

E-COMMERCE : A NEW STEP TOWARDS THE CONVERGENCE OF ELECTRIC POWER AND NATURAL GAS INDUSTRIES

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ABSTRACT

The word « convergence » of natural gas and electricity industries is progressively used at least in North America and currently in Europe. The **deregulation** process and **technological** changes are inducing growing links between these two energy value chains. The meshing of electric and gas value chains seems to be highly relevant to study in the era of changes. In this paper, we will focus on a specific characteristic of the emerging competitive markets : the convergence electricity - gas in the new e-commerce arena. To begin with, we will explain which means the convergence of gas and electricity value chains : main drivers of the growing links between these two industries and their impact on the new energy market organization. Then, we will analyze the role of e-commerce in the new energy gas-electricity industry. The evolution of **e-commerce** is compelling greater changes in the way BTU units is marketed and purchased in both wholesale and retail markets.

INTRODUCTION

Worldwide, energy networks industries are undergoing a transition from regulated to competitive markets. The pace of liberalization and the route towards it geographically varies. The European electric power industry is in its early stages of transition towards a competitive electric market. In the United States, for the last two decades, electric and natural gas industries have progressively experienced major changes in terms of **organization and competitiveness**. All over the world, the move seems to speed up.

The word “convergence” of natural gas and electricity industries is progressively used at least in North America and currently in Europe. The **deregulation process** and **technological changes** are inducing growing links between these two energy value chains. They are driving major transformations in how the electric power industry operates. Within ten years the electric power sector, as we know it, will cease to exist. It is unclear what kind of industry will emerge from the period of transition. The **meshing of electric and gas value chains** and the **impact of new technologies** seem to be highly relevant to study in the era of changes.

In this paper, we will focus on a specific characteristic of the emerging competitive markets : **the convergence electricity - gas in the new e-commerce arena**. To begin with, we will explain which means the convergence of gas and electricity value chains : main drivers of the growing links between these two industries and their impact on the new energy market organization. Then, we will analyze the role of e-commerce in the new energy gas-electricity industry. We can wonder which is the real role of e-commerce in the emerging energy industry. Indeed, there are lively discussions about the evolution of e-commerce in the transformation of energy value chains.

CONVERGENCE OF ELECTRICITY AND GAS VALUE CHAIN

With the liberalization reforms, the creation of more efficient markets and price transparency is inducing the meshing of electric and gas value chains. Technological innovations combined with a growing demand for commercial choices are accelerating this movement. More precisely, the **main drivers** of this convergence have been :

- **ongoing deregulation of the gas and electricity markets.**

The greatest parallel between the two industries is probably in the area of regulation. Begun at the same periodⁱ, their regulatory histories are closely intertwined. Both sectors are generally regulated by the same commission which creates a natural tendency to converge of regulation. This is perhaps not surprising considering the many similarities between the electric power and gas industriesⁱⁱ. For example in the United States, recent restructuring of the electric power industry is based on the precedent model of the gas industry. There is already a form of deregulatory convergence between electricity and natural gas at federal level. The F.E.R.C. Order 889 in the electric industry, for example, mirrors its earlier Order 636 in the gas industry. This parallel trend seems to continue at the state level with progress towards retail competition. Moreover, worldwide the process of unbundling energy utility business is facilitating the link along both value chains. By separating energy activities and liberalizing some of them, utilities are allowed to go beyond their markets to penetrate others. The opening to competition reforms appear **necessary but not sufficient** to electricity-gas convergence (M.JESS E.I.A. 1998).

- **upstream linkage in generation.**

Technological progress, regulatory factors and environmental concerns combined to encourage the use of natural gas for power generation. Advances in turbine efficiency have been made in the last decades with some combined-cycle gas turbine (C.G.T.) units now capable of achieving 65-75% efficiency compared to the 35 % efficiency for coal fired plants. Low polluting and less capital risked, C.G.T. units are more efficient method of producing electricity than traditional coal plants. Recent innovations in power generation have resulted in the emergence of so-called "distributed generation" units. This is a term for a diverse group of technologiesⁱⁱⁱ aimed at generating electricity close to the place where it is used instead of generating at large centralized power plants and transmitting the power to users over long stretches of wire. The latest distributed generation options are gas microturbines and fuel cells. Small, flexible, environmentally clean, and relative maintenance free, these new units can compete favorably with traditional units. With environmental protection decisions, a few recently improved and new technologies based upon natural gas will play important roles in competitive power generation strategies.

- **midstream synergies between gas-power trading and risk management.**

Technology advances are transforming the perception of electricity towards a commodity as it has occurred in the gas sector. The commoditisation refers to the move in both gas and electricity away from long term fixed price contracts to contracts based on spot process or some other market-related price. Gas and electricity are now considered as two commodities with a physical spot market^{iv} and a "financial paper" market. With the emergence of

electric spot markets, energy buyers and sellers have become exposed to financial risk caused by volatile spot prices. This has led to the development of derivatives markets and the entrance of a wide range of traders and risk management providers. The introduction of NYMEX electricity futures has raised possibility of trading spreads between gas and electricity futures. Last year, nine of the top-ten US based power marketers have originated from the gas sector.

- **downstream opportunities to eliminate duplication costs.**

In the United States, combined distribution utilities of gas and electricity have always existed. With the deregulation of power retail function, an increasing number of utilities are now combining their gas and electricity marketing activities to offer consumers a bundled energy service as one package. They are testing new technologies : on-line billing, remote appliance scheduling and control, and energy-usage monitoring. Significant synergies are perceived as offering customers a one-stop-shop energy services (similar to the approach of supermarkets to food retailing). Some utilities are trying to leverage their customer relationship to cross-sell products and services^v like water delivery, telecom, technical advice, home-security systems and electrical appliance maintenance contracts.

The meshing of gas and electricity industries have resulted of the liberalization reforms towards competitive power generation and retail sectors, and the powerful disruptive effects of technological changes. Deregulation combined with important innovations have induced growing link between these two energy value chains at different levels of activity. The convergence is breaking over the electric power industry organization, sweeping away traditional utility structures and creating new business opportunities in an increasingly competitive market environment. The move towards convergence have been primarily driven by a need to reduce costs and to take advantage of the various synergies that might occur between electric and gas businesses. The electric power and natural gas industries are clearly connected along deregulated segments.

- **In power generation**, the use of natural gas is leading to the emergence of a new market place where gas and electricity will be sold together and compete together.

Many energy utilities view convergence as a means of managing commodity price volatility, by providing them with the opportunity to arbitrage^{vi} between the various commodities and their respective markets. A number of players are seeking deliberate convergence of gas and electricity trading. This is generally motivated by intention of cutting costs by combining trading operations and exploiting arbitrage opportunities. Of particular importance to the convergence of the gas and electricity industries, is the development of arbitrage related use of gas-fired power generating units. Over 200 new entrants have filed the necessary paperwork to become power marketers including potentially powerful players such as major oil companies (e.g. *Amoco*), gas marketers (e.g. *Enron*), and Wall Street firms (e.g. *Morgan Stanley*). As might be expected, players who are now entering the commodity marketing-trading game position themselves with either financial or physical dimensions (if not both). At present, the United States offers the most developed gas-electricity arbitrage worldwide^{vii}. However, exploitation of arbitrages still varies from region to region due to differences in the structure of markets and trading mechanisms.

Furthermore, with technological advances and the loss of significant economies of scale in production, a new generation market has emerging and is about to revolutionize the electric power industry's organization (C.BAYLESS 1994). These new generating systems can do more than reduce the costs of electricity. Distributed generation units have changed the fundamental premise that shaped electricity systems for more than a century. The long trend of large expensive central power plants which take years to build, require miles of distribution wires and take decades to pay off (see the discussions on stranded costs) is replaced by new highly efficient distributed generation units closer to end users^{viii}. The optimism regarding microturbines may be premature because they still have to be

commercially proven. However, they have frightened some traditional utilities accused of suppressing researches and strategically delaying deployment of distributed generation (B.ALTHOUSE 1999).

- **Energy retailing** will continue to see increased competition with consumers having a greater choice of suppliers.

"Beyond the meter" is a widely used sentence in the literature to describe business opportunities that may provide customers with greater services. The convergence of the electricity and gas value chains in the marketing-supply segment has led companies to offer both fuels, till to become home services providers. In an effort to add value, many energy suppliers are seeking to decommo-ditise electricity : they are providing "value-added" services to attempt to increase their margins. Energy companies, using the same infrastructure to deliver energy, are looking for differentiating themselves on the basis of service. Three basic models of energy supply retailer have emerged : basic company supplying gas and/or electricity with few added services ; combined energy company offering a total energy package ; and a multi-utility services for customers. As the market for energy services evolves, utilities need to make careful strategic choices on paths to follow in attempting to build a distinctive value proposition for customers they wish to target in the long run.

The much-talked-about convergence of electric power and gas industries is continuing, pushing toward an increasingly integrated energy market. The United States are moving from an electron and molecule energy system to a **BTU's one** (the BTU is the British thermal unit of heat formerly used in the UK and currently used worldwide in many gas and power projects). Electricity and gas markets are disappearing with the emergence of the BTU market where it would be possible to buy and sell energy units (with or without owning electric assets). Players could make arbitrage : geographic arbitrage, commodity arbitrage and grade arbitrage. Energy companies are looking to "enhance the value of the BTU" by becoming the least costs energy supplier and enhancing the convenience of the commodity with services beyond the meter. They are looking beyond the confines of the segments of the value chain in which they operate to form links with end-users via companies in others segments (see the wave of large electricity and gas mergers).

E-COMMERCE

In this era of transformation of the value chain, everyone involved in energy recognizes that the evolution of **e-commerce** is compelling greater changes in the way BTU units is marketed and purchased in both wholesale and retail markets. The combination of the existing market size for a standardized and essential commodity, with an exponential growth rate as more states and / or countries open to electric and natural gas competition has drawn an array of energy service providers aiming to the Web-based energy exchange. Now come the Internet with the promise of an electronic exchange for many commodities. Food , books, and wholesale commodities such as steel, already trade over the Web. Electricity and gas are ideal commodities for e commerce. They are delivered by wire and pipeline and controlled electronically. The technology of e commerce is well suited to the real time matching of supply and demand required by electric power and natural gas markets.

Just when the gas-electricity industry is consolidating, the number of sites dedicated to buying and selling energy online or that offer new services to downstream energy companies is proliferating. For example, more than a dozen new or expanded online energy e-commerce ventures were reported in the first quarter 2000 alone. While several shops have increased the percentage of their business executed electronically, a smaller pool of players is responsible for the most of the gain.

The BTU sector is young, and competitors are not yet tripping over one another as different providers focus on specialized market segment whether by type, size or geography. The company likely to withstand any future shakeout and emerge as the dominant industry standard are still several years away. It is still not clear who will be left standing after the inevitable shakeout. Some companies are already taking aim at becoming all things to all customers. For example National Utility Service examine the transmission and distribution charges and take care of

regional differences between markets for their national accounts. The industry is still in the emergence phase of the product life cycle. It is now the beginning of the entrance of many new players. Some startups including Utility.com and GreenMountain.com purchase wholesale power from generating plants and resell it to customers on the Net. Other pioneers such as ElectricityChoice.com and BrightOptions.com use the net to sign up households and create large buying pools with enough power to win discounts from suppliers. The challenge facing providers both on the national and regional level is differentiating their service from a competitor's.

E-business has yet to fully take root in utility operations. While most companies believe it will ultimately have a profound effect, particularly in customer facing parts of their business, not all have the same view about e-business benefits across other parts of their business. A distinction in energy segments must be realized : the e-commerce has not the same role in trading operations and in retailing activities.

Deregulation of the energy industry is creating opportunities for energy distributors. Just as long distance telephone providers now compete while sharing the use of wires and satellites, energy providers can now compete while sharing oil pipelines and power transmission facilities in a way that government regulations used to prohibit . By 2005, 28% of online households will be using the Net to trim their energy bills spending 10 US\$ millions to do so. Still even 10 US \$millions is small amount compared with the total market. Indeed, not every home is hooked up to the Net. And growth has also been hampered by the lethargic pace of state-by-state deregulation. But for instance, come the end of 2001, analysts expect that some 80% of America's population will be able to select the power provider they want, up from about 20% in 2000. In surveying the field of service providers in this segment, utilities, power marketers and energy service consultants have joined the fray offering products ranging from on line energy cost management, bill auditing, and energy procurement tools.

Wholesale electricity trading has been a start-stop affair, as players moved in, then out of the market. Extreme volatility, illiquidity, complaints of inaccessibility to electric transmission system, and unlike the opening of the natural gas market, short supply have proved to be major hurdles. Many observers predict the number of combined gas and power companies with large-scale trading operations could shrink to just a dozen as the industry consolidates. Underscoring a growing shift to electronic commerce, the NYMEX suspended open outcry electricity trading at the end of business on March 2 in favor of its Access electronic trading system. And, for the first time, the giants of the industry are making a direct investment in e commerce. For example, Texaco is taking a minority equity position in TradeCapture.com and will use the Internet Based platform to trade crude oil, refined products and natural gas.

Net markets allow more flexibility and access to wider group of global trading partners. With liquidity, net markets make it possible to commit less inventory to contract and long term relationships. A net market has the following characteristics : new revenue model, multiple buyers and sellers, and dynamic pricing. Forester Research has projected online energy-utility trading will grow to more than 169 billion by 2003 generating potential e commerce revenue of more than 3000 million per year. Though some disagree, advocates claim online trading offers speed, quicker price discovery and lower transaction costs compared with broker assisted telephone trading.

Automated Power exchange (APX) and Altra Energy Technologies are expanding internationally. Altra, long a powerhouse in gas and natural gas liquids trading, is barreling ahead in electricity with more than 10 million MWh exchanging hands in its first month of online trading. Privately held APX operates Internet Based exchanges and clearinghouses for electricity, energy transmission, and related products in California and Ohio, and was scheduled to open in Illinois, in New York and in the UK. More than 250 million in transactions were processed through APX exchanges in 1999. APX services include anonymous scheduling, credit management settlement and price discovery.

There are a number of reasons for the increase in popularity for electronic commerce, but the ones mentioned most often are instant credit screening, anonymity, and speed of execution. On the negative side, a lack of personal contact is been cited by critics. Nonetheless, the rush is on to establish Internet e-commerce sites both for retail sales and to conduct wholesale transactions of gas, power, crude oil and related product.

CONCLUSION

The energy utility sector is undergoing a fundamental transformation around the world as markets are deregulated and governments owning utilities are privatized. There is still considerable resistance from the existing incumbent monopolies, and a firm degree of ignorance from many end-users who are unaware of the potential savings that competition might bring to their energy costs. However, a shock in the European energy markets is beginning to appear as more customers seek to below their energy costs^{ix} with access to cheap sources of gas and electricity.

In the United States, the value chains for gas and electricity supply are becoming meshed together as a result of the deregulation process and technology changes. As competition has intensified in both electricity and gas value chains, it has become noticeable that all parties are seeking to develop market shares in both industries by making use of benefits of synergies between the two markets. Convergence is more than simply the integration of common gas and electricity business processes to form one entity. It involves : exploiting and sharing common activities to reduce costs, as well as exploiting synergies and substitutability at each end of the value chain (wholesaling and retailing). The development of competition clearly provides progressively thinner profit margins. Some U.S. utilities believe that is a case of "converge or die". And it is coming to Europe^x where changes are accelerated thanks to utilities strategies.

Traditional energy industry's organization is altered by nimble competitors, new technology and freely traded energy. As G.RIDER (1999 pp.19) underlines "*the slowest to move are often the first to fall*". Established companies have to adapt quickly if they want to survive. The "energy company" has emerged. A good illustration is Enron's vision to become the "*world's leading energy company*" where the focal point is gas and electricity convergence.

In European Community like in North America, while there has always been competition it is only now in the deregulated energy markets that gas and electricity can be traded interchangeably : the competition is becoming inter and infra energies at wholesale and retail level. The E commerce will speed up the move but it has only started to make a difference.

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ⁱ For example in the United States, federal regulation of both industries was established when the Federal power Act and the Natural Gas Act were incorporated in the Public utility Holding Company Act in 1935.

ⁱⁱ However, although demand for gas and electricity is reasonably well correlated there are significant physical differences between the two commodities.

ⁱⁱⁱ Some of the technologies that can be placed near users include microturbine generators, windmills, solar cells, photovoltaic and fuel cells

^{iv} The emergence of spot markets has been the result of regulatory reforms and the introduction of competition into markets which were formerly monopolies. Emerging spot markets are largely physical, they serve as a market in which to trade a commodity for physical delivery.

^v Different services : energy management, metering, cleaning services, maintenance, water delivery, computer services, home security, broadcast, telecom, cable TV...

^{vi} Arbitrage is the difference in price between related markets; either markets for a given commodity traded in different locations, or markets for two different commodities that can in some way substitute each other.

^{vii} At present, only spot markets for either gas or electricity in Europe are in Scandinavia, and in Great Britain. Several countries are working on spot market projects (Spain, Netherlands, Germany...)

^{viii} See Cooksey J. (1998), Linden H. (1997), Zuckerman L. (1997)....

^{ix} To ensure industrial competitiveness, end users prices have to come down across the E.U. , where they are average 70% higher than in the US.

^x Convergence is beginning to occur in many countries throughout the world, although the main locations where it is beginning to have a significant effect are the US and the UK where the development of the competitive markets has promoted an impetus for the convergence of these industries.