

DRPT 2000

HIGHLIGHTS OF THE INTERNATIONAL CONFERENCE ON ELECTRIC UTILITY DEREGULATION AND RESTRUCTURING AND POWER TECHNOLOGIES 2000, CITY UNIVERSITY LONDON, UK

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The International Conference on Electric Utility Deregulation and Restructuring and Power Technologies 2000 (DRPT 2000) was held at the City University London, UK, April 4~7 2000. It provided an international forum for participants to share knowledge, experience, new ideas, and future trends in the ongoing process of electric utility deregulation and restructuring. The conference focused on power delivery technology for a new market and highlighted technology behind the new market brought about by deregulation and restructuring. It served as a meeting place for people from industry, utilities, and the universities to present their work; and presented a full spectrum of the competitive market and engineering technologies in electricity industry service for the millennium. The symposium was organized by the City University, London and was co-sponsored by IEEE PES and IEE. Financial sponsors included: The National Grid Company plc, UK; Electricite de France; Mitsubishi Electric Corporation, Japan; London Electricity plc, UK; ABB; and A. M. Best International Ltd. More than 140 papers on utility deregulation and restructuring together with power technologies were debated during the technical sessions. Delegates from more than 35 countries attended. The high standard of the papers, presentations, and technical discussions was particularly gratifying.

The conference was preceded by a Tutorial on Deregulation, New Electricity Trading Arrangements, System Planning and New Technologies. During the conference, there was an exhibition of products and services related to the theme of the conference: *Competitive Market and Engineering Technologies in Electric Service for the next Millennium*.

The conference was opened by David Rhind, Vice Chancellor, City University London, UK; Malcolm Kennedy, President IEE; and Donald R. Volzka, President IEEE Power Engineering Society. David G. Jefferies, 1997 President IEE and Former Chairman, The National Grid Group plc, UK then delivered the Keynote Address. This was followed by three invited speakers: Dr Nigel Burton, Managing Director, Utilities Group, Deutsche Bank; Professor Hugh Rudnick, IEEE /PES Distinguished Lecturer, Catholic University of Chile, Chile; and Luigi Salvaderi, Power Engineering Consultant, Rome, Italy; and a Special Session which was organized by London Electricity Board. Plenary Addresses on the second and third days were delivered by Wallace S. Read, 1996 President IEEE; and Tadao Amakasu, Former Executive Vice President, Mitsubishi Electric Corporation, Japan.

Opening Session

Wallace S. Read (1996 President IEEE) introduced the speakers in the opening session.

David Rhind (Vice Chancellor, City University London) said it was a great pleasure to welcome participants to London and an honor to have such distinguished guests from all over

This conference review article was prepared by T. J. Hammons, Chair of UKRI Section Power Engineering Chapter; Chair of UKRI Section; and Chair of International Practices for Energy Development and Power Generation; University of Glasgow, United Kingdom.

the world. To hold a meeting on a subject of such universal concern and which creates a mutual environment for the people who are deeply involved gives an opportunity to share knowledge, experiences, opinions, feelings, and enthusiasms. He said City University London was in the top 10 of around 102 Universities in the UK in terms of jobs students get after graduation. They achieved that by getting good relationships with industry and commerce, with understanding of what the needs of the world of work are. He was delighted to be present at the opening of the conference which, as it says, is intended to highlight the technology behind the new market brought about by deregulation and restructuring of the electric power industry. In the UK we have had more than a decade of exciting times in our power industry following deregulation. There is much to be learned from the contributions from around the world and he looked forward to meeting participants during the course of the conference. He wished all success.

Donald R. Volzka (President IEEE Power Engineering Society) said he was very pleased to participate in the opening ceremony and brought greetings from the Governing Board of PES, who wished every success in the endeavors of the conference. He said he personally was very pleased to be present at the conference as he is deeply involved in virtually every issue that the conference was addressing.

He said he would try to touch on a few of the issues from his perspective as well as that of PES. First, he worked for the Wisconsin Electric Power Company, a vertically integrated utility, and has done so for almost 4 decades. He was in the transmission business involved in power system planning and the protection of power systems. He was also deeply involved in reliability issues that we face in the US, and chairs one of the engineering committees on the regional council, seeing national issues that are involved. So he was pretty deeply involved in all the things that the delegates were to discuss.

With regard to deregulation, his personal view is that this is a misnomer, at least of sorts. This is true because it is extremely rare that the regulatory community ever really lets loose of an entity being regulated, and that is certainly the case with the electric utility industry. Most often, regulatory efforts are either refocused into another area or transferred to another entity. Regardless of which happens, the regulatory burden on the utility industry goes up, not down.

In the US, this increase is usually the result of increased pressure on the boundary between the Federal Energy Regulatory Agency which has jurisdiction over transmission facilities used in interstate commerce, and the states which regulate rates in their jurisdictional areas including siting and permitting for construction. Siting and permitting issues become more complex since the states are being asked to site facilities for which they have no control in rates. Facilities which cross state boundaries have been nightmarish licensing efforts in the past in instances. They could get worse in the era of open access as it is realized that transmission construction could have an adverse impact on rates in an area blessed with efficient generation. Planning for new transmission will be difficult in the new environment. Obtaining authorization to construct facilities planned will present new challenges beyond those that presently exist. The only positive influence might be the emergence of a higher degree of control over the situation brought about by the existence of Regional Transmission Organizations (RTOs).

The facilities and analysis techniques that we use in power transmission are also being directly affected by these changes. Across the US, transmission planning entities are being inundated with requests for IPP interconnection studies, transmission service requests, and system impact studies. Complicating the matter is that they are usually not trying to locate where we would like them to be from a transmission viewpoint, but are selecting sites where

the gas is available. They also want to build power plants, not the transmission that might be associated with them, so there is often intense pressure to compromise the reliability built into many of the transmission systems which exist.

Restructuring from the vertically integrated world complicates life considerably in the transmission area because of the associated changes in responsibility to serve and the redefinition of the meaning and function of “control area”. With that redefinition must come new tools and facilities to permit reliable operation of the power system, which is also being redefined. It certainly appears that considerable direct control of load is inevitable. A great challenge indeed lies before you!

One of the needs of the electrical industry in the US is for a quality set of planning and operating standards to assure reliable operation of the power system in a restructured and deregulated environment. A trial is presently underway to determine if PES and the North American Electric Reliability Council (NERC) can develop a process to jointly develop these standards as IEEE standards, building on the work NERC has done thus far. Although this process is still under development and the relationship is far from being agreed upon, he believed PES has a lot to offer in terms of expertise and the ability to develop quality standards. A decision on PES involvement should be made within a few months.

As the electrical industry struggles with these issues, so does the Power Engineering Society struggle with its ability to be a relevant resource to the industry. His position is that PES must undergo structural change to match those in the basic industry. These changes are necessary to create the forum necessary to discuss and influence the issues noted above and many others. The changes are substantial and have received considerable attention over the last couple of months. A detailed plan is being brought to the PES Governing Board in July for discussion and approval. In the process, our goal is to be able to respond to industry needs without sacrificing the many areas in PES which are functioning very well.

He thanked the conference for the opportunity to chat to participants in the opening ceremony.

Malcolm Kennedy (President IEE) said it seems very appropriate that this Conference is being held within a week of the 10th anniversary of the privatization of the Electricity Supply Industry in England and Wales. During that period the ESI in this country has been transformed much further than anyone could have imagined when the first tentative steps of private ownership were made 10 years ago and yet the basic principles of the Government's White Paper at that time still seems to hold. Customer is King, competition is to be encouraged even perhaps to the point of diminishing returns and Monopoly businesses will come increasingly under the scrutiny of regulating authorities. Over the past 10 years the movement which started here in the UK has spread unabated throughout the world each country having its unique proposals and solutions dependent upon their political agenda and the size and disposition of the physical assets of the ESI in each country.

It is interesting to note the evidence that the de-regulation and privatization idea has tended to move more quickly in those countries that have no strong secondary layer of Government. Conversely, in those countries with a Federal system and strong State Government, basic principles agreed at Federal level are frequently slowed down and re-integrated at State level.

The whole de-regulation and privatization movement is not only concerned with political objectives and shareholder value but has also had profound effects on technical aspects of the Industry and which are the subject of this Conference. The movement has helped the upsurge in the use of gas and because of political intervention the case for renewable energy seems stronger than ever.

Whatever else has changed from a technical point of view, it is certain that the assets on which these newly de-regulated industries depend will have to work harder for their Owners in the future so that there is an upsurge in the interest of the several boundaries of operation of plant equipment and systems as a whole.

De-regulation of ESI is like letting the genie out of the bottle; it can never be got back again and he will continue to abound us with his virtuosity.

Keynote Address

The Keynote Address was given by David Jefferies, formerly Chairman of the National Grid Group. It was entitled: The Electricity Industry - A Decade of Change.

He stated that some 10 years have elapsed since the Electricity Industry in the U.K. was re - structured and privatized. Whilst some mistakes have been made, the performance of the new Industry has been remarkable, delivering lower prices, better Customer service whilst improving quality of supply.

To-day, we are able to review the experience of many other Countries which have followed the U.K. and liberalized their Electricity Markets. Each Country is different, but it is possible to observe six major drivers of change:

- ◆ LIBERALISATION - A reduced role for Government, economic freedom, reliance upon market forces and de-centralized decision making.
- ◆ COMPETITIVE RE-STRUCTURING - Commercial pressures re - shaping the Industry. Vertical and horizontal integration. The emergence of total Utility Service Providers.
- ◆ GLOBALISATION - Companies operating on a global stage, hence spreading and managing risk.
- ◆ ENVIRONMENTAL VALUES - Drive for non fossil generation - e.g. wind and wave. Increasing amounts of C.H.P. and small local generation.
- ◆ TECHNOLOGY - Major business opportunities arising from use of Information Technology - e.g. sophisticated Energy Trading Systems. E Procurement. New metering and information gathering technologies.
- ◆ REGULATION - Increasing role of Regulation into sectors where it was considered competition would render regulation superfluous. Convergence of Gas and Electricity markets, leading to arbitraging resulting in gas and electricity regulation being brought together.

The impact of each of these drivers upon the Industry and its structures was examined.

In conclusion, the Speaker highlighted the impact of these changes upon Staff and the culture of the new Companies. He concluded that this had been a time of great change and opportunity. Successful Organizations had continuously re - structured to overcome threats and take advantage of opportunities presented by changing market conditions. Successful Individuals were those who could thrive in an ever changing environment, and who had moved from a risk adverse culture to an entrepreneurial approach, where it is necessary to accept risk and manage it.

Special Session on Deregulation

This followed the Keynote Address on the morning of the first day of the Conference. There were three presenters: Nigel Burton, Managing Director, Utilities Group, Deutsche Bank, who discussed Liberalization and Convergence of European Energy Markets; Hugh Rudnick, Catholic University of Chile, Chile, who examined the Electricity Deregulation Process in Latin America; and Luigi Salvaderi, Electric Power Engineering Consultant, who reviewed the Evolving Italian Electric Industry.

Unbundling, Liberalization and Convergence of European Energy Markets **Nigel Burton, Managing Director, Utilities Group, Deutsche Bank**

The presentation focused on the major trends in the liberalizing of the European energy markets. The three major trends, of unbundling, liberalization and convergence, are driven by a combination of the EU Electricity and Gas Directives and National legislation. In practice, just as between jurisdictions in the United States, liberalization is occurring at greatly differing speeds and with significant differences in terms of specific implementation details between countries. For example, in Germany the entire end customer market has been liberalized, leading to significant price reductions for all customer categories – unusually however no regulator has been appointed. In several markets regulators or Governments have taken a more interventionist approach, including forcing the disposal of generation assets by dominant incumbents (UK, Italy) or preventing increases in capacity (Spain). It is therefore not the case that a uniform market exists, and nor is it likely to be for very many years.

Regulation

The German example highlights an interesting dilemma, namely that regulation can inhibit rapid liberalization, and in particular can create obstacles to new business models, which can develop far more quickly than regulation or Government can evolve. Incumbent utilities are, more often than not, complicit in moderating the pace of change unless regulation has created such commercial pressures that the utility itself promotes change. The UK illustrates many of these themes. The idea that regulation was initially necessary to protect customers, but in the longer term would only be necessary for monopoly businesses, with the result that regulation would “wither on the vine”, now seems discredited. Indeed the UK appears to be embarking on the same path that California pursued in the 1970s, with “social objectives” pursued not by Government and taxation but introduced by “encouraging” the utilities to implement a variety of cross subsidies under the cloak of economic regulation. The issue is not whether the social objectives should be pursued, but whether they should be paid for openly through taxation and the social security system or covertly as cross subsidies from other customer groups.

As another example of regulation slowing change, in the UK electricity sector the lack of clarity on mergers and acceptable market shares in both distribution and supply has delayed change and thereby delayed benefits to shareholders and customers alike. It is also widely believed that the lack of accountability of the regulator has led to excessive costs, both direct and indirect, imposed by regulatory dictate. Another specific example is the introduction of the New Electricity Trading Arrangements (NETA) which are intended to replace The Pool. Although it is clear that changes to The Pool were necessary, it is by no means clear that abandoning the system entirely and replacing it with a more complex and less transparent NETA system is the right approach. Indeed, no cost benefit analysis has been produced to justify the change, and it is ironic that this is happening at precisely the time when concerns about market fragmentation are leading US Stock Market regulators and authorities to

develop proposals for combining the different markets. Crucially the concern in this case is that fragmentation is detrimental to the small investor – exactly the same problem that appears most likely in the case of NETA, which will result in excessive costs and complexity, and high barriers to entry, particularly for smaller market participants including customers.

The above examples show that, far from the deregulation that many predicted, the energy sector (and other utility industries) is actually in a process of re-regulation. The end result is by no means clear, but it is the presenter's view that regulators should concentrate on cost reduction and price controls in monopoly businesses, minimize regulatory costs and complexity, maximize transparency of regulation and markets, and make sure that regulation itself is not a significant barrier to entry.

Over-Capacity

Another major issue affecting the strategies of both incumbent players and new entrants in the European electricity market is the significant over-capacity in most countries. The over-capacity in some countries may be partially alleviated by politically mandated closures of nuclear plant, as has already happened in Sweden and is now largely agreed in Germany. However it again pays to look beyond the headlines, as only one reactor has closed in Sweden, more than a decade after the political promise to do so was made, whereas in Germany the recent agreement amounts to little more than confirmation that no new plant construction or life extensions will occur and that reprocessing will cease at the end of the existing contracts.

Fragmentation

The liberalization strategies preferred by many pro-competition regulators and external funding agencies such as the World Bank and EBRD are looking increasingly at odds with the broader aspirations of EU accession by the countries with relatively small economies and electricity systems to the East of Europe. Implementation of existing policies is likely to lead these countries to have fragmented energy industries, which will be dwarfed by the much larger West European groupings that are now emerging. The end result is that, lacking critical scale, these smaller companies will probably be acquired by, or at least become controlled by, their larger counterparts, which may be neither politically nor economically desirable.

Convergence

A frequently made prediction has been that there would be convergence between the energy (i.e., oil and gas) and electricity industries. This has not happened, except to the limited extent that the "oil majors" have extended relationships intended to monetize their gas assets (i.e., find customers willing to provide secure contracts to purchase gas). Furthermore, it has become clear that the skills that are required to prosper in a liberalized environment are not those of the oil companies but are more likely to be internet, telecommunications, e-commerce and retailing skills. As a result the emergence of non-traditional players is becoming more evident. Although these currently have only limited market shares in any country, they are likely to be the most significant drivers of change going forward. Analogies with other industries (Telecom, Airlines) illustrate the potential scenarios.

Conclusions

The key conclusions of the presentation were that deregulation is a myth, that EU directives will eventually lead to more open markets, but at very different speeds and that major challenges remain, particularly in avoiding excessive fragmentation in Accession Countries which will require a different approach than simply implementing the orthodox “unbundling/liberalization” model of the 1990s.

Electricity Deregulation Process in Latin America

Hugh Rudnick, Fellow IEEE, Catholic University of Chile, Santiago, Chile

The electric energy industry in Latin America has faced a profound transformation, with no parallel worldwide. New electric sector regulations were set in Chile in 1982, Argentina in 1992, Peru in 1993, Bolivia and Colombia in 1994, and the Central American countries of Panama, El Salvador, Guatemala, Nicaragua, Costa Rica and Honduras in 1997. Brazil also joined the group and Venezuela, Mexico and Ecuador have initiated actions.

The diversity in the size of countries and power demand is striking, but as a whole, the Latin-American market is comparable to the North American one if growth is the measure. The Canada and United States market has an annual growth of 7,500 to 15,000 MW, while Latin America needs 10,000 MW a year. The level of electricity consumption is still low, if compared to the industrialized world, so that there is much room for further growth as these economies develop further.

In most countries in Latin America, the vertically integrated electricity state-owned electricity companies of the 70's failed to adequately manage the electricity business and diverse technical and financial problems became endemic. The deregulation process started in Chile, where free-market ideas gave rise to the notion that government control over the economy should be reduced and the role of the private sector enhanced. The concept of the subsidiary role of the government was coined and soon extended to the energy and electricity business. The government should perform entrepreneurial activities only when such activities cannot or will not be carried out by the private sector, and its main job should be to regulate activities that are monopolistic. Market forces are recognized as a basic mechanism in the correct allocation of resources in the electricity sector, with competition being welcome wherever it can take place. De-concentrating, decentralizing, and finally privatizing the activities and property of the electricity companies was recognized as necessary for the efficiency and stability of the system. Speeding up the process in other countries in the region, international lending banks, the World Bank included, started making loans conditional on the initiation of privatization or deregulation processes.

In the essence of Latin American changes, similar to what happened elsewhere, there is change of paradigm in the understanding of the electricity business, recognizing essentially different economic characteristics in the stages of generation, transmission, and distribution. Competitive wholesale generation couples to incentive-based regulated wire businesses (transmission and distribution). Explicit separation of the three businesses is defined (a fourth segment, the supply business is introduced in the latest de-regulations) and new pricing systems are developed, with operational or capacity expansion marginal prices or both.

To reduce market power, restrictions on cross ownership among different categories of companies (i.e., generation versus transmission versus distribution) were introduced in most countries (Argentina, Bolivia and Peru, but they were not defined in Chile). Argentina and Bolivia further limited horizontal integration at the generation level. Independent system operators were also introduced.

The reforms have had radical results in all countries, with consumers benefiting from the introduction of competition. There have been impressive efficiency gains, labor productivity has doubled, coverage rates have grown, and high-energy losses have reduced drastically, all this accompanied by a sharp reduction of prices.

The structural economic and political changes that are taking place in Latin American economies coupled to the privatization process have also accelerated the globalization of the energy industry. A regional energy market has been developing along the years. Regional energy integration initiatives are developing seeking to reach new energy resources and reduce energy costs. Electricity and gas develop hand to hand as the most dynamic areas of the energy integration process. Natural gas, abundant in Argentina, Peru and Bolivia, is flowing to nearby markets and massively used for electricity generation, changing the energy matrix of neighboring countries. The long-term tendency will be reaching a price equilibrium among electricity markets, new large gas companies mingling with electricity ones in responding to electricity growth.

The minimum size of companies is changing, particularly with the arrival to the region of main world energy players (gas and electricity ones), that look for regional portfolios, given the low level of growth in their own home countries. New challenges arise for the regulators that on one hand want to facilitate these regional gas and electricity integrated markets, but face increasing horizontal and vertical integration, with European and North American owned companies gaining increasing market power. Some analysts see the region dominated by five or six major regional electricity holdings. Two schools of thought have confronted in how to handle this menacing trend in the region. A first one favors regulating the industry structure, like in the 60's and 70's, defining market quotas and forcing disintegration and divesting where needed (for example, controlling market power through limiting the market share of any generator). Another one favors regulating conduct through supervision of monopolistic behavior and harsh penalties when such conduct arises. Antimonopoly commissions join energy regulators in these controls.

The challenge, whatever path is followed, is to define consistent regulations that stimulate investment in a region avid for foreign capital, coupled to controls on intra-segment and inter-segment conducts. Intra-segment conduct refers to that taking place horizontally, either at the generation or the distribution level, while inter-segment conduct refers to that taking place when monopolistic segments (transmission or distribution) link with competitive segments (generation or supply), when vertical integration takes place. In both cases the concern is one of controlling, limiting, if not prohibiting, horizontal and/or vertical integration that could give opportunity to monopolistic activity.

A discussion-taking place in the region is that on the advantages and/or disadvantages of the centralized pool forcing “perfect” competition versus the laissez faire model of the Power Exchange, coupled to an independent system operator that dispatches essentially based on long term bilateral contracts plus short term bids.

Finally, a growing concern in the region has been that of quality and security of supply, and the adequate balance between prices and the requested level. A second stage of development of the electricity sector in the region assigns a high value to the cost of non-served energy and this was further emphasized when blackouts took place in Argentina and Chile during 1998/99. The regulations and the market forces have failed in providing that security and countries are exploring the best alternatives to orientate the actions of the players. Investment signals, penalty instruments, centralized expansion plans and cooperative expansion mechanisms, are only a few of the alternatives considered. All this has to be developed and coined in regional regulatory arrangements that will shape the industry of the future.

The Evolving Italian Electric Industry

Luigi Salvaderi, Fellow IEEE, Consultant

During 2000, the long process to implement the EU Directive 96/92 CE on electric market liberalization is coming to fruition in Italy.

Many *institutional steps* have been implemented:

- *Generation*: rules for the displacement of ENEL generation aimed to create a competitive market and the framework for the sensitive issue of “stranded costs” recovery
- *Transmission*: creation and start-up of the new independent system operator (ISO)
- *Distribution/Supply*: criteria for restructuring electricity distribution in the main cities.

From *the regulatory side*, the main moves are related to:

- implementation of the “wheeling tariff” for eligible consumers
- determining criteria for the allocation of limited import transmission capability
- restructuring of the new tariff system.

From the financial side:

The Government floated some 32% of the ENEL equity in November 1999. The selling price was based on a balance of the conflicting interests of the Company, the present owner (the Ministry of Treasury) and the future stockholders. After a period of “market disaffection”, the share value now is some points higher than the placement value of 4.3 euro/share. Taking into account a “bonus share” which will be given to those who retain their shares for one year and the yield recently decided, the investment so far has proved a good one. By taking into account many un-expressed possibilities, including for example those connected with telecommunications, many analysts express the opinion that the shares have potential for growth. Discussions for the placement of a second tranche, of the order of 15% of the Company, in the 2001 are presently under way within the Government.

The “shape” of the resulting electric sector after these events is described in the following.

Industry Restructuring

Generation:

Generation, import and export are now liberalized: producers willing to enter the free market have to request authorization. To avoid/prevent the possible abuses arising from any dominance of the position, the new “Electric Law” 79/99 of March 16, 1999 established that:

- by January 1, 2003 no generator should have the capability of producing-importing more than 50% of the total Italian supply
- by the same date ENEL spa has to divest at least 15 GW (out of the present 58 GW)

Accordingly, at the beginning of August 1999, three Generation Companies (GenCos) were established by a Government Decree. Eurogen 7 GW, Elettrogen 5.4 GW, Interpower

2.6 GW will mirror, as far as possible, the structure of the present system, with a similar mix (70% base duty, 30% mid merit) and balanced geographical siting. To foster competition, the Industry Minister is minded to “anticipate” the privatization by 2002; at least one of the GenCos, probably Elettrogen, could be placed on the market within this year.

Advisors for the privatization have been appointed. Almost 30 Italian and foreign Companies, as well as a Consortium of the three largest Municipalities (Rome, Milan, Turin), have expressed their interest in participating. They are forming alliances in order to enter the Italian Electric Generating Sector and to exploit as much as possible synergies with the gas market.

Electric Law 79/99 foresees that, commencing 2002, all Companies which produce or import more than 100 GWh/yr from conventional sources (CHP excluded) must supply 2% of their production in 2001 with *new (in operation after 1 April 1999)* renewables. The Ministerial (Industry & Environment) Decree 11 November 1999 ruled the “Green Certificates” (GC): -i). nominal size 100 MWh each; -ii) are issued by the new ISO who is also responsible for “certification” of the related renewable source; -iii) prices will follow the market, but initially will probably be based on the average of the “incentives” paid in the past to the renewables.. It is anticipated that when the Market Operator is established (by January 2001) a market place for such certificates will also be created, but also bilateral contracts will be allowed.. The expected volume of GC the total Italian system should be around 1400-1500 MW of new renewables.

A parallel initiative for the labeling of renewables - not used/usable as GC- with “Renewables Energy Certificates (RECs), is also anticipated in the Decree, with a “projected” European market.

Transmission:

Transmission will remain a regulated activity. The ISO model (separation of the operation and ownership of the grid) has been chosen.

A new independent public joint stock Company, the “Gestore della Rete Trasmissione Nazionale” (GRTN), in January 2000, is tasked with planning, scheduling, dispatching and operating the system. GRTN will also “order” for the network owners, through suitable contracts, the necessary maintenance and reinforcements of the transmission system. The shares corresponding to the above activities were transferred to the Treasury. With the exception of network ownership, all the contractual obligations of ENEL have also been transferred to GRTN.

GRTN has not have regulatory powers; these are entrusted to the Authority for Electricity and Gas.

Market Place:

Two further joint stock companies are envisaged within GRTN: - namely the Single Buyer (SB) and the Power Exchange (PX or “Operatore del mercato”).

The SB has the duty each year to forecast demand for the following three years and the responsibility of supply - *with the needed reserve margin* - for the *captive* consumers through a suitable portfolio of contracts with the generators and with the distributors. The Ministry of Industry can authorize the sale of shares of the SB, up to 49% and within a maximum percentage of 10% each, to the various Distributors.

The PX, fully owned by GRTN, is to be instituted for *eligible* consumers who do not wish to remain captive. The market at present operates through bilateral contracts between

generators and distributors but the Decree envisages new arrangements by 1 January 2001.

The rules for this rather complex market structure, in particular the relationships between the two markets (SB for the captives and the PX for the eligible consumers) are being formulated by the Ministry of Industry. The main concern is to create a market place with sufficient liquidity and not to hinder the potential new entrants. A "day ahead market" (DAM), with a compulsory pool and System Marginal Price, and an "on-the-day" balancing market are presently being discussed. Initially the DAM will be one-sided, but demand side bidding is foreseen in the second phase. Bilateral contracts should not be the norm and would require special authorization. A real time market for some ancillary services is also foreseen while financial products may be introduced later.

Distribution: Wires and Supply Businesses:

The "old" distribution activity has been subdivided into a regulated "wires" business and a liberalized supply business. By March 2001, the Ministry of Industry will issue 30-year licenses to Distributors who were engaged in the distribution business on April 1, 1999.

Within six months of the Electric Law becoming effective, all the Distributors having more than 300,000 clients (namely ENEL and a few Municipalities) should have unbundled the distribution business and set up Companies to which assets and a suitable portion of the debt will be transferred. Arrangements are in place to rationalize the distribution, for example with only a single wires-business Concession in the Municipalities. The time limit for presenting a consolidation proposal to the Ministry of Industry was March 2000 and it is not improbable that the Municipalities will exploit their *right to ask ENEL Spa to sell* its local distribution business by March 31, 2001. The selling price, if not agreed before October 2000, will be determined by external experts nominated by the negotiating parties and by the president of the court having jurisdiction where the Municipalities are located.

The granting of only one concession in the Municipalities relates only to the "wires-business". In principle, domestic consumers will be able to choose their suppliers since it is anticipated that the supply activity will be liberalized. Services open to competition in supply include meter operation and data collection. Suppliers must take an active role in competing for eligible consumers business, inside and beyond their host area, in order to protect or increase market share.

Market Opening

Market opening envisaged by the Italian Electric law goes beyond the limits imposed by the Directive, with forecast opening shares of 30% by 1999, 35% by 2000 and 40% by 2002. To be eligible in 1999, the annual consumption by a customer at a particular site must exceed 30 GWh; neighboring clients may combine into a Consortium to reach the 30 GWh limit if their individual consumption exceeds 2 GWh/yr; these requirements will reduce to 9 GWh/yr and 1 GWh/yr by 2002. Thus, compared with 100% liberalisation in the UK and Sweden for example and 25% in Greece, the Italian market liberalization is in the mid-range among EU countries. In parallel with the anticipated divestment of the GenCos, the Ministry of Industry has recently expressed its will, to allow by October 2001 the eligibility of clients consuming 100-900 MWh/yr; this corresponds to almost 76 TWh and represents a total market opening of 71%.

Regulatory Actions

The Authority for Electricity and Gas, operational since March 1997, has been very pro-active in seeking to open the market. Its main moves have resulted in:

- i) restructuring, effective August 1997, of the “variable part” of the tariff, to cover fuel and import costs, away from the “pass through” system fixed “ex post” to an “ex ante” “contribution” - updated every two months according to a basket of fuels
- ii) revision of the prices paid by ENEL for purchases of “surplus production” from Autoproducers with a gradual reduction of the past “capital avoided cost and O&M” component and a realignment of the “fuel avoided cost”
- iii) provision of a “wheeling tariff” for eligible consumers
- iv) rules for the allocation of import capacity
- v) revision of the “fixed part” of tariffs (used in Italy as a tool for more general purposes of economy policy) targeted to the gradual removal of cross subsidies

Some comments on the last three issues are given in the following:

Import capacity allocation. Italy is a country which imports almost 42 TWh across borders with France, Switzerland and Austria/Slovenia. In the past year, market liberalization in continental Europe has led to overcapacity and decreasing wholesale prices in generation. Correspondingly, the Italian market became a target of many European producers. The total Net Transfer Capability (NTC), taking into account Reliability and Operation Constraints which the Italian ISO must respect, is around 5.4 GW during winter but only 2.2 GW in the summer. Existing long term contracts occupy almost half of the NTC. The request in 1999 for new wheelings largely exceeded the available capacity for the year 2000 and so the rationale used by the Authority to fix the allocation criteria for the year 2000 was:

- The total available capability allocated to the eligible consumers is 50% of the total
- Two caps were established:
 - No one can be given more than 20% of the total available
 - No one can be given more than 15% in each of the above mentioned three borders
 - Reciprocity for the same clients in EU will be applied
- After the caps application, any residual available capacity was equally subdivided among all the requests
- The Authority requested ENEL and the ISO to trigger measures (new interconnections, utilization of new devices, relaxing in some cases of the reliability criteria, etc.) to increase the present limits

The above measures were “transient”. At the beginning of August with its 140/2000 Order, the Authority fixed new rules for the Available Transfer Capacity (ATC), netted by the long term import contracts) for the year 2000. An auction model has been adopted:

- no one can be given more than 10% of the ATC available on each border
- no one can have at disposal more than 10% of the total ATC on all borders

At the beginning of September 2000, the GRTN auctioned for the first time for the months of October, November and December some (600-800 MW) ATC. The competitors were almost 40; the winners paid a rather high price, corresponding to the high difference of wholesale price in Central Europe (where overcapacity exists) and Italy where the fuel-related component rocketed due to the recent oil price steep increase.

Tariff Restructuring

The Guidelines are:

- Effective date: January 1, 2000. Regulation period: 4 years
- Tariff to cover “recognized” operating costs plus allowed pre-tax real return on the regulatory asset base (RAB)
- One-off reduction, average of 11% in 2000 plus price cap on regulated business 2001-2003 : RPI-4%
- Limit on the revenues of each consumer category
- Flexibility (not for domestic) left to Distributors within revenue limits
- Stranded costs for transition to the market recognized
- Supplements for the “Italian-system charges” related to nuclear decommissioning, incentives for renewables and CHP, HV clients having by law special discounts, eligible research and development and stranded costs

For the three previously bundled segments of the industry, the main aspects of the Authority ruling are:

a) *Production:*

- *Fixed part* of the tariff not differentiated by type of plant, flat in nominal term in the 2000-2002 period to allow a gradual transition to a market price system
- Regulatory supervision maintained
- Real pre-tax allowed return on the 1997 RAB: 7.9%
- The resulting “generation tariff” considerably lower than the “implicit” former one
- A temporary “additional component” added for 2000-2001 to allow a soft transient to the market
- Fuel cost component: updated on a bimonthly basis, as indicated above

b) *Transmission :*

A distinction is to be mentioned with reference to eligible and captive consumers. In order to “anticipate” the market *for eligible consumers*, the Authority issued a “wheeling tariff” with the following characteristics/components:

- point to point tariff, based on notional path injection- load points
- power charge for each different path
- system services including static reserve, frequency and voltage regulation and despatch
- losses: marginal loss coefficients, on regional basis to give a “siting-signal” to future generation
- other supplements associated with the “Italian-system” charges

The wheeling tariff introduced a new concept of “wires utilization” to encourage each client to improve its knowledge of its hourly profile and so reduce its costs. In fact two types of potential penalties were introduced - namely:

- “*wire flows*” *exceeding the contracted wire capacity*: this is designed to manage potential network congestion, with penalties for violation are high (by a factor of 75) compared with the trading price of power; generators can contract for wire capability

different from those of consumers

- *energy imbalances*: this penalty is designed to reduce the potential for lack of generation reserve margin for which contracting is optional; it involves a complex reconciliation of the yearly balance, based on [real generation, net of losses- real load], with different weights are given to surpluses and deficits

This tariff arrangement has been criticised as being “too complicated”. Many market participants suggest a “point of connection” charge as an alternative. It is not improbable that the Authority will reconsider the issue when the new market place comes into force.

The component related to the stranded costs, mainly in generation, corresponding to the opening of the market has been ruled by the Ministry of Industry, accepting the criteria laid down by the Regulating Authority. Consequently the total amount allowed by the Government is capped to 15 trillion lire to be recovered, over 7 years for the allowed assets, through an additional charge on the transmission tariff paid by all the consumers.

c) Distribution & Supply

- The allowed pre-tax real return on the 1997 RAB is 7.4%
- A social tariff is foreseen:
 - A shift from consumption-based to income-based requirements
 - A transient period 2000-2003, with moderate adjustment of the progressive slope of the present tariff curve

A compensation scheme for the distribution cost is also foreseen.

Effect of the tariff reform on consumers

The new tariff requires that LV clients should pay less than in 1999 while HV clients should pay more. To smooth the step change from existing arrangements, a gratuity supplement, sliding from 100% of the step in 2000 to 0% in 2002, will be applied. This mechanism should particularly help the Municipalities who, through having many LV clients who will pay less on the new tariff, are exposed to a resulting decrease in income.

New Structure of ENEL

As a result of the above, ENEL spa will be shaped as an industrial holding, controlling:

- one Production company (ENEL Produzione), within capacity/generation limits reflecting those of the three Generation Companies Elettrogen, Eurogen, Interpower
- ownership of the Transmission network through a company called TERNA
- one Distribution company and the Supply to the captive consumers (ENEL Distribuzione)
- one company for Supply to the eligible consumers (ENEL Trade)
- one company for the Nuclear phase-out, to be transferred to the Treasury (Sogin)
- various companies for renewables (Erga), lighting (Sole) and activities beyond the meter (Seme)
- various companies for services (Construction and Engineering-ENELpower; Real Estate-SEI, R&D CESI; Informatics , ENEL.it, Water-ISMES)

- a telecommunication company for the mobile phone (Wind), which will probably obtain one of the five UMTS licenses which the Government will assign shortly

Final Remarks

The possibilities offered by the introduction of the electricity market in Italy are increasing the speed of the change in the industry. In particular:

Generation:

Many initiatives for siting new capacity (of the order of 35 GW, out of which almost 33% sited in the South of Italy) are proposed. Many of them look just a sort of “site booking”. In fact, should all these materialize, then assuming in 2005 a yearly demand in Italy of 330 TWh peaking at 58 GW, and a reserve margin of some 15%, an over capacity of about 30 GW could arise. Nevertheless in the short term, because of the time needed for the restructuring of existing plant and the new green field CCGT, there might be only a moderate decrease in the generation price in spite of strong competition. In the longer term, depending also on the future structure and competitiveness of the market place, greater price decreases are anticipated.

Transmission

The new ISO is facing a corresponding high number of connection requests, more than 170 for the said 35 GW. A “How to be connected” Master Contract is still to be implemented and constitutes really a key priority. The rules and the responsibilities of the players are still lacking. It is hoped that more certainty, as needed by the industry, could be provided through appropriate legislation.

Conversely, the presence of very demanding limits for electromagnetic fields (0.2 micro-Tesla on average on an yearly basis) can make it extremely difficult to erect new lines or to reinforce the existing network.

Other Business

A strong tendency to diversification can be recognized in parallel with convergence between gas and electricity in terms of joint marketing or arbitrage opportunities (i.e, ENEL in the process of converting 15 GW of fossil power stations to gas and trying to consolidate in gas distribution). There are moves also in the field of the so-called “new economy”. For instance ENEL spa has a joint venture with the American Internet Capital Group (ICG) to develop business-to-business links for its procurement activities. The three Municipalities of Rome, Turin, and Milan are candidates for purchasing the largest GenCo (Eurogen 7 GW), aiming to re-establish a form of vertical integration, as happened in UK.

Special Session on Distribution Systems under Deregulated Environment

This followed the three speakers in the Special Session on Electricity Deregulation on the first day of the conference and preceded lunch. There were three presenters: Cliff Walton, Technical and Regulation Manager; Robert Friel, Strategy Development; and Craig Lucas, Business Innovation. They represented London Power Networks, London Electricity's new Asset Governance Company. They set out what they saw as the opportunities and challenges facing innovative urban distribution companies; and posed a real time challenge for the assembled delegates for which prizes of £500, £300 and £200 were awarded.

The winners were:

- ❖ Professor Mo-Shing Chen of The University of Texas in Arlington, for his proposal about low voltage systems and real-time measurements. In this computer age, they have ability to simulate loads down to each customer. They can simulate very short-term load forecast with intelligent techniques.
- ❖ Dr Gregory Levitin of The Israel Electric Corporation. Due to the large amount of data that needs to be analyzed, it may not be easy to know whether there is a problem. His proposal was on the use of color graphical to identify problems in a network. If there is a large color contrast and variation, then there could be a problem.
- ❖ The third prize was for a proposal on embedded generation in distribution systems.

There were 27 entries from 24 delegates. Some wrote essays and some wrote a few lines. Each winner was given a certificate as well as a check.

Plenary Lectures

There were Plenary Lectures at the beginning of each of the second and third days of the Conference. The first was entitled: Electric Utility Restructuring—a Personal Choice, delivered by Wallace S. Read, IEEE Past President, REMAS Inc., Canada; the second was entitled: Power Technology Development Schemes for the Deregulated Electrical Power Industry, delivered by Tadao Amakasu, Japanese National Committee CIGRE, former General Manager of Power and Industrial Systems, former Executive Vice President, Mitsubishi Electric Corporation, Japan.

Utility Restructuring: A Personal Choice

Wallace S. Read P. Eng., 1996 President IEEE, President REMAS Inc.

The electric utility industry in North America is undergoing a transformation unlike anything it has experienced in its history. Disassembly of the traditional vertically integrated utility is taking form in response to; pressures to privatize, customer choice demands, competition in the marketplace, improved quality of service and unfettered access to the transmission network. How will restructuring affect the reliability and quality of our electric power service?

Today's world offers the electric utility industry a difficult but exciting challenge as we close out the 20th century. That challenge is to organize itself so that utilities can compete in an open market for customer allegiance, while at the same time preserving a reputation for delivering a reliable, high quality service. Obviously, if reliability and quality standards are not met, the customer base will erode and perhaps disappear which is an untenable situation.

Similarly if the utilities' commercial interests in the new marketplace are not maximized, company earnings can be placed in jeopardy. However, we have not embarked on this restructuring of the industry to put utilities out of business. We must find the middle ground that ensures we deliver a quality service over a secure transmission network at the best possible price for customers and a fair return to shareholders.

How we meet these reliability and quality standards in a large integrated power system open to competition on the producer and consumer sides is quite different from how we met them when we operated in the traditional franchised mode of "cradle to grave" delivery of energy. Herein lies the difficulty for North American utilities. The separation of ownership of

the components which make up the power system means a loss of control, or at best a sharing of control, over what constitutes a reliable service as we have come to know it. The management rules for this new delivery system will require careful planning by competent people.

It is not my intention to herald a return to the old ways. There are good and valid reasons for the changes in direction that are now taking place and I believe these changes will go a long way to solve two threats to our industry:

* **alienation of customers** - In the past utilities faced nearly every customer relations situation in an autocratic, even arrogant manner. The world has changed. Customers no longer respond well to "command and control" tactics. New ways to relate to our customers must be sought, including the opportunity of building a partner relationship that provides them with the information and the wherewithal to control their energy use and to allow them to make appropriate energy choices.

* **alienation of the public** - Utilities must ensure that they make every attempt to meet performance targets they have set for themselves, particularly when it comes to their impact on the environment. We have not always been good at it but we are improving. Also utilities in many parts of North America have been labeled overstaffed, insensitive, and unresponsive. In the restructuring process, where this label applies, they must become more effective and efficient.

So there is no turning back. The electric power industry, one of the last bastions of conservatism, has awakened to the fact that it is not immune to the pressure for change. It realizes that it cannot afford to bury its head in the sand when confronted with this challenge. But here is the catch 22. Any restructuring must not undermine the utilities reputation for reliable service. Customers may complain about prices but they will never forgive unnecessary interruptions in supply.

The North American Scene

I suspect that the North American electric power system and the utilities that operate in that environment are viewed as a "Johnny-Come-Lately" in responding to the pressure for change. In the late '80s and early '90s, the United Kingdom, Norway, Chile, Argentina, Australia and New Zealand can be credited with pioneering the process. Each in their own way has experimented with restructuring, has experienced the consequences and has learned how to cope with the results.

Why hadn't the United States and Canada taken the lead in such an initiative as this? Certainly it wasn't because change wasn't needed or recognized. The North American power network has been described as "the largest, most complicated machine ever devised". It was this size and complexity and the number of players involved that dictated a slower approach to restructuring. The "machine" did not stall in the '90s, but it probably can be said that it did not shift into high gear either.

Not everyone was comfortable with a direction that seemed to be moving away from the historical emphasis on reliability and low cost to one that stressed competition and customer choice. The first reaction to these blowing winds of change was to take it slow and easy. Caution was the watchword. In order to appreciate this thinking, one needs to have an understanding of the diversity of North America's energy resources, the expanse of the service

territory and the variety of legislation under which electric utilities must operate. Let me briefly sketch the scene.

CANADA is the second largest country in the world in terms of land mass. It stretches 8500 kilometers from east to west covering four and one half time zones between the Atlantic and Pacific Oceans. From south to north it reaches from the 49th parallel to the North Pole. Its population is sparse, just 30 million, about one tenth of that of the United States.

CANADA generates 65% of its electricity from low cost hydro-electric resources and the balance from thermal sources (coal, oil and nuclear). Over some very strong north/south interconnections, it exports to the United States annually as much as 10% of its electric energy depending on hydrological conditions. Exports take place principally from those provinces whose electricity is generated from hydraulic and nuclear resources.

CANADA'S electricity use per capita is 17,500 kWh per year, the third highest in the world, Comparable figures for the United States and Japan would be 12,700 kWh and 7,700 kWh per year.

CANADA'S Constitution assigns the ownership of energy resources to the ten Provinces and most of these have elected to use Crown Corporations to develop and market electricity. Each Province has some form of regulatory authority to which all utilities in their jurisdiction are accountable. About 85% of the country's electrical energy is generated, transmitted and distributed by Crowns and the balance is by investor owned utilities. Although the Federal Government regulator, the National Energy Board, probably has a broader mandate than it exercises, it generally only gets involved when energy is exported from the country.

THE UNITED STATES, though smaller in geographic terms, is still a large country and is more heavily populated than its neighbor to the north by a factor of ten. Consequently it has a much larger economy to support and a widely dispersed populace to serve. Geography and climate are never very far from the minds of system planners.

THE UNITED STATES' electric power system is supported principally by thermal generating stations powered by coal, oil, natural gas and nuclear. About 10% of their energy is supplied from hydro-electric plants.

THE UNITED STATES, with its 50 States, has hundreds of large and small electric utilities with varying degrees of ownership; federal agencies, publically traded companies, municipals,, and rural co-operatives. Its 50 State governments, through their regulatory bodies, wield a lot of power and can exercise a great deal of control over electricity issues in their jurisdiction. Add to that list the various national groups representing the industry one can imagine the degree of difficulty there is in reaching consensus on big issues facing the industry. On the other hand, the Federal Government's regulatory body (FERC) has considerable strength and is able to push reforms reasonably quickly.

MEXICO operates its own independent power network, except for a small area in the northern part of the country, which is connected to the North American grid.

The North American Power Grid

The growth of the North American power grid has been dictated somewhat by the geography of the continent. The main arteries, which ensure the reliability of the system, generally provide for north to south flows, not dissimilar from the way the mountain ranges run. East-west transmission links are more regional in nature. The grid consists of four interconnected synchronous networks which span most of the United States, Canada and a small part of northern Mexico. Without the benefit of large direct current interconnections between these networks, it is a challenge for system operators to maintain the stability of the

entire power system as the loading of the transmission lines shift with the commercial transactions that take place at any point in time.

Nevertheless to date the reliability experience of the grid has been very good. Like every integrated power system it has had its battles with Mother Nature and in some instances unintentional human errors have occurred also. Let me relate a few of these:

*** February 10, 1958.** - Although not a serious upset to the entire system, I chose to use "authors license" in presenting it here because it was an occurrence that I experienced myself and one which very nearly ended my career. That night the earth experienced high current flows in most of the communication land lines running down the east coast of the continent. In the northern regions of the United States and Canada power lines also tripped. The source was induced currents in these lines due to a high level magnetic storm originating from solar flare activity on the sun. When my report indicated this was the cause for the lost production at the newsprint mill, it was not taken lightly. I recall the General Manager's words quite vividly, "If you engineers tell me one more time that outer space is controlling things here, don't bother to show up for work the next day".

*** November 9, 1965.** - A major transmission line interconnection between the Ontario Hydro system in Canada and the North-east grid in the United States tripped and caused a cascading effect which brought down the whole system affecting the lives of 30 million people. It was an experience not to be forgotten, especially by those trapped in elevators in the high rise office buildings of New York. This was the occurrence that signaled to the Federal government that it should establish a watchdog organization for reliability of the expanding power network.

*** August 10, 1996.** - There was a major interruption of service on the west coast of the continent which some have attributed to the reliability of the system being seriously compromised by excessively high levels of power trading. If correct this flagged for the first time what could be a major concern for the health of the grid as we move towards greater deregulation.

*** January 8, 1998.** - A major ice storm in the north-east of the continent brought down primary power lines and much of the distribution system. On the Canadian side of the border the "storm of the century" was responsible for 15 deaths, \$2 billion of damage and left more than 2 million people without electricity. There was no consequence to the rest of the grid as the damaged area was isolated through the proper operation of protective devices.

The 1965 blackout triggered an action by the industry to form a voluntary, non-profit corporation called the North American Electric Reliability Council (NERC). It was charged with establishing a set of operating standards for the electricity network and to monitor compliance with the rules it would establish. Without a doubt, the credit for the impressive record of performance of the network over the past 30 years can be attributed to the work of this body. As many will admit it was industry self-regulation at its best.

But are new warnings being sounded? Was the 1996 outage on the west coast of the continent a harbinger of things to come? Many engineers in the utility field believe that it was. In this new environment of competition between the utilities, market incentives and customer choice, allowing commercial benefits to be the number one driver as to how the system should operate can pose a real threat to the security of the system. Clearly this situation needs to be carefully managed.

The Issues

With this background let us take a look at some of the reliability issues facing utilities and regulators as a consequence of restructuring the industry:

PRIVATIZATION - In both Canada and the United States public and private electric utilities have operated side by side without major conflict. As mentioned earlier the proportion of government owned institutions in Canada is much higher than in the United States but this arose from the need in earlier days to finance large, capital intensive projects and to extend electric service to a widely dispersed population. Although there may be other good reasons to promote further privatization of the industry, reliability and quality of service do not seem to be among them.

RIGHTSIZING THE WORKFORCE - At first blush one might think that the laudable target of adjusting the workforce to achieve efficiency makes sense, should be pursued, and should have no effect on the security of the power system. To the extent that the driver for this activity is long term improvement in the efficient operation of the corporation, that is true.

Unfortunately some managers, caught up in the euphoria of change for change sake, overzealously act in the belief that they have a cost target to beat for the next quarter and that is the only goal. That is when downsizing takes over from rightsizing. Planning, maintaining and operating the power facilities get second consideration behind short term financial gain. Inevitably the penalty for this will be reduced reliability.

SEPARATION OF RESPONSIBILITY - Inherent in the restructuring process is the breakup of the vertically integrated utility into separate business units:

- * Generation will operate in an open competitive environment with many players. To ensure there are no disruptive entrants, someone will have to set the technical specifications for entry onto the grid and in some cases, where flexibility exists, may have to specify the location for new generation.

- * Transmission will be an open access system. Any qualified generator will have the right to attach to the grid and, after paying a prescribed fee, to market their energy far afield. Any industrial, commercial and eventually any domestic customer will have the right to contract with any producer of electricity for their service. Single entities will no longer control the production, quality and delivery of the service. This is a major issue for the security of the system and will require a partnering of all concerned to resolve.

- * Commercial takes on an expanded role with the advent of an enlarged community of potential customers. It must demonstrate its ability to compete in this larger world and must ensure it develops and retains its rightful market share. On the one hand, reliability of the generation and transmission system is important for them in the discharge of their contractual commitments, yet, on the other hand, they will want to push the system for all its worth before accepting a curtailment in delivery.

PLAYER COMPETITION - Opening up the system to competition will result in many more parties coming to the table as generators and energy traders. This is a situation that the North

American system has not had to deal with before. Suddenly the spirit of cooperation and the willingness to share information, which existed while utilities operated in protected, franchised areas, may not be as well accepted. Introducing grid practices for the good of all requires the participation of all. It will be essential for the new players to grasp the importance of this and build the necessary partnerships early.

More importantly perhaps, if deregulation is carried out to its fullest degree, then there are bound to be utility winners and losers. Obviously, low cost producers entering this new open market will be able to retain their existing customers and look forward to gaining new ones. The opposite is true for those utilities who can only deliver energy to customers at or above market price. These latter utilities may wish to rethink the extent they wish to enter a fully deregulated market. It will be a personal choice.

In Canada, for instance, one could well visualize Hydro-Quebec, Manitoba Hydro and B.C. Hydro welcoming this new market environment, while other Provincial Crown Corporations might take a more cautious approach.

GOVERNANCE - Perhaps the biggest challenge we have in North America is to obtain the "buy-in" from all concerned parties for the establishment of a single, fair minded, impartial authority to promote and enforce standards for a reliable electric system operating in this new environment. Whether this be a revamping of some existing body or the creation of a new one is the subject of debate now. Recognizing this imperative last summer, NERC assembled an Electric Reliability Panel to obtain its advice as to how to proceed. The Panel filed their report in December, 1997. It is now being considered by the NERC Board of Trustees. I have used that report as a reference document for this presentation and I recommend its reading in its entirety for those of you wishing to pursue this topic further. It is available on the WEB at www.nerc.com.

Conclusion

I started this presentation by saying that establishing the governance, writing the rules and ensuring compliance for this process will be difficult. It certainly will. Nevertheless I have no doubt that we can meet the challenge if we have the will and we put the right people on the task. Maybe it is as simple as just understanding what a dispatcher said to me awhile ago when we discussed this subject. If I may take the liberty of paraphrasing his comments, it went something like this:

"You know all we have to do is get the powers that be to understand that pushing electricity around the system is not like moving other products to market. Those pesky little electrons are unruly and have a mind of their own. Why can't they behave like molecules of oil which you can push into one end of a pipe and have them show up in full force at the other end? When properly directed, those molecules will even go quietly into storage until they are needed. Not so the elusive electron. It leaves your control as soon as you release it into the grid and it will seek the path of least resistance to arrive at its choice of home. Generally it doesn't react well to storage. If you don't want it, it won't come. The laws of physics are indeed unfair but real."

It is these characteristics that test the expertise and patience of the system dispatcher day in and day out. In the final analysis it has to be his or her call as to how accommodating the system can be to the many demands made on it. That dispatcher has to know the

boundaries of the playing field and the rules of the game. It will be the responsibility of regional, national and international groups to set these rules and enforce them. Somebody has to call the shots. There is no other way.

I know we all look forward to witnessing the resolution of these difficult issues and we wish all those responsible for dealing them every success.

Power Technology Development Schemes for the Deregulated Electrical Power Industry
Tadao Amakasu, Japanese National Committee CIGRE, former General Manager of Power and Industrial Systems, former Executive Vice President, Mitsubishi Electric Corporation, Japan.

The trend of deregulation is becoming common for the global power industry. However its process varies country by country depending upon their history. East Asian countries are taking different way of deregulation from western countries. Corresponding to these trends, new power technologies have to be developed. Not only conventional products but also new equipment and control systems are to be developed. First the deregulation process in Japan and East Asia is introduced. Then, power technology development schemes for the future are explained. Technologies aiming at this deregulation trend are discussed as well. In any case whether deregulation is proceeding or not, technologies indispensable for power system development are introduced.

Deregulation Process in Japan and East Asia

Japanese electrical power utilities have been private companies for about 100 years. At the dawning era of electrification there existed 35 power companies in Japan. And the number of the power companies increased up to more than 700 at maximum before the Second World War. About 60 years ago these companies were integrated into one generation and transmission company and several regional distribution companies. Once they were controlled by government during the Second World War. But after the war they became nine private and regulated power companies. They have been regional monopolies for almost 50 years. Japan opened only the generation market in 1995 for IPPs (Independent Power Producers). In year 2000 retail sales of electricity is partially taking part and transmission access becomes open. Big consumers, above 2 MW and above 20 kV can select bi-lateral retail sales. Japanese utilities will keep a bundling configuration at least for 3 years. Eligible customers account for about 28 % of total customers on kWh bases.

In the other countries of East Asia power utilities were mainly governmental. These days they are being rapidly privatized and will be deregulated. Chinese power utilities are being privatized and they will accept competition. In Malaysia, unbundling is proceeding now. These processes vary depending on their own history and culture of the countries.

Power Technologies for New Market

Power technology development can be categorized as follows:

(i) In the deregulated market and supply side, new functions for load dispatch control is required, including bidding and auction. These new dispatch controls are characterized not as the conventional control scheme but as an autonomous self-organization.

(ii) Deregulation and demand side management covers the subject of information exchange between supply and demand sides. These could be called demand side technologies. Corresponding to these trends, manufacturers in power industries should change their product to suit the new market. But power systems still need highly reliable and low priced equipment and control systems. Development of conventional products with advanced technology application is indispensable for power systems.

(iii) In the conventional field and demand side, global environmental issues are essential.

(iv) In the conventional business field of power industry and the supply side, price reduction and high reliability of products realizing less margin of power system ability are essential. In this area the presenter is proposing technologies for SMART power systems to power utilities. SMART is an abbreviation of Simple, Maintenance-free, Autonomous, Robust, and Transparent.

Bidding System

When deregulation proceeds, many new entities join to the power market and they play a game in this market.

For this purpose a computer system for generation short-term auction is needed. One example of this system is BLENDER. This is an abbreviation of Bidding Liaison and Environment Dispatcher. Its concept uses the Web network with the JAVA language. BLENDER is based on two types of market rules, which can be applied: uniform-pricing and discriminatory auctions.

BLENDER can also deal with two methods of scheduling, say, system cost minimization and total payment minimization. This bidding environment is very flexible.

Demand Side Technology

To realize minimum social cost for matching power supply and demand, demand side management (DSM) is a key concept. Especially information provision from power utilities and information exchange between utilities and customers are essential for DSM application. For this purpose we are developing Total Customer-focused Service technologies. The power utility prepares the service center, including energy consulting center and call center. Customers including commercial buildings, industrial workshops, and residential houses install their internal information gathering system on their energy equipment. Customer side also prepares an information gateway for the outside information network. Power utility uses their optical fiber network for information exchange between utility and customers.

SMART Power System

In the conventional market and supply side technology, cost down of equipment is a very keen need for the power market. Cost and/or price mechanism is not linear to the number of the functions or the performance as a specification for the required equipment. Price has not linear but almost quadratic characteristics to its specification from our experiences. And also this characteristic has hysteresis. If an equipment has many functions with high price, its price is reduced along the linear line by reducing the number of functions.

The price could not be reduced enough. On the other hand low price product with a limited number of functions could not be enhanced to the higher number of functions because of technology limitations.

It implies that at least two types of products should be prepared; a many functions product, in other words high-end technology, and the other one is a product with a few numbers of functions or low end one. The author introduces GIS, HVDC, EMS/SCADA, and FACTS as examples.

As the presenter introduces some examples of the technologies for conventional but indispensable power system business, a high end and low-end technology can realize SMART power system.

Energy Saving Technologies in Demand Side

Energy saving is a critical issue to conserve the global environment for the power industries. One potential business is ESCo (Energy Service Company). To realize this business we are developing several energy saving technologies. Advanced air conditioners with heat pumps, heat pipes, inverter control, micro-gas turbine generators, etc. are being applied. Some manufacturing companies, including us, joined this business in Japan and some power utilities are planning to join it.

Conclusions

East Asia including Japan is taking a different way of deregulation from western countries. It is necessary to develop new technologies in this area corresponding to these deregulation movement and also to advancement of conventional power equipment and control system. CIGRE is recently promoting regional activities. Japanese national committee will join the so-called Asia-Oceania region and will lead these regional activities, especially technology development.

These new technologies are not restricted within the power engineering field but also to economics and information technologies. Information should be exchanged to realize these advanced technologies all over the world.

Technical Paper Sessions

Topics debated on the first day in the four oral sessions (in two parallel groups) included: FACTS, deregulated systems, power quality, and new methods for competitive markets.

On the second day, there were ten sessions in two parallel groups which included: energy management, power load flow analysis, intelligent system applications, fault location and protection, distribution, impacts of open trading, power system control and operation, restructuring, and power system stability.

Topics debated in the eight sessions in two parallel groups on the third day included: new concepts in electric markets, intelligent system applications, pricing, utility pricing, reliability, distribution, generation and storage, and disturbances and harmonics.

All of the papers were presented orally and discussed. Approximately 15 minutes was allowed for each presentation and discussion. The high standard of the technical discussions that resulted from each presentation was particularly gratifying.

Tutorial on Deregulation

This all-day tutorial preceded the conference and covered Deregulation, New Electric Trading Arrangements, Transmission Capacity Planning in an Open Energy Market, and New Technologies.

Topics highlighted were the current industry structure in England and Wales--new entry, restructuring and plant divestment; the England and Wales pool--wholesale trading arrangements 1990~2000; changes in UK generation mix--1990 versus 1998/1999; and changes in generation market shares--output, capacity, new entry and competition. Other topics included price developments since 1990; problems with the Pool; new electricity trading arrangements; and an overview of NETA--forward markets, new products, the balancing mechanism and imbalance settlement.

Also examined was reasons for reform, bilateral trading, the role of NGC and incentives, effect on industry participants, and future developments--market evolution, reform of transmission access, flexibility markets.

The final part of the tutorial was related to transmission planning which has the ability to forecast changes in the energy market, particularly developments in generation. Discussed was investments relating to extensions to the transmission network (connections and infrastructure) which are primarily influenced by the level of new generation opening activity, the location of new generation openings and closures, the level and location of demand growth, and impact of power flows across the transmission system.

Conference Proceedings

All papers were included in the 688-page Hard Copy Proceedings (and the equivalent CD-ROM in Adobe Acrobat PDF format) which were distributed to delegates at the conference. The electronic format made possible publication of authors' work in color and supports text searching.

DRPT Proceedings (Hard Copy or CD-ROM) may be purchased until current supplies are exhausted from IEEE Service Center, 445 Hoes Lane, PO Box 1331, Piscataway, NJ 08855-1331, USA, +1 732-562-5430; Fax: +1 732 981 9667; E-mail: customer.services@ieee.org
Details: Proceedings of the International Conference on Power Utility Deregulation, Restructuring and Power Technologies 2000, CD-ROM version, IEEE Catalog Number 00EX382C, ISBN 0-7803-5919-4, softbound version, IEEE Catalog Number 00EX382, ISBN 0-7803-5902-X, April 2000, cost \$184.00 non-member / \$92.00 IEEE Member (printed version).

Social Events

Social highlights of the symposium included:

- Welcome cocktails on the Tuesday evening in the Oliver Thompson Lecture Theater Foyer, City University London

- Lunch on the Wednesday at the Barbican Hotel close to City University London sponsored by ABB at which the speaker was Les Manning, Manager, ABB Transmission Technology
- Conference Banquet on the Thursday evening at the Four Seasons Restaurant located in the historic County Hall overlooking the River Thames and the Houses of Parliament, Westminster, London, at which the after dinner speaker was Wallace S Read, Past President IEEE and the response to the Address was made by Thomas J Hammons, Chair, IEEE UKRI Section
- Technical visits which followed the closing ceremony on the Friday. Visits were jointly arranged with London Electricity.

Symposium Wrap-Up

Papers were well thought out and benefited from the 15 minutes allowed for presentation and discussion of each paper. The general level of the discussions was high and stimulating. Of particular note was the high standard of the presentations by the younger members of the profession. The pleasure the participants experienced in meeting colleagues with similar interests from so many countries should be particularly noted. Gratitude is expressed to the Conference Chair, Dr Loi Lei Lai, Organizing Committee Members, colleagues at City University London and to the UKRI Power Engineering Chapter Chair, Tom Hammons, for an excellent arrangement of the Meeting.
