002.

2.5.2 Degree of Regulatory Openness to New Incoming Investment in France

The views of electricity utilities on the degree of regulatory openness to new incoming investment in France are presented in Table 2.5. While a small minority of utilities surveyed felt that France was open to new incoming investment, a large majority of utilities felt it was restrictive, very restrictive or extremely restrictive to new incoming investment.

Table 2.5: Views on Openness of France to New Incoming Investment - Percentage of Respondents

Extremely Open	0.0
Very Open	10.0
Open	10.0
Neither Open nor restrictive	0.0
Restrictive	40.0
Very Restrictive	30.0
Extremely restrictive	10.0
Source: London Economics Survey of European Utilities 2002	

2.6 Germany

2.6.1 Market and Regulatory Overview

Germany's electricity sector had previously been characterised by high prices. Early electricity market liberalisation in Germany has been associated with a decline in high German electricity prices. According to Eurostat, German prices fell about 9.6% for industrial users between 1996-99, and increased slightly for residential and small users, 0.8%. Germany expects to fully open its electricity market by 2003 (full choice was available in 2000, but some municipalities have a derogation as municipal generation ownership is still pervasive), and allow all customers to choose their supplier, thus exceeding the requirements of the EU directive.

Competition in Germany is still having some problems, however, as negotiated third party access to the grid led to an inquiry by the EU Commission. In contrast to most other European countries and to experiences made by deregulating the German telecommunications market, Germany has not installed a regulatory authority for the energy industry sector that sets binding limits on utilities' rates for electricity and transmission. Charges are regulated by voluntary agreements among industry associations on electricity transmission. In addition, the electricity market and distribution system in Eastern Germany is governed by agreements made at unification between the Government and VEAG. Many observers believe VEAG may eventually have to be restructured to usher in competition in the former East Germany[8].

Currently, there is about 2,400MW of merchant IPP planned for Germany[9], although it is possible that recent economic conditions in the energy sector may make some of these projects unlikely to go forward.

8 US DOE Country Reports.

9 Resource Data International, online database, 2002.

2.6.2 Degree of Regulatory Openness to New Investment in Germany

There were differing views on the degree of regulatory openness to new investment in Germany among the electricity utilities surveyed. While most felt the regime was open, some felt the regime was restrictive to new incoming investment. There seemed to be a clear dichotomy between these two views among the utilities surveyed.

Table 2.6: Views on Openness of Germany to New Incoming Investment - Percentage of Respondents

Extremely Open	0.0
Very Open	11.1
Open	44.4
Neither Open nor restrictive	0.0
Restrictive	33.3
Very Restrictive	11.1
Extremely restrictive	0.0

Source: London Economics Survey of European Utilities 2002

2.7 Greece

2.7.1 Market and Regulatory Overview

Greece's electricity sector is a small market with significantly less interconnection with the rest of Europe than most EU countries. Installed capacity in Greece is only about 10GW, and total production is about 48.5GWh. The majority of Greece's production is thermal, consisting mostly of coal. About 10% of production is hydro, or about 4GWh per year.

Greece has embarked on market reforms to liberalise its electricity sector and comply with EU directives. Greece had a two-year derogation on market opening from the EU electricity liberalisation directive. Greece's electricity sector was characterized by large excess capacity in the early 1990's, with reserve margins over 40%. While reserve margins had fallen to about 25% by 1998. Greece's electricity market still has some special features relative to many others in the EU, such as its lack of interconnection. However, an undersea DC interconnector has recently been constructed between Greece and Italy, connecting Italy's South-eastern area (Puglia) with Greece. In addition, Greece's electricity consumption is expected to grow significantly over the period to 2005[10]. Installed capacity in Greece stood at about 7,840MW in 1999 with an additional 1000MW of capacity due to come online between 2004-05. Greece has a managerial separation between generation and transmission assets and negotiated third party access to the grid.

Greece's law on liberalisation, passed toward late 2001, ended over 50 years of monopoly provision by the state-owned vertically integrated utility (PPC). PPC generates, transmits, and distributes over 96% of the country's electricity.

10 Energy Policies of the IEA Countries, IEA, 2001.

2.7.2 Degree of Regulatory Openness to New Investment in Greece

The views of European electricity utilities surveyed on the degree of regulatory openness to new investment in Greece are presented in Table 2.7. A quarter of the respondents felt that Greece had an open policy to new investment; another quarter saw it as restrictive, while 50% felt it was neither open nor restrictive.

Table 2.7: Views on Openness of Greece to New Incoming Investment	
Extremely Open	0.0
Very Open	0.0
Open	25.0
Neither Open nor restrictive	50.0
Restrictive	25.0
Very Restrictive	0.0
Extremely restrictive	0.0
Source: London Economics Survey of European Utilities 2002	

2.8 Ireland

2.8.1 Market and Regulatory Overview

Ireland opened its electricity market to about 30% of retail customers in 2001 and as of February 2002 40% of the Irish market is open. This is scheduled to be estimated to 56% in February 2004. Ireland's regulator CER has been very active in encouraging competition and Ireland has also opted for a "virtual" market opening, via the virtual independent power producer process (VIPP). The VIPP has been a capacity auction, where bidders have essentially bought options to buy energy from the Electricity Supply Board (ESB) generation at a regulated price. There has been a VIPP1 and VIPP2, with VIPP1 auctions being undersubscribed. The idea behind the VIPP is to allow new entrants a jump start on their retailing or "supply" business in advance of actual physical generation being brought online. Physical IPP have been commissioned with two new CCGT plants being built near Dublin, one (Huntstown) by Northern Ireland Electricity's parent company, Viridian, and one by a consortium of ESBI and Statoil (Synergen).

The VIPP, the actual IPP, and new wind projects indicates market liberalisation has been progressing. Since Ireland has enjoyed the fastest economic growth, in Europe for some 10 years now, security of supply is a major concern for the regulator. In light of this, the regulator is currently undertaking reviews of previous regulatory decisions, including a review of the trading arrangements in Ireland.

2.8.2 Degree of Regulatory Openness to New Investment in Ireland

The views of the European electricity utilities surveyed gives a very positive ranking to the degree of regulatory openness to new investment in Ireland. The results show that 60% rated the Irish regime as extremely open, very open or open to new incoming investment and the balance rated Ireland as neither open nor restrictive. None of the utilities surveyed rated Ireland as restrictive.

Table 2.8: Views on Openness of Ireland to New Incoming Investment - Percentage of Respondents

Extremely Open	10.0
Very Open	20.0
Open	30.0
Neither Open nor restrictive	40.0
Restrictive	0.0
Very Restrictive	0.0
Extremely restrictive	0.0

Source: London Economics Survey of European Utilities 2002

2.9 Italy

2.9.1 Market and Regulatory Overview

Italy is a country where electricity liberalisation may eventually have a large impact on the market and end-user prices. Italian prices are among the highest in the EU. Italy's electricity sector was heavily concentrated with the major player being the state-owned monopoly vertically integrated utility (VIU), ENEL. A national law has recently required ENEL to divest about 15GW of thermal generation capacity. The first of these asset sales were completed in late 2001 and early 2002.

The new markets in Italy will number five in total: a day-ahead energy market, an adjustment market, a congestion market, a reserve market, and balancing market. These markets will be administered by the Gestore del Rete di Transmissione Nazionale (GRTN).

2.9.2 Degree of Regulatory Openness to New Investment in Italy

The views of the European electricity utilities surveyed on the degree of regulatory openness to new investment in Italy are presented in Table 2.9. Perhaps reflecting the changes following ENEL's divestment, most utilities felt the market in Italy was open with a further 33% rating it is neither open or restrictive.

Table 2.9: Degree of Regulatory on Openness of Italy to New Incoming Investment

- Percentage of Respondents

Extremely Open	0.0
Very Open	0.0
Open	55.6
Neither Open nor restrictive	33.3
Restrictive	0.0
Very Restrictive	11.0
Extremely restrictive	0.0

Source: London Economics Survey of European Utilities 2002

2.10 Luxembourg

2.10.1 Market and Regulatory Overview

Luxembourg represents one of the EU's smallest electricity markets. Luxembourg's market also is characterised by significant interconnection with surrounding states' electricity grids. Luxembourg's energy market liberalisation process has been proceeding slowly, relative to member states such as the Netherlands.

According to the regulatory authority in Luxembourg (ILR), the regulatory objectives in Luxembourg are as follows: Regulate transmission and distribution tariffs; Control access conditions to the grid; Avoid abuse of a dominant position and predatory behavior.

The opening of the market in Luxembourg will be gradual, and will permit only the largest consumers to choose their supplier in the first phase. From 2003 market opening will apply to eligible customers with annual consumption of 9 GWh and from 2005 this will decline to 1 GWh.

Customers who elect to choose their supplier will also have to pay use of system charges in addition to energy charges. Eligible customers will face regulated tariffs for use of network charges, given the monopoly status of the provision of network services.

2.10.2 Degree of Regulatory Openness to New Investment in Luxembourg

The views of the European electricity utilities on the degree of regulatory openness of Luxembourg to new incoming investment are presented in Table 2.10. While 25% rated Luxembourg as open, most utilities surveyed rated Luxembourg as neither open nor restrictive. This is likely to reflect the early stages of market opening.

Table 2.10: Degree of Openness of Luxembourg to New Incoming Investment - Percentage of Respondents

Extremely Open	0.0
Very Open	0.0
Open	25.0
Neither Open nor restrictive	62.5
Restrictive	12.5
Very Restrictive	0.0
Extremely restrictive	0.0
Source: London Economics Survey of European Utilities 2002	

2.11 Netherlands

2.11.1 Market and Regulatory Overview

The recent reforms in regulatory situation in the Netherlands has resulted in new players entering the electricity market. Foreign investment in the sector is also evident and three of the four electricity – generating companies have been acquired by foreign companies. Acquisitions have also taken place in the distribution sector and trading companies established in the Netherlands. The Dutch regulator (Dte) estimates that in spite of overcapacity in electricity generation, the demand for import capacity is still many times greater than the supply that is technically feasible.

The electricity market in the Netherlands and its recent reforms are seen to be a success by Dte, and this is reflected in the new players that have entered the electricity market.

The Netherlands introduced competition in their electricity sector in 2001. The Electricity Production Sector (Transition) Act on 1 January 2001 exposed the electricity generating companies and the distribution companies to full competition.

Congestion on the international transmission grids is seen as a prominent concern on the national electricity market reform agenda. Dte cite a "continuing lack of clarity[11]" with regard to the available transmission capacity as an obstacle to further price reductions.

In the Netherlands auctions have been introduced as an allocation mechanism in order to improve the efficiency of the allocation of the scarce interconnection capacity and thus maximize the benefits of interconnection to the market. The regulator has stated that it "considers it its duty to ensure that the method of auctioning capacity is closely aligned to the Dutch electricity market, on the one hand, and the requirements of players in this market, on the other hand"[12].

11 Dte 2001, op. cit.

12 Dte 2001, op. cit.

2.11.2 Degree of Regulatory Openness to New Investment in Netherlands

Reflecting the recent changes in electricity regulation in the Netherlands, the views of the European electricity utilities surveyed suggest a very positive view on the openness of the Netherlands to new investment. 33.0% of utilities surveyed rated the Netherlands as very open to new incoming investment and a further 22.2% rated the Netherlands as open to new incoming investment.

Table 2.11: Degree of Openness of Netherlands to New Incoming Investment - Percentage of Respondents	
Extremely Open	0.0
Very Open	33.3
Open	22.2
Neither Open nor restrictive	33.3
Restrictive	11.1
Very Restrictive	0.0
Extremely restrictive	0.0
Source: London Economics Survey of European Utilities 2002	

2.12 Portugal

2.12.1 Market and Regulatory Overview

Portugal's electricity sector is currently undergoing significant changes. The sector is seen as eventually joining a more liberalised and more interconnected system for the whole Iberian Peninsula.

The electricity sector in Portugal has been the object of profound changes since the end of the 1980's, when the production and distribution of electric energy was opened up to private investment. In 1991, the restructuring of the electricity sector continued to evolve via further legislations, which established the general principles of the regulatory regime for the production, transmission and distribution of electric energy.

The principals established by this legislative package approved the general legal regimes of the production, distribution and transmission of electric energy, as well as independent regulation, through the creation of the Regulatory Entity of the Electric Sector (ERSE).

According to ERSE, from 1 January, 2003, the Iberian Peninsula will begin to constitute an integrated electricity market interacting with the rest of the European Union. As a consequence of a 2001 Protocol between the governments of Spain and Portugal, the regulatory entities of both countries drew up a joint proposal to define the organisational model for the Iberian electricity market (MIBEL). This is intended to lead to the development of an efficient competitive market, with mechanisms that are designed to protect consumers' needs, guarantee supply, and secure compatibility between the objectives of efficient energy and the encouragement of renewable energy.

2.12.2 Degree of Regulatory Openness to New Investment In Portugal

The views of the European electricity utilities surveyed on the degree of regulatory openness of Portugal to new incoming investment are presented in Table 2.12. The figures show that 44.4% of utilities rated the market as open while the same percentage rated it as neither open nor restrictive.

Table 2.12: Degree of Openness of Portugal to New Incoming Investment - Percentage of Respondents

Extremely Open	0.0
Very Open	0.0
Open	44.4
Neither Open nor restrictive	44.4
Restrictive	11.1
Very Restrictive	0.0
Extremely restrictive	0.0

Source: London Economics Survey of European Utilities 2002

2.13 Spain

2.13.1 Market and Regulatory Overview

The Spanish market, Omel, can perhaps be described as resembling a hybrid between NordPool and the England and Wales Pool. Bidding procedures are different from NordPool and more like E&W, since complex bids are allowed in Omel, and there are administratively set capacity payments. The one-day ahead market sets prices for each of the twenty-four hourly periods of the next day. Generators and buyers make bids to the market operator who matches supply and demand based on the bids. If the resulting basic daily schedule is not feasible due to transmission constraints, the market operator incorporates offers for congestion relief to establish the definitive feasible daily schedule. Scheduled bids are firm. On the day of operation, Omel operates a type of balancing market, with the intra-day spot market potentially opening several sessions of trade (up to 24) for the remaining one-hour periods of the day. Each session is similar to a one-day ahead market session.

2.13.2 Degree of Regulatory Openness to New Investment in Spain

The views of European utilities surveyed on the degree of regulatory openness to new investment in Spain are presented in Table 2.13. The results present a very positive view among utilities with 70.0% rating Spain as very open or open to new incoming investment. None of the utilities surveyed rated Spain as restrictive.

Table 2.13: Degree of Openness of Spain to New Incoming Investment	
Extremely Open	0.0
Very Open	10.0
Open	60.0
Neither Open nor restrictive	30.0
Restrictive	0.0
Very Restrictive	0.0
Extremely restrictive	0.0
Source: London Economics Survey of European Utilities 2002	

2.14 Sweden

2.14.1 Market and Regulatory Overview

Sweden's electricity sector has been at the forefront of electricity liberalisation and was one of the original members of NordPool. Sweden, unlike its Scandinavian neighbours, produces a significant proportion of its electricity from nuclear reactors, as well as significant thermal and hydro resources. With about 10GW of nuclear capacity, 16GW of hydro, and 7GW of thermal capacity (almost all oil/petroleum).

Sweden implemented full market opening (ability to choose supplier) in 1996, well in advance of requirements under the EU directive. Generation and trading are open to competition, while transmission and distribution remain natural monopolies. Since 1999, all customers have had the right to switch energy suppliers (while previously they had had to purchase a new meter, which represented a significant barrier to competition).

While the market has been successfully liberalised, three large players hold a significant share of the market. The state-owned Vattenfall, is the largest, and generates about 53% of the nations electricity[13]. Vattenfall accounts for 20% of the Nordic market and has purchased electricity generation assets in Norway, Finland, and the Baltics. Vattenfall is also a majority shareholder in HEW, the Hamburg Utility and several other German ventures.

Sydrkraft and Birka Energi are the other two major players in Sweden. Birka is the largest electric utility in Sweden in terms of number of customers.

13 See US Dept. of Commerce site: http://www.sce.doc.gov/us.html

2.14.2 Degree of Regulatory Openness to New Investment in Sweden

Reflecting the open regulatory approach in Sweden to the liberalisation of the market, the views of the European electricity utilities surveyed indicate a very positive view on Sweden's openness to new incoming investment. 44.4% of utilities surveyed rated Sweden as very open, which was one of the highest ratings given to any of the EU countries and a further 11.1% rated Sweden as open.

Table 2.14: Degree of Openness of Sweden to New Incoming Investment - Percentage of Respondents

Extremely Open	0.0
Very Open	44.4
Open	11.1
Neither Open nor restrictive	33.3
Restrictive	11.1
Very Restrictive	0.0
Extremely restrictive	0.0

Source: London Economics Survey of European Utilities 2002

2.15 UK

2.15.1 Market and Regulatory Overview

England and Wales recently adopted new electricity trading arrangements (NETA) in replacement of the Pool of England and Wales. The new trading scheme, according to Ofgem, has helped deliver a 40% reduction in wholesale power prices over the past few years, led to lower domestic bills and, in their view, ended the market power exercised by generation companies. These conclusions come from a recent report on the workings of NETA by Ofgem[14] the regulator in the UK. The New Electricity Trading Arrangements replaced the much-criticized Electricity Pool of England and Wales arrangements 16 months ago. There are however differing views evident within the industry, on the effectiveness of NETA.

In our view it is not clear exactly how much of the price reductions are directly attributable to NETA itself. Much of electricity price falls may relate to reductions in gas prices or cyclical falls in fuel prices. Some observers cite overcapacity of generating plant in Britain. Increased competition from generators, of course, has also contributed, but the extent to which such competition would have emerged under the old rules is open to speculation.

An important part of the changes in NETA verses the Pool is that currently under NETA a single reference energy price is not necessarily available in the market. Ofgem is reporting month-ahead baseload prices as their reference energy price, whereas the reference price under the pool was the system marginal prices. Even if Ofgem tried to compare baseload forward contracts under the Pool to NETA, these may or may not be comparable between the two regimes.

Ofgem is also considering changes to the arrangements with Scotland and is hoping to integrate Scotland into a Great Britain-wide trading system that can capture the benefits of competition generally believed to have been achieved in England and Wales for Scotland. Scotland's electricity market currently operates under a regulated price regime for energy as well as other services, a regime which has not changed since privatisation.

14 See http://www.ofgem.gov.uk/docs2002/48neta_year_review.pdf

Over the past few years, Ofgem have been considering the trading arrangements in Scotland and how they might be updated. Ofgem noted most importantly that prices in Scotland, where hydro generation dominates, were about 9% below England and Wales prices about 10 years ago, but now are about 9% above England and Wales prices. This has led to proposals to adopt BETTA, or British electricity transmission and trading arrangements. Ofgem's current schedule envisages a BETTA in 2004.

Northern Ireland is covered under different trading rules than the rest of the UK. In NI, prices are regulated via long-term contracts. Several years ago, the regulator in NI took action in the courts to reduce the price of wholesale electricity in NI, as wholesale prices at one point were around £41/MWh. NI is likely to increasingly take part in an all-Ireland energy market. In addition, an undersea DC interconnection with Scotland may bring cheap power imports from Scotland to NI, with the additional possibility of wheeling power through NI to the Republic.

2.15.2 Degree of Regulatory Openness to New Investment in UK

Apart from Ireland, the UK was the only market rated by any respondents as extremely open to new investment. Overall, nearly 90% rated the UK as extremely or very open to new investment. The views of European electricity utilities surveyed on the degree of regulatory openness of the UK to new incoming investment are presented in Table 2.15. Not surprisingly given the fact the UK led many of the early initiatives to liberalise its electricity markets, a very positive view on the degree of openness of the UK to new incoming investment is evident.

Table 2.15: Degree of Openness of UK to New Incoming Investment

Extremely Open	11.1
Very Open	77.8
Open	0.0
Neither Open nor restrictive	11.1
Restrictive	0.0
Very Restrictive	0.0
Extremely restrictive	0.0

Source: London Economics Survey of European Utilities 2002

3 Comparative Assessment of Degree of Openness to New Investment in Different Markets

As was evident in the individual EU country reviews in section 2, electricity regulators and policy makers in EU have embarked on programmes of market liberalisation with differing degrees of rigour. In many cases, if liberalisation is to generate sufficient investment to meet demand and to ensure competitive behaviour it is important that investors perceive the regulatory regime as being open to new investments. There are, of course, significant differences in the physical characteristics, and the actual regulatory programmes of markets across the EU and internationally as well as the perception of market openness to investment. It is useful to consider a comparative assessment of the views of the electricity utilities surveyed on the degree of openness to new investment in different markets. In this section we consider the views on market openness, not only in the EU but also in American markets and in Asia and the Pacific.

3.1 Views on Openness of North South, Central American Markets

The views of the European electricity utilities on the openness to new increasing investments of North, South and Central American markets are presented in Table 3.1. In general, the European utilities surveyed felt that the Americas on the whole were open to incoming investment. At least 37.5% of respondents in all cases said each of the four regions was at least "open" in terms of the regulatory environment and policy regime. The US and Canada were ranked as more open than Central and South America, with 27.2% and 25% respectively rating the US and Canada as having a "very" open regulatory regime.

Table 3.1: Views on Openness to New Incoming Investments of North, South and Central American Markets
% Ranking Markets as Open

	Extremely open regulatory policy/regime for new investment	Very open regulatory policy/regime for new investment	Open regulatory policy/regime for new investment
United States	0.0%	22.2%	44.4%
Canada	0.0%	25.0%	37.5%
Central America	0.0%	0.0%	37.5%
South America	0.0%	0.0%	37.5%

Source: London Economics Survey of European Utilities 2002

The results for the negative aspects of openness were similar. They showed that none of the European electricity companies surveyed rated North, South or Central American markets as having either a very restrictive or an extensively restrictive policy/regime in relation to new investment in the electricity sector. None of the utilities ranked either the US or Canada as having a 'restrictive' regulatory policy. Conversely 25% ranked South and Central America as 'restrictive'.

Table 3.2: Views on Openness to New Incoming Investments of North, South and Central American Markets
% Ranking Markets as Not Open

	Neither open nor restrictive regulatory policy/regime	Restrictive regulatory policy/regime	Very restrictive regulatory policy/regime	Extremely restrictive regulatory policy/regime
United States	33.3%	0.0%	0.0%	0.0%
Canada	37.5%	0.0%	0.0%	0.0%
Central America	37.5%	25.0%	0.0%	0.0%
South America	37.5%	25.0%	0.0%	0.0%

Source: London Economics Survey of European Utilities 2002

3.2 Asia Pacific

In general, the European electricity utilities surveyed felt that the Asia-Pacific region was at least somewhat open to incoming investment. At least 12.5% of respondents in all cases said each of the four regions was at least "open" in terms of regulatory environment and policy regime. Australia and New Zealand were ranked as significantly more open than the rest, with 62.5% and 12.5% respectively rating the Australia and New Zealand as opposed to 12.5%, 22% and 25% for each of Japan, China, and Hong Kong respectively.

Table 3.3: Views on Openness to New Incoming Investments of Asia and Pacific Markets % Ranking Markets as Open

	Extremely open regulatory policy/regime for new investment	Very open regulatory policy/regime for new investment	Open regulatory policy/regime for new investment
Australia & New Zealand	0.0%	12.5%	62.5%
Japan	0.0%	0.0%	12.5%
China	0.0%	0.0%	22.2%
Hong Kong	0.0%	0.0%	25.0%

Source: London Economics Survey of European Utilities 2002

The results for the negative aspects of openness in Asia and Oceania were similar but with some ranking China as extremely 'restrictive'. None of the utilities ranked either the Australia or New Zealand as even 'restrictive'. Conversely, 25% ranked Hong Kong as 'very restrictive'.

Table 3.4: Views on Openness to New Incoming Investments of Asia and Pacific Markets
% Ranking Markets as Not Open

	Neither open nor restrictive regulatory policy/regime	Restrictive regulatory policy/regime	Very restrictive regulatory policy/regime	Extremely restrictive regulatory policy/regime
Australia & New Zealand	25.0%	0.0%	0.0%	0.0%
Japan	62.5%	25.0%	0.0%	0.0%
China	22.2%	33.3%	11.1%	11.1%
Hong Kong	25.0%	25.0%	25.0%	0.0%

Source: London Economics Survey of European Utilities 2002

3.3 European Markets

In terms of Europe, we present the results for the EU countries and also for Eastern European and Baltic countries. These represent diverse and large areas of the grid and large amounts of generation capacity. Most respondents felt that France was generally restrictive, with only 10% ranking France as 'open' and none ranking France as 'very open'. Conversely, the UK is seen as very open with 77.8% saying the UK was very open and 11% saying it was extremely open. Italy is seen as somewhat open with 55% ranking it is open, but none of the electricity companies surveyed rated Italy as either very or extremely open. Apart from the UK, Ireland was the only European country to be rated by any utility as having an extremely open regulatory/policy regime for new investment.

Table 3.5: Views on Openness to New Incoming Investments of European Markets
% Ranking Markets as Open

	Extremely open regulatory policy/regime for new investment	Very open regulatory policy/regime for new investment	Open regulatory policy/regime for new investment
Austria	0.0%	0.0%	25.0%
Belguim	0.0%	0.0%	25.0%
Denmark	0.0%	0.0%	25.0%
Finland	0.0%	20.0%	50.0%
France	0.0%	10.0%	10.0%
Germany	0.0%	11.1%	44.4%
Greece	0.0%	0.0%	33.3%
Irish Republic	10.0%	20.0%	30.0%
Italy	0.0%	0.0%	55.6%
Luxembourg	0.0%	0.0%	25.0%
Netherlands	0.0%	33.3%	22.2%
Portugal	0.0%	0.0%	44.4%
Spain	0.0%	10.0%	60.0%
Sweden	0.0%	44.4%	11.1%
United Kingdom	11.1%	77.8%	0.0%
Eastern European & Baltic Countries	0.0%	11.1%	44.4%
Other European	0.0%	0.0%	11.1%

Source: London Economics Survey of European Utilities 2002

Data on those European countries that were viewed by the utilities as being restrictive in terms of regulatory policy are presented in Table 3.6. The results show some differences in views but it is clear that most of the utilities surveyed had clear views on which European markets were seen as open or restrictive.

Table 3.6: Views on Openness to New Incoming Investments of European Markets % Ranking Markets as Not Open

	Neither open nor restrictive regulatory policy/regime	Restrictive regulatory policy/regime	Very restrictive regulatory policy/regime	Extremely restrictive regulatory policy/regime
Austria	62.5%	12.5%	0.0%	0.0%
Belguim	50.0%	25.0%	0.0%	0.0%
Denmark	37.5%	12.5%	25.0%	0.0%
Finland	30.0%	0.0%	0.0%	0.0%
France	0.0%	40.0%	30.0%	10.0%
Germany	0.0%	33.3%	11.1%	0.0%
Greece	44.4%	11.1%	0.0%	11.1%
Irish Republic	40.0%	0.0%	0.0%	0.0%
Italy	33.3%	0.0%	11.1%	0.0%
Luxembourg	62.5%	12.5%	0.0%	0.0%
Netherlands	33.3%	11.1%	0.0%	0.0%
Portugal	44.4%	11.1%	0.0%	0.0%
Spain	30.0%	0.0%	0.0%	0.0%
Sweden	33.3%	11.1%	0.0%	0.0%
United Kingdom	11.1%	0.0%	0.0%	0.0%
Eastern European & Baltic Countries	22.2%	0.0%	11.1%	11.1%
Other European	77.8%	0.0%	0.0%	11.1%

Source: London Economics Survey of European Utilities 2002

The views of European electricity utilities surveyed suggest that North America, Australia and New Zealand and European countries were the most open to new investment. Within the EU a number of countries were perceived as particularly open from a regulatory perspective to new investment including UK, Sweden, Netherlands, Ireland and Finland.

4 Developments in Investment Climate for European Electric Utilities

This section reviews the investment climate for European electric utilities. The utilities surveyed were asked to provide information on their total new investment in the electricity sector. These results were broken down into domestic and international categories. Table 4.1, presents trends in the value of total new investment in domestic markets. The table shows the average annual % change in value of total new investment in the electricity sector in domestic markets.

Table 4.1: Trends in Value of Total New Investment in Domestic Markets

	1998/97	1999/98	2000/1999	2001/2000
Average (Mean) Annual % change in value of total new investment in electricity sector in domestic markets	10.7	293.1	0.7	99.6
Max % change in new investment in domestic markets	132	2000	20	600
Min % change in new investment in domestic markets	-80	-40	-24	-9

Source: London Economics Survey of European Utilities 2002

There was a significant increase in new investment in 1997-98 of around 11% for the utilities surveyed. 1998-99 showed a very large increase in investment in domestic markets, at 293% on average, but almost no increase on average in new investment in 1999-2000 among the utilities. In the year 2000-01 on average there was about a 97% increase in domestic market investment but as in other years the average figures represent a significant variance among the utilities.

Table 4.2 presents results as to trends in value of total new investment in international markets, for the last two years. Internationally, the respondents more than doubled their investment on the previous year in 1999-2000. In the year 2000-01, the responding companies decreased new investment internationally around 19%. The figures suggest that for the companies surveyed the very rapid increase in investment evident in 2000 slowed significantly in 2001.

Table 4.2: Trends in Value of Total New Investment in International Markets

	2000/1999	2001/2000
Average (Mean) Annual % change in value of total new investment in electricity sector in domestic markets	125	-18.75
Max % change in new investment in domestic markets	500	0
Min % change in new investment in domestic markets	0	-75

Source: London Economics Survey of European Utilities 2002

Table 4.3 shows the distribution of expected percentage changes in investment as forecasted by the electricity companies surveyed. A majority of respondents believe that investment will increase in 2002 compared with 2001 perhaps reflecting a slower growth in investment in the previous year. 25% forecast an increase of 40-50% however 25% believe, that investment will fall by up to 20%.

Table 4.3: Forecast Change in Total Investment in Electricity Sector in 2002	
	Expected change in 2002/2001 % of respondents
1 - 19% reduction	25%
No Change	12.5%
1 - 19% increase	37.5%
20 - 29% increase	12.5%
40 - 50% increase	25%
Source: London Economics Survey of European Utilities 2002	

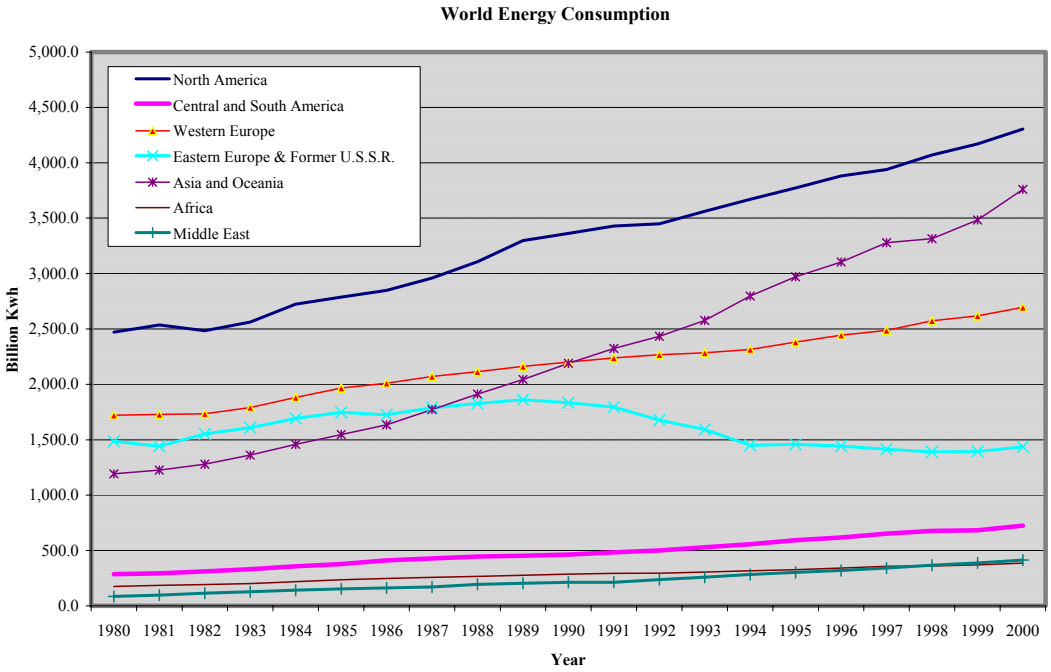
Respondents had differing views as to their forecast of changes in investment in 2003 shown in Table 4.4. 12.5% believed total investment would fall by over 50% while 12.5% felt it would increase by over 50%. Most of the companies expected some increase.

Table 4.4: Forecast Change in Total Investment in Electricity Sector in 2003	
	Expected change in 2002/2001 % of respondents
Over 50% reduction	12.5%
20 - 30% reduction	12.5%
No Change	12.5%
1 - 19% increase	37.5%
20 - 29% increase	12.5%
40 - 50% increase	12.5%
Over 50% increase	12.5%
Source: London Economics Survey of European Utilities 2002	

The results show that investment in the electricity sector is quite lumpy, as the ranges are quite high. It is also useful to study trends in investment by electric utilities worldwide. According to the EIA, 2000 worldwide installed capacity was about 3,262 million kW.

The trends in investment by electricity companies reflect trends in world electricity consumption, which has been growing rapidly. Figure 4.1 shows trends in world electricity consumption by geographic region. From the figure, it is clear that some areas are growing faster than others. Asian and Oceania markets have been the fastest growing over the last 20 years, and North American markets have been growing almost as quickly. In contrast, electricity consumption in some Eastern Europe and the former Soviet Union has fallen dramatically, although it is now showing signs of levelling off. Growth in most of Western Europe, Africa, and the middle East has been moderate. Because of the well-known correlation between energy use and gross economic activity, no-doubt the recent events of late 2001 and early 2002 will have impacted the trends, significantly slowing growth.

Figure 4.1: World Energy Consumption



Source: US EIA

4.1 Views of European Electric Utilities on Attractiveness of Markets by Location

Survey respondents were asked to rate the market opportunities pertaining to "attractiveness to new investment" by geographic location. Survey respondents were asked to rank the 4 major regions of the world in terms of their attractiveness as potential areas for investment. A wide range of factors are likely to influence these assessments including the views on the openness of the regulatory regimes to new investment and the scale of market opportunities. The consistency of the markets with the utilities individual strategies and their assessment of the potential risks and returns are also likely to influence opinions on this issue. Europe tops the league table, with an average ranking of 1.9. Next comes North America in at 2.2 for its average ranking. Then comes Asia Pacific with an average ranking of 2.7. Finally, other regions come in a last at 3.3.

Table 4.5: Attractiveness of Different Geographic Regions for Investment by European Electricity Utilities (median rank)

North America	2.2
Asia/Pacific	2.7
Europe	1.9
Other	3.3

Source: London Economics Survey of European Utilities 2002

4.2 North, South and Central American Markets

Many of the European electricity utilities surveyed felt that there were significant opportunities for investment in the America's. 50% ranked the US as either significant or very significant, while 30% ranked Canada as either significant or very significant, and 10% ranked South America as either significant or very significant.

Table 4.6: Views on Attractiveness of North, South and Central American Markets % Ranking Markets as Significant Market Opportunity

	Extremely Significant Market Opportunity	Very Significant Market Opportunity	Significant Market Opportunity
United States	0%	20%	30%
Canada	0%	10%	20%
Central America	0%	10%	0%
South America	0%	10%	10%

Source: London Economics Survey of European Utilities 2002

Given the size and nature of the United States market and the amount of European investment in the US it is perhaps not surprising that none of the electricity utilities surveyed ranked the United States as a very small or extremely small market opportunity. The views on other North, Central and Southern American are also presented in Table 4.7.

Table 4.7: Views on Attractiveness of North, South and Central American Markets % Ranking Market Opportunities as Not Significant

	Neither Significant nor Insignificant	Only Small Market Opportunity	Very Small Market Opportunity	Extremely Small Market Opportunity
United States	20%	30%	0%	0%
Canada	30%	30%	10%	0%
Central America	20%	20%	40%	10%
South America	20%	40%	20%	0%

Source: London Economics Survey of European Utilities 2002

4.3 Asia and Pacific

Interestingly, the results for Asia and Pacific show some noticeable differences in views. 13% of the European utilities surveyed felt China represented an extremely significant opportunity, in spite of the fact that many felt China to be restrictive in terms of market openness. This undoubtedly reflects the large scale of potential opportunities in China. Interestingly, none of the utilities felt Hong Kong/Japan, or Austria and New Zealand to be extremely significant market opportunities.

Table 4.8: Views on Attractiveness of Asia and Pacific Markets
% Ranking Markets as Significant Market Opportunity

	Extremely Significant Market Opportunity	Very Significant Market Opportunity	Significant Market Opportunity
Australia & New Zealand	0%	0%	20%
Japan	0%	0%	11%
China	13%	13%	38%
Hong Kong	0%	22%	11%

Source: London Economics Survey of European Utilities 2002

The results on the negative side are a bit more spread out than the positive for Asia/Pacific. Again, Japan was seen as the least attractive, with 22% believing it was an extremely small opportunity.

Table 4.9: Views on Attractiveness of Asia and Pacific Markets
% Ranking Market Opportunities as Not Significant

	Neither Significant nor Insignificant	Only Small Market Opportunity	Very Small Market Opportunity	Extremely Small Market Opportunity
Australia & New Zealand	30%	40%	10%	0%
Japan	33%	22%	11%	22%
China	25%	0%	13%	0%
Hong Kong	22%	11%	33%	0%

Source: London Economics Survey of European Utilities 2002

4.4 European Markets

In terms of the European markets, the most significant opportunities were seen as Italy and Eastern Europe and Baltic countries. Interestingly, none of the European utilities felt that any of the European markets represented extremely significant market opportunities.

Table 4.10: Views on Attractiveness of European Markets
% Ranking Markets as Significant Market Opportunity

	Extremely Significant Market Opportunity	Very Significant Market Opportunity	Significant Market Opportunity
Austria	0%	0%	22%
Belgium	0%	0%	33%
Denmark	0%	0%	22%
Finland	0%	0%	40%
France	0%	0%	11%
Germany	0%	0%	22%
Greece	0%	11%	11%
Irish Republic	0%	9%	18%
Italy	0%	30%	40%
Luxembourg	0%	0%	0%
Netherlands	0%	0%	56%
Portugal	0%	10%	20%
Spain	0%	10%	40%
Sweden	0%	0%	22%
United Kingdom	0%	0%	30%
Eastern European & Baltic Countries	0%	30%	30%
Other European	0%	0%	0%

Source: London Economics Survey of European Utilities 2002

The views of European utilities that felt that different markets represented only small market opportunities are presented in Table 4.11. The fact that some utilities rated Ireland and Luxemburg as extremely small in terms of market opportunities is likely to reflect the small absolute market size of the markets while the ratings for France may reflect perceptions of the regulatory openness to new incoming investment.

Table 4.11: Views on Attractiveness of European Markets
% Ranking Market Opportunities as Not Significant

	Neither Significant nor Insignificant	Only Small Market Opportunity	Very Small Market Opportunity	Extremely Small Market Opportunity
Austria	33%	22%	22%	0%
Belgium	44%	11%	11%	0%
Denmark	11%	44%	22%	0%
Finland	0%	30%	30%	0%
France	0%	44%	33%	11%
Germany	67%	0%	11%	0%
Greece	33%	22%	22%	0%
Irish Republic	18%	18%	9%	27%
Italy	10%	10%	10%	0%
Luxembourg	44%	0%	44%	11%
Netherlands	33%	11%	0%	0%
Portugal	40%	20%	10%	0%
Spain	30%	10%	10%	0%
Sweden	44%	11%	22%	0%
United Kingdom	50%	10%	10%	0%
Eastern European & Baltic Countries	20%	10%	10%	0%
Other European	86%	0%	14%	0%

Source: London Economics Survey of European Utilities 2002

5 Impact of Enron Development on Investment and other Factors

The bankruptcy of Enron, formerly the world's biggest over-the-counter energy trader, has rocked energy markets[15]. At the time, Enron was the USA's and the world's largest ever bankruptcy[16]. Perhaps no other single event of 2001 has impacted energy markets so profoundly.

5.1 Review of Enron Development

Enron was involved in a labyrinth of financial engineering and accounting practices. As the scandal broke, the ratings agencies downgraded Enron's corporate debt. These ratings downgrades triggered payments on some of Enron's debt. It would appear that the company may also have been weakened by a series of acquisitions in areas such as bandwidth trading and water services.

Enron had developed over-the-counter energy derivatives markets. In doing so, it often acted as both market maker (sometimes called a specialist in stock trading) and market participant (trader or broker). This made confidence in Enron as counterparty to trades and/or market maker of paramount importance to Enron's business model.

Because of Enron's size it appears revenues from trading operations dried up quickly as trading counterparties did not want to take the risk of having Enron as a counterparty to its trades. The result was the seventh largest company on the S & P 500 list filed for bankruptcy protection in US court.

15 Although, the industry as a whole has likely been as badly damaged in the recent revelations of what might be called, "Enron emulation", in that many energy traders may have engaged in practices, such as "wash-trades" in their attempts to catch-up with Enron. As a result, many of the companies engaged in entering the energy derivatives trading markets have come under intense scrutiny from regulators such as the SEC. This has led to several companies restating earnings and other financial data. Fuelling the already falling stock market, energy companies with earnings restatements have seen dramatic declines in their valuations.

16 Worldcom has quickly surpassed Enron in this category, however.

The developments at Enron itself may be of significant importance to electric power companies. New electric power markets often require merchant plant development and significant new investment. Merchant finance may require banks lending on a project finance basis, as companies wish to leverage merchant plants highly, but do not want to degrade their balance sheets. Banks will often require significant risk management if they are lending on a project finance basis. As part of the London Economics ' survey of European electricity utilities, we considered the perceptions of market participants on the impacts of these events. We therefore asked survey respondents to rank the importance of various potential Enron related effects.

The results in Table 5.1 indicated that all of the utilities surveyed believed that the Enron bankruptcy has resulted in an increased focus on corporate governance. Enron could be viewed as fundamentally a corporate governance problem, in the sense that financial engineering undermined the company's ability to come to the markets with credible financial results. Related to this is the fact that the Enron development is viewed by half of the electricity utilities surveyed as restricting the range of off-balance sheet finance, and this may have implications for how future investments in the electricity sector are structured.

Table 5.1: Impact of Enron development on electricity companies

Enron development has caused:	yes	no	don't know
Increased Focus Corporate Governance	100%	0%	0%
Restricted range of off-balance sheet finance	50%	30%	20%
Have made obtaining investment finance more difficult	40%	60%	0%
Reduced possibilities for energy trading	20%	70%	10%

Source: London Economics Survey of European Utilities 2002

40% of utilities also indicated that the Enron development will make obtaining finance for investment more difficult, but most believed that it would not reduce the future possibilities for energy trading. While in the long term this may be the case, London Economics believes that in the short run the development at Enron may have significant implications for the possibilities for energy trading in certain markets.

6 Developments in Approaches to Hedging Power Prices

A major factor in the development of new energy markets, and their ability to attract new investment will involve risk management. Risk management in the energy industry has traditionally been achieved by vertically integrating utilities. Under the old regime, much of the hedging function was accomplished by the vertically integrated nature of the utility, i.e., the power company sells power from its generation company to its distribution company; retail prices were set by the regulator and unanticipated changes in cost were generally passed on to consumers at the next rate filing or internally absorbed, in the case of national semi-state companies. Fuel prices for natural gas were sometimes regulated and sometimes set under long-term contracts. Oil price risk was sometimes one of the main risk factors that electric utilities traditionally faced.

The instruments available to hedge power prices in new electric power markets generally fall into four categories: Forwards (usually OTC physical energy trades), futures (exchange based financial contracts), power purchase agreements or PPAs (really a bundle of swaps, options and other physicals), contracts for differences or CfDs (medium term physical energy swaps), and other more exotic derivatives.

6.1 Development of forwards and futures markets for electricity

The liberalisation of electric power markets was viewed as potentially requiring additional risk management, since previous risk mitigation was partially achieved by vertical integration. Some markets, such as in North America and the UK, had developed advanced but specialised over the counter markets for power supply, with the UK trading CfD's against the Pool price and some market makers trading significant quantities of spot and forward power in the US over the counter. However, futures were more slow to develop.

Previously, some valuable information on electricity futures trading could be obtained from actual volume and open interest data from electricity futures traded on one of the major commodities exchanges such as NYMEX or IPE. The NYMEX trades standard power futures contracts. The contracts are financial futures that are marked to market daily, but the contracts actually have provisions for physical delivery of power should the trader allow the contract month to expire with a short position still open.

For a while, electricity futures trading looked like the wave of the future of power risk management, at least in the USA, with trading in NYMEX contracts looking positively liquid in the later 1990's. The New York Mercantile Exchange opened its first 2 power contracts to trading in March 1996. The liberalising process in the different States generated the need to implement the use of risk management tools.

The US wholesale power market was developed based on 1992 law (EPACT) and the 88 and 89 orders of the FERC. Since then, trading in hubs started to proliferate. Hubs became the physical points for power sale operations. Of all these, 20 hubs attract greatest trading volume, six of which are delivery points for futures from NYMEX.

Over the following years, the NYMEX added new contracts until they were six in all, the last one being the Mid Columbia contracts, which started trading in September 2000.

Futures contracts traded on the NYMEX define a one-month delivery period for peak hours and they are differentiated by the delivery point. As the US power system is divided in regional subsystems, it is impossible to define a representative contract for power price in the whole territory. Within each subsystem there are a series of key points where several high tension lines can be found. These points are known as hubs. The power futures contracts on the NYMEX were defined by a total of six different hubs. These hubs are California - Oregon border (COB), Cinergy, Entergy, Mid - Columbia, Palo Verde and PJM Western.

As there are no official markets that publish a reference price, against which a maturity can be cleared, power futures contracts on the NYMEX were cleared by delivering the underlying asset.

The trading volume of power futures contracts on the NYMEX, rose dramatically over the first 3 years. However, the excessive fluctuations in the spot market price in 1998 caused huge loses in trading companies and affected future contract trading. Then the California energy crisis caused further erosion of volumes and problems for energy market participants in 2001.

Apart from NYMEX, other futures markets (Chicago Board of Trade and Minneapolis Grain Exchange) also created futures contracts on electricity. Specifically in September 1998 the CBOT created futures contracts on electricity with delivery at hubs Commonwealth Edison Area and Tennessee Valley Control Area, and the MGE created a futures contract with delivery at the Twin cities generation hub. However, these futures contracts stopped trading in July 2000 and June 2001 respectively.

The story for the NYMEX California-Oregon Border (COB) and the Palo Verde (PV) contracts got worse. Energy and Power Risk Management magazine reported recently that trading in these contracts has been nearly non-existent in 2002, and NYMEX is not currently reporting contract data on its website.

Germany's European Energy Exchange, which merged this summer with the Leipzig Power Exchange, launched continental Europe's first electricity futures contract on March 1 of this year. There are contracts for both baseload and peak energy. By July 2002 approximately 587 contracts were traded for the September baseload contract and about 18,000MWh of open interest.

In the UK, increased forwards and futures and other derivatives trading was expected to be one of the hallmarks of the New Electricity Trading Arrangements (NETA). NETA came into effect at end March 2002, bringing with it the end of the electricity pool. NETA is founded on forward power trading. The pool disappears and power should be traded either bilaterally or through forward power markets.

Concerning markets or exchanges where electricity can be traded forward, there have been many initiatives. The first to be set up has been the UK power exchange (UKPX). This market was supported by the Swedish group OM through OM London Exchange. On this exchange, spot contracts and forward contracts may be traded.

Where futures trading is concerned, the International Petroleum Exchange started listing its futures contracts on electricity on 19th March 2001. The contracts are for daily, monthly, quarterly and seasonal (Summer and Winter) base load, and are traded in multiples of 5. Settlement is on delivery or on differences.

Trading on IPE was sparse, with the largest volume being 45 contracts in August of that year. The contract has not traded in recent months and was officially dropped in May 2002. Nonetheless, other futures and energy exchanges, especially in Europe are continuing to develop, and launch derivative products. The Amsterdam Power Exchange is a spot market in electricity and we understand it showed significant growth in volumes.

Other exchanges, such as the Intercontinental Exchange (ICE) have recently launched European electricity derivative products, but it is not clear if the contracts will prove liquid enough for reliable risk management in the future. ICE's approach to electricity derivatives is that it expects to deal only in OTC products, and acts merely as a market clearing agency, rather than an exchange (most traditional exchanges manage counterparty risk by requiring margins on all products and marking to market contracts daily[17].) ICE also intends to extend its clearing facility to include the UK natural gas and power markets and the German power markets. The clearing of OTC gas and power markets in both North America and Europe through a single global clearing house, the London Clearing House (LCH), allows ICE clients to eliminate counterparty risk – an increasingly important benefit since Enron's collapse. ICE already offers a clearing service for US oil swaps and US gas swaps.

Spain has seen the development of a successful OTC market based on pool prices in the OMEL as the reference price. This unorganised market or OTC market had been growing over time, not only in depth, but also in traded volume. In 1999 there was a registered volume of between 2 and 2.5 TWh (it should be pointed out that it is impossible to know the exact traded volumes due to the lack of transparency inherent in unorganised markets). In 2000, traded electrical energy was between 4 and 5 TWh. In the first half of 2001, 8.2 TWh had been registered and another 1.8 TWh of operations qualified as private and confidential, which represents a significant increase on the previous year.

Last but not least, Scandinavia and NordPool deserves some significant mention. The use of forwards and futures in NordPool has been growing, and is widely credited as part of the reason for the success of electricity liberalisation in Norway, Sweden, and now Finland and Denmark. Current year to date trading in NordPool's Eltermin futures market is about 3900 GWh, and a significant increase on last year.

6.2 PPAs and Other Derivatives to Hedge Power Price Risk

PPAs are just one, but formerly the most popular, form of OTC contract for hedging power price risk. Many merchant plants built on a project finance basis were constructed with bank loans made against PPAs.

17 This means that participants in contracts with large price fluctuations might have to post cash to a margin account at any time should price move against them.

In the USA, many power projects used to rely on PPAs and long-term gas contracts for risk management. In addition, merchant banks were willing to lend funds on a project finance basis to international power plant developers who were able to get signed PPAs in developing nations.

For a variety of reasons, PPAs are becoming increasingly rare. In the developing world, no doubt the inability to hedge currency risks is a major factor. The Argentine monetary and debt crisis has no doubt highlighted this problem, as concessions for plants developed by large EU power companies, have taken big losses since Argentina has been forced to devalue its currency. In the case of other nations, recent Asian and Latin American currency crises have highlighted the underlying risks of devaluation in developing countries.

Currency risks are not easily mitigated, and the amounts of cash needed to pay for a power plant over 20-30 years will be very large. In spite of any efforts made to hedge risk, even where there is dollarisation in some economies, the fact that local electricity users will have to pay in local currency cannot be avoided.

In the developed world, the reasons PPAs have fallen out of favour have more to do with regulatory and legal concerns, as well as the developments of competing products. Forward contracts have replaced them in many cases. One of the major concerns with PPA in countries like the USA is their illiquidity. Illiquidity, the inability to replace or trade the contract, means that the risks of the contract cannot be sold-off. For example, if one bought a forward contract to buy electricity at $20/MWh, and then prices fell to $18/MWh, one could unwind the position and take a $2/MWh loss, if one wanted to limit oneself to further downside exposure. With a PPA, this would not usually be possible, as the contract is typically on a take-or-pay (must buy) basis. This may prove especially onerous considering the usual length of PPAs is 15-30 years.

PPAs also have several other disadvantages in that counterparties may not be able to sell off tranches of the risk to other parties for diversification reasons. Finally, as they are non-standard, the ability to value a PPA quickly is limited and so further reduces trading or collateral opportunities.

Elsewhere around the world, energy and electricity derivatives have been launched. The Sydney Futures Exchange launched an electricity futures contract that is still trading, although volumes are still somewhat low.

The New Zealand futures contracts started trading in October 1996, whereas the Australian contracts started in September base load and March 1999 peak hours.

Both, in the case of New Zealand and Australia, the contracts cover monthly periods. In New Zealand the contract is nominally for 250 MWh independently of the days of the month. The price reference being Haywards hub (North island) and it is settled by references. In Australia, there are 2 points of delivery (Victoria and New South Wales) and baseload and peak hour contracts for each one. The size of the 4 contracts is 500 MWh. Settlement is carried out by differences and the price references are those of Victoria and New South Wales pool, both managed by the Australia electricity market operator, EMMCO. The traded volume in both cases has gradually fallen off. Respecting NZFOE, the evolution of contracts has been decreasing starting with 1,148 GWh in 1997 and going down to 381 GWh in 1999.

Respecting SFE, in 1998 the Victoria contract registered 1,821 GWh, while the New South Wales one registered 2,881 GWh. In 1999, Victoria had fallen 2,768 GWh, and New South Wales to 1,284 GWh. The main reason that justifies a very limited development of this type of products resides in the fact that the majority of the generation companies are public, and most of them do not have the necessary authorisation to be able to act in the derivatives markets.

6.3 CfDs and Swaps

CfDs and swaps are long-term forward purchase agreements for energy. Their main difference with other energy derivatives is their use of a clear reference price as the price against which the contract is cleared. The most common Cfds were traded in the UK and early in Australia's NEM. These were contracts that effectively hedged power prices against electricity pool prices.

With the advent of the NETA trading arrangements, and more sophisticated trading in the NEM in Australia, Cfds and swaps have fallen out of favour. A major reason for this is that any swap arrangement requires a clear reference price that all parties to the swap can agree upon. The absence a pool price against which swaps can be cleared means that striking these contracts has become increasingly difficult.

European electricity utilities surveyed by London Economics of the survey were asked, by derivative category, to rate by how much the use of derivatives in hedging power prices would increase over the next five years. Interesting, the vast majority of respondents stated that every type of derivative contract would either increase, or increase significantly.

Table 6.1: Views of European Electricity Utilities on Hedging Power Prices

	Increase Significantly	Increase	No Change	Decline Slightly	Will Decline
OTC Forwards	27%	45%	18%	9%	0%
Futures	27%	36%	36%	0%	0%
PPA	20%	60%	20%	0%	0%
CfDs/Swaps	20%	50%	30%	0%	0%
Other	29%	43%	29%	0%	0%

Source: London Economics Survey of European Utilities 2002

7 Regulatory Issues and the California Electricity Crisis

The California electricity crisis has important implications for the development of regulatory policy concerning the electricity sector. California, the most populous and richest (in Gross State Product terms) state in the world's largest economy (the USA), had deregulated its electricity industry in advance of most states and regions with the aim of lowering power prices and promoting greater efficiency in the industry. However, a combination of a failure to build new power plants, a sudden increase in demand, unusually hot and dry weather, the decommissioning of some nuclear plant, and poor regulatory design all may have combined to bring California's new electricity market crashing to a halt and return, at least for a while, to a fully regulated environment. In the end, two of the three major investor-owned utilities, PG&E, and Southern California Edison filed for bankruptcy and the state was subject to a series of rolling blackouts on several occasions.

The regulatory and economic impact of the crisis on deregulation power markets has yet to be fully felt. Many state's and other jurisdiction outside the US delayed plans for rapid or radical deregulation of their power markets, while, notably, others, such as Texas and the EU, continued their deregulatory programmes.

The views of European electricity utilities surveyed on the causes of the electricity crisis in California are reported in Table 7.1. Views were divided on the importance of increased reliance on imported power on the causes of the crisis. Imported power from the Pacific Northwest may have exposed CA to greater uncertainty due to the vast percentage of hydro capacity in that region. An unexpected surge in demand was ranked as important or very important by 80% of respondents. It would appear that demand for electricity in California grew at a rate that exceeded growth rates in prior years with similar levels of economic growth. Lack of capacity was deemed to be important or very important by all of the electricity utilities surveyed. The role which regulatory design played in the resultant lack of capacity was seen by all of the European utilities surveyed as very important or important in contributing to the Californian electricity crisis.

Table 7.1: Importance of factors contributing to CA crisis

CA crisis factors	Very Important	Important	Neither	Not Important
Increased reliance on imported power	20%	30%	40%	10%
Unexpected surge in demand	10%	70%	20%	0%
Regulatory design	40%	60%	0%	0%
Lack of capacity	44%	56%	0%	0%

Source: London Economics Survey of European Utilities 2002

A number of the utilities highlighted the importance of the regulatory design flaw that fixed retail prices while wholesale prices were allowed to fluctuate fully with the market spot price, generated in the California Power Exchange (CalPX). The need to avoid competitive bypass of stranded cost payments to utilities also meant that all traders were required to trade through the PX. Still others highlighted the regulatory design problem that allowed gaming and market power problems in the market. The Californian development clearly highlighted the need for careful economic analysis in designing market liberalisation regulatory policies in the electricity sector. It also highlights the need for utilities to examine in detail the regulatory environment in evaluating investment opportunities.

Comments on this report are welcome and should in the first instance be sent in writing to Mr. Patrice Muller, Partner, London Economics, 60 Lombard Street, London EC3V 9EA. Email pmuller@londecon.co.uk.