

## **Electricity: Business Futures**

By Walt Patterson

### **1. Introduction: the business dimension**

When Thomas Edison established the Pearl Street central-station electricity system in Manhattan in 1882, he knew exactly what business he was in. He was selling illumination - better illumination than that from gas-light or kerosene lamps. He delivered it by installing his own make of incandescent bulbs and fittings on his customers' premises, and connecting them by cables to the generator in Pearl Street. The customers paid for the illumination delivered, as measured by meters recording the electricity used to deliver it. But Edison was a master entrepreneur. He knew that his customers would use their incandescent bulbs only for a few hours a day, mostly in the evening. So Edison also launched a subsidiary business, selling motive power. Electric motors in factories and in due course in electric trams would use electricity during the day, keeping the generator running and earning revenue even during daylight hours. Electric light and electric motors were much more expensive than gas-light and steam engines. But they were also obviously better, delivering services that were cleaner, more convenient and much easier to control than the cheaper alternatives. Gradually but inexorably, the business initiated by Edison and his contemporaries, among them George Westinghouse in the US, Charles Merz in Britain, and Werner Siemens in Germany - the business of delivering services by means of electricity - began to supersede its less satisfactory precursors.

However, even as it was becoming commercially competitive, and more than a mere luxury for ostentatious display by the wealthy, the business of delivering services by means of electricity was breaking up. In the early years, all the technology of the system - generation, network and end-use equipment - was manufactured and supplied by the same entrepreneur, either directly or indirectly by sub-contracting. Over time, however, the very versatility of electricity as a way to deliver energy encouraged different individuals and groups to specialize. Some manufactured generators, some lighting, some motors, some cables and other system hardware. Some installed and operated complete systems to deliver electricity, to which users could connect end-use equipment from some other manufacturer. Generating and delivering electricity to customers became a business in its own right; what each customer did with the electricity was no longer part of what had become the 'electricity supply' business.

In many places, indeed, electricity supply was not a business at all, but a 'public service', established and managed by local government on behalf of its citizens, paid for not only by metering and billing but by taxes. Here again, the 'public service' was limited to the supply of electricity itself. Citizens had to purchase and maintain their own lightbulbs,

motors and other equipment. Separating the system in this way had a major consequence, yet more important almost a century later. When Edison and his contemporaries sold lighting, a key objective was to minimize the cost of the illumination delivered. That entailed making the entire system - generation, network and end-use equipment - as efficient as possible at reasonable expense, reducing losses and waste, to keep down the running cost of providing the light the customer was paying for. When the focus of the commercial activity shifted, selling electricity instead of illumination, the electricity supplier no longer cared whether the lightbulbs and fittings were optimally efficient - if anything the contrary. The less efficient the lightbulbs and fittings, the more electricity the supplier could sell to a customer wanting the same level of service.

From that time on, throughout the rest of the twentieth century, the electricity business has been based on selling more and more units of electricity, for a steadily widening range of applications. On one level, particularly in most OECD countries, it has genuinely been a 'business', in that it has fought to win customers from other types of energy supply, particularly the direct use of solid and liquid fuels, and more recently natural gas, for various kinds of heating, a major category of energy use. On another level, however, because of the monopoly franchise, the electricity 'business' has been a very special kind of business, having little in common with other commercial activities to which the term is usually applied. Most electricity is used for motors, lighting, electronics and other applications that specifically require electricity. Under a monopoly franchise, a potential electricity user wanting access to the system has to accept its conditions and pay what it charges, with no option and no recourse except to remain unconnected to the system. Commercial business as conventionally transacted entails a measure of reciprocity between buyer and seller. The buyer must seek to accommodate the seller, and vice versa, since each can look elsewhere for a better deal. When, however, you have a monopoly franchise to provide an essential requirement, you can offer a prospective client Hobson's choice - take it or leave it.

This circumstance engenders a certain mindset in those providing electricity under a monopoly franchise. At its best, it manifests itself as a dedication to 'public service', and a devotion to keeping the lights on for the good of society. At less than its best it can become arrogant and condescending: 'We know what is best for you. Go away and let us get on with it.' These two extremes, indeed, can co-exist within the same organization. Neither attitude, however, can really be called 'businesslike', as the word is normally used. Over the decades, as the monopoly franchise came to be taken for granted and electricity became an essential, the operational and management culture of central-station electricity systems in OECD countries, and even more so in transition countries and emerging countries, came to be dominated by an engineering approach, not a business approach.

Under the monopoly franchise, the electricity user is not a 'customer' who can take business elsewhere. Once users come to take electricity for granted, management becomes preoccupied with keeping the lights on, in a cost-plus context that permits

investment in over-capacity and redundancy, sometimes extravagant. Belated and diffuse objections to unnecessary cost are much easier to stomach than the political and public furore provoked by power failure. Dramatic episodes such as those in the UK in the winter of 1962-63 and the northeastern US in 1965, when lights went out and electricity was cut off over large areas for many hours, made uncomfortable headlines. In response, system planners routinely over-engineered their technology and their systems, widening margins of available redundancy to cover every conceivable contingency, with little regard for the cost. By the 1980s, for example, the UK Central Electricity Generating Board was said to have 'gold-plated' its system. In transition and emerging countries, the electricity engineer was a member of the country's elite, even when - as became increasingly the case - the system performance proved woefully unsatisfactory. Electricity systems were part of the power structure not only literally but metaphorically. As Working Paper 1 discussed, the relation between electricity systems and governments became a sort of symbiosis. Governments were expected to keep the lights on; so were the electricity systems under their aegis. Conventional commercial considerations took a back seat.

Even after nearly a decade of liberalizing and restructuring electricity systems in many parts of the world, the same expectation still prevails. It sits uneasily, however, with efforts to inject conventional commercial and business relationships into electricity transactions. The essence of a business deal is that either participant can walk away from the table without making a deal. Any other process is not business but coercion. Over time, as margins shrink and revenues tighten, as earlier Working Papers have discussed, reconciling the freedom not to make a deal with the demanding constraints of a synchronized AC system may prove difficult if not impossible. If business takes over from government the management and operation of electricity systems, can business keep the lights on? How can it do so, and on what basis?

In other words: 'Now that you are in the electricity business, what business are you in? In the coming century, what business do you expect to be in?' This paper will explore some possible responses.

## **2. Electricity and commerce**

Providing services by generating, delivering and using electricity was a persuasively commercial business undertaking as long as the services so provided had to compete with other ways of providing the same services - mainly lighting and motive power until well into the twentieth century. Those involved in the electricity business had to contract to manufacture and install system hardware, to staff, operate and maintain the system, and to purchase fuel when required, paying both investment and running costs. In turn they had to persuade enough users to join the system and use it enough to provide a revenue stream adequate to cover these costs, and if possible to earn a return. In the initial decades the risks were substantial, and large sums were gained and lost.

Gradually, however, the idea that a central-station electricity system constituted a natural monopoly took hold. Some governments operated systems under their own monopoly control; others granted a franchise to a chosen private operator. With the franchise came an obligation to supply all the electricity requirements of all users and prospective users in the franchise area. Over much the same period of time, economies of scale for water power and steam power dramatically reduced the cost of central-station electricity; and the evident superiority of electricity for lighting and motive power created a rapidly expanding constituency of users for whom electricity was becoming essential. New applications specifically requiring electricity added to its attractions. What had been a business like many others became a unique and distinctive arrangement mediated by government. The electricity system became a 'utility' providing a 'public service' on a cost-plus basis.

System managers still had to do business with suppliers of plant and equipment, and where necessary fuel, although after the Second World War many governments also intervened to downgrade or remove the commercial aspects of these transactions, mandating choice of supplier and sometimes also prices. However, system managers no longer had to persuade final users to join the system. Instead, the monopoly franchise and the essential character of electricity for a growing range of applications left system managers with little if any need to 'market' electricity at all. For any but the largest industrial user, purchasing and paying for electricity was no longer a business transaction, but more in the nature of a tax, levied unilaterally under the aegis of government to ensure provision of an essential service. Tariff structures were decreed by government pronouncement, directly or indirectly, without negotiation with those who would pay. Subsidies and cross-subsidies were likewise mandated, favouring some social groupings at the expense of others, for reasons of equity in the context of a 'public service' obligation, or for other reasons of politics rather than economics.

As noted in earlier Working Papers, this arrangement worked fine. Few noticed the externalities. Most people in most OECD countries came to take both electricity and electricity bills for granted. To be sure, by the 1960s opposition to large dams, and by the 1970s opposition to nuclear power, gradually began to undermine the long-standing acceptance of the electric status quo, as activists challenged electricity planners and managers. But the upheaval that began in Chile in the mid-1980s and the UK soon thereafter was only incidentally related to the undercurrent of discontent at the perceived arrogance and insensitivity of electricity monopolies and their managers. The upheaval was motivated at the outset rather by ideology, the conviction of 'free market' politicians that governments should not own or operate economic activities, and by the prospect of windfall revenues for government coffers. These motives were accompanied by a counterpoint of rhetoric about the virtues of competition to bring down prices; introducing 'market mechanisms' would gradually eliminate the need for regulatory price-setting and oversight. By implication, if not in so many words, electricity would

once again become a business like other businesses. Electricity users could enter into deals in a framework of commerce, not monopoly.

As earlier Working Papers have discussed, the processes of privatization, restructuring and liberalization were set in train without much apparent thought as to where they might eventually lead. In particular, they seemed to assume that governments could overturn the guiding premises underlying the growth of electricity systems for most of a century, while still expecting the systems to continue to function in more or less the same way more or less indefinitely. Governments certainly assumed that systems would continue to be based on the common technical model of central-station synchronized AC. If they did not, they kept very quiet about it. Nevertheless, as earlier Working Papers have argued, the longer-term implications of liberalization pose a serious challenge to central-station synchronized AC. One aspect of this challenge is that the ground rules for normal business and commercial relationships may prove over time to be incompatible with the ground rules for large-scale synchronized AC.

If large-scale synchronized AC were the only way to provide essential electricity, governments would then have to resolve a daunting dilemma, and conceivably even try to reverse the processes of liberalization, to keep the lights on. However, central-station synchronized AC is by no means the only way to generate and deliver electricity. Indeed, given mounting concern about the side-effects of all the traditional large-scale generating technologies - coal-fired, nuclear and hydro - and the transmission lines they necessitate, and the availability of other options, the traditional system configuration may no longer even be optimal. Earlier Working Papers indicated some of the changes that system configurations might undergo as a consequence of liberalization, restructuring and the introduction of competition. Reintroducing commercial relationships involving electricity users appears likely to be consistent with, and indeed to reinforce, these changes.

In the new business context of electricity, one striking difference is the re-emergence of the 'active buyer'. In a monopoly context, the electricity user is a passive participant, subject to unilateral decisions taken by others about price and quality of service provided. In the new market context, the electricity user may become an active buyer, whose wishes and concerns the sellers must address and accommodate. This in itself requires a major cultural change; most electricity users have never given a thought to shopping for electricity services, and may find the idea disconcerting. As in the case of competitive telephone services, however, some users at least will catch on quickly. If a particular seller fails to satisfy the active buyer, the buyer can and will look to other sellers. Arrangements for provision and use of electricity become business deals, on terms agreed by both seller and buyer.

If electricity is to become again a focus of commercial transactions involving the ultimate purchaser as an active participant, several immediate problems have to be addressed. An organization previously functioning as part of a monopoly 'public service' or 'utility' may not readily manage the culture change required to deal with active buyers, in

bilateral commercial transactions. Suppose, nevertheless, that the change to a commercial culture succeeds. What then is to be the subject of commerce? The traditional monopoly system delivered electricity by the unit, and charged the user accordingly. From one viewpoint the process could be described as a 'public service', in which metering measured how much 'service' was delivered. Indeed, one stated intention of 'free market' privatization was to move away from this 'public service' concept, and to treat electricity as a market commodity. In practice, however, electricity itself was already treated as a commodity. The number of units of electricity, not of services, was metered and paid for. The quantity and the unit price were the key considerations. In a monopoly context this fiction could be maintained. But electricity is not a commodity. Because it cannot be stored, in a competitive context it cannot be withheld from the market until the price is right. The need for an elaborate fixed infrastructure and central control moment by moment mean that any 'commodity market' in electricity delivered by large-scale synchronized AC is fundamentally illusory.

An exception must be made for systems with a high proportion of hydroelectric generation, in that water behind a dam is a good first approximation to a commodity that can be stored until the price is right. With that proviso, however, treating electricity by the unit as a commodity for commercial transactions is at best a short-term interim measure, in the transition from monopoly franchise to commercial market. Over time, as electricity and commerce reconnect, new business relations and transactions will enter the marketplace. Those that succeed will recognize and take advantage of the distinctive attributes of electricity as a way to deliver essential services.

### **3. Business and electricity finance**

Historically, at least in most OECD countries, supplying electricity by the unit to users' meters has been run as a cost-plus activity under the direct or indirect oversight of governments. The financial framework has been established and managed accordingly. Outside the OECD, other criteria have often applied, with elaborate subsidies and cross-subsidies from government budgets to protect or placate favoured constituencies of users. Such arrangements usually prove resistant to change, because the favoured constituencies - for instance heavy industry in transition countries, and agriculture in south central Asia - object vociferously to any hint that they may lose their preferentially subsidized position. Such active involvement of government, however and wherever it is manifest, makes electricity finance a matter of politics rather than business. Decisions on investment, expenditure, procurement and staffing are ultimately political decisions rather than business decisions; and their success or failure is judged accordingly. Even in OECD countries whose electricity systems are privately owned, the assumed responsibility of government to keep the lights on makes government influence on electricity finance both relevant and political. So long as the overall framework remains the traditional franchised monopoly, electricity finance remains a low-risk activity. The risks are borne by electricity users and taxpayers. Unless the government itself is a source of risk, as it may

be in some non-OECD countries, participation in a franchised monopoly electricity system on the system side of the meter is a comfortable business to be in.

Liberalization, therefore, discomfits the comfortable. If electricity finance can no longer be provided on a cost-plus basis, someone's money is at risk on the system side of the meter. Reshaping electricity finance on a genuinely commercial business basis is a challenge as yet only tentatively confronted, even in those countries which have privatized, restructured and begun to liberalize their electricity systems. As noted in earlier Working Papers, the terms of privatization have generally left substantial amounts in newly privatized coffers, to cushion the early years of operation in the new context. So long as shareholders and senior managers are amply rewarded, conflicts and confrontations about the finances of system participants have been mild and easy to deflect. This cosy situation may not last. Questions of dispatching, network access, payment for system services and other issues that affect revenue streams are moving steadily up the agenda.

As a businesslike approach to electricity finance gradually takes over from the well-cushioned, amply redundant, cost-plus monopoly approach, transactions for electricity-related business will have to be agreed by both parties, and sometimes more than two - including users. Contracts will have to stipulate in detail the goods or services to be provided, the timescale over which the contract is to be in effect, the money to change hands, and the apportionment of risk in the event of failure by any party to fulfil the contract. Risk is no longer borne entirely and implicitly by the user. If the user bears risk in a contract, it is explicit and agreed; and other contractual partners bear proportions of risk similarly explicit and agreed. In the 1990s, where electricity systems are being liberalized, management of risk has already become a critically important new financial discipline for those active in electricity markets. It helps to shape new financial instruments that may involve hedging, futures, derivatives, arbitrage and other arrangements hitherto unheard of in the context of electricity. These innovations may be peculiar to a transitional phase of electricity business, for transactions dealing in electricity as a commodity. Nevertheless, very large sums are nevertheless already committed to them.

Tracking the flow of revenue through the process in a liberal framework may indicate where trouble could arise. Owners of and equity investors in system facilities will expect to earn returns. Lenders and others holding debt will expect the debt to be serviced. Suppliers of fuel, spares and other goods will expect to be paid, as will the staff of system participants. Governments will expect system participants to pay taxes, and possibly also duties or other imposts on imported fuel and spare parts. Each system participant will expect to be paid for services rendered to the system. All the money changing hands in these various payments will come ultimately from the users of electricity; and they will pay it by agreement, not by coercion. In a liberal business framework for electricity, a dissatisfied business partner can look elsewhere. Moreover, the dissatisfied business

partner can be any individual participant on the system - user, generator, even network operator, to take the most extreme and disruptive possibility.

In the 1990s, any such suggestion may sound inconceivable. It is not. Over time, the need for explicit and equitable business arrangements acceptable to all system participants will become both more pressing and more challenging. Neither regulator nor central controller will be able to compel a participant seriously dissatisfied with the terms of electricity business to remain part of the system. On a synchronized AC system, one seriously dissatisfied participant, if large enough, can jeopardize the entire system.

In any case, the risk of a system collapse, for whatever reason, affecting all participants, is worrying enough in a monopoly context. If it happens in a context defined by business relationships and contracts with explicit financial penalties, the reverberations will tie up courts for years. Since August 1996 major system collapses have struck the western US, northern India and Venezuela, disrupting electricity for close to 200 million users in these three places alone. The financial implications for central-station synchronized AC in a liberal business framework involving liabilities and compensation claims stagger the mind.

Such extreme but far from impossible examples illustrate some potential incompatibilities between normal business relationships, with their explicit financial terms, and traditional central-station synchronized AC electricity systems. How and indeed whether they can be reconciled remains to be seen. At the same time, if changes such as those foreshadowed in earlier Working Papers come to pass, most of the requisite transactions will take place in normal business relationships, involving contracts, buying and selling and apportioning risk on terms mutually agreed. Who will be the participants, and how will they interact? Will alliances and consortia emerge, with the unfamiliar blend of competences - technical, financial, legal, marketing, customer relations and managerial - required in the new context? Will investors seek to acquire diverse portfolios covering varieties of electricity business, possibly international? Early indications are that the transformation of the electricity business is just beginning.

#### **4. Business and electricity technology**

Even under a monopoly franchise, important transactions take place according to normal business criteria, including purchases of technology and fuel. Major engineering firms compete for orders to supply new generating plant and network equipment, on agreed financial terms and timetables, with warranties, acceptance and handover criteria, penalties for delay or substandard performance and so on. The same applies to spares, repairs, maintenance and upgrades for technology. Fuel suppliers bid for contracts to supply coal, oil, natural gas or nuclear fuel, again on a straightforward business basis. Liberalization in itself makes only a limited change to the context and content of such transactions. If the purchaser is a monopoly franchise system, its own financial soundness is usually indisputable, either explicitly backed by government with sovereign guarantees

or implicitly granted cost-plus financing by a regulator. If, however, the purchaser is a participant on a system at least partially liberalized, somewhat more financial risk has to be anticipated. That in turn may influence the choice of technology, and possibly of the fuel to run it, as earlier Working Papers have discussed. But the transactions themselves remain normal business transactions.

Where the new business context may affect electricity technology is more likely to be on the customer's side of the meter, and on the information technology that provides innovative linkages between different parts of the system, including customers. Transactions with customers in which the only object of the transaction is the sale and purchase of units of electricity on a commodity basis are a limited form of business, likely to offer modest profit margins at best in a potentially very risky context, if purchasers can switch freely from one seller to another. Units of electricity sold as a commodity offer little if any opportunity to create customer loyalty in a potentially volatile market with tight margins. Those planning business strategy for electricity in a liberal context will have to look beyond units of electricity to find more distinctive offers for sale.

Some are already introducing marketing techniques long since familiar in other competitive contexts. The notion of 'branded' electricity may seem bizarre, but it is now offered for sale in the US, and the idea is spreading rapidly. Organizations with long experience of active customer relations, such as travel agencies and mail-order retailers, are forming alliances with electricity companies lacking this experience, to attract and keep electricity customers by means of branded sales and services. So-called 'affinity groups', for example members of trades unions, are being targeted with electricity marketing. Some marketers are offering package deals bundling various services together, including electricity, gas, water, telecommunications, entertainment and security - albeit thus far with limited success. The 'loyalty cards' now offered by many retailers will soon extend to buying electricity. Electricity itself may even be offered as a 'loss leader': 'Buy this appliance - or indeed this package holiday - and we'll give you free electricity'. Marketers new to electricity are full of enthusiasm - perhaps because they have yet to appreciate the possible negative impact of a power failure that can be blamed on the brand. A brand that has been a household name for decades can be destroyed by a single fiasco. In a liberal context, with so many participants involved, electricity has undoubted fiasco potential. Marketers ought to tread carefully.

One business option newly revitalized in a liberal context is the provision of on-site generation and cogeneration, initially for industry but potentially also for other users. In a monopoly context, the franchise holder invariably opposed on-site generation, charging punitive rates for back-up and paying a pittance for electricity delivered to the network. The reason was understandable: on-site generation usually deprived the system of its most preferred loads, large and stable, the best match for large central-station generators. In a liberal context, however, users with large loads now find entrepreneurs offering to design, build, operate and maintain on-site generation - or, better still, cogeneration -

negotiating fuel contracts and obtaining permits, and selling surplus electricity to the network. Such a complete service agreement leaves the site owner-operator free to focus on the core business at the site, while having much firmer control over the reliability, quality and cost of site electricity and possibly heat supply. On-site generation and cogeneration are already expanding rapidly, and the expansion will accelerate.

Another aspect of on-site electricity business will be technology on the customer's side of the meter. One corollary will be innovative technology for the meter itself. The 'intelligent meter', able to record, deliver and manipulate much more detailed information about what is happening at this crucial point on the system, and to control what is happening, will be a potent stimulus to other innovation, in both technology and business. The role of the meter itself will change dramatically, from being an implicit system boundary to being an intermediary between parts of the system. Metering and control technology for such active interfaces is already high on the agenda of information technology developers around the world. Its costs are coming down and its potential burgeoning with breathtaking speed.

On-site electricity business will not, however, be directly analogous to 'demand-side management' or DSM as mandated by the regulator of a monopoly franchise system. Instead, in a liberal context, a business transaction might involve, for instance, a tender to provide all the requisite services to a new office building - illumination, heating and ventilation, office equipment, computers and networks, security and so on - complete with the electricity and possibly also gas to run them, possibly also including other services such as water and telecommunications, and information technology to manage the entire suite of hardware. Selecting high-efficiency, high-performance technologies in an integrated design, including that of the building structure itself, would make coherent commercial sense if coupled with a contract to deliver the resulting reduced requirements for electricity, gas, water and telecommunications. The option to generate electricity on site, with the added control thus enabled, would be a further attraction. For existing buildings, comprehensive backfits of end-use technologies, combined with contracts to deliver the reduced requirements of electricity and gas, might be a commercially attractive alternative. The business deal might also include contracts to operate and maintain the entire facility.

The range of possible examples of such deals is limited only by the imagination of the entrepreneurs. Many examples share a common feature, illustrating an important new dimension of business deals involving electricity technology in a liberal context: a single deal can involve technology on both sides of the meter, from generation to use - not to mention the meter itself. This opens the possibility to reintegrate system technologies hitherto segregated for up to a century, and recreates the opportunity to optimize both sets of technologies together, in a way that would have made sense to Edison.

## **5. Business and electricity institutions**

Reciprocity, the give-and-take bargaining of normal business deals, sits uneasily amid the institutions that have grown up around traditional electricity systems. On a regulated monopoly franchise system, decisions about everything from system planning to residential tariffs are made essentially unilaterally. The decision to build a new power station, or to raise electricity rates, may be ventilated in a public hearing of some kind; but the decision is nevertheless taken unilaterally by those responsible for the system, whether or not 'the public' appears to agree. Effective opposition to a particular decision can be - and has been - mounted; but the process is then fundamentally political rather than commercial.

In the newly liberalized context of electricity systems such as that of the UK, business deals have emerged in the form of bilateral contracts negotiated between generators and users, for supply of a mutually agreed quantity of electricity at a mutually agreed price over a mutually agreed period. On the face of it such a contract is a normal business deal, subject to the laws and other institutional arrangements for commerce in the society. But the contract has to be drafted in an artificial way, to acknowledge the fact that the generator must have access to the synchronized AC network in order to deliver the contracted electricity to the user. The generator must be dispatched - instructed to connect to the network - by the central controller of the system if the contract is to be fulfilled.

The arrangement is therefore that the generator must sell its output to the system, into a so-called 'Pool'. It receives payment at a price determined by the most expensive generator connected to the system during each half-hour period. The user buys electricity from the Pool, at a price determined by the most expensive generator plus an additional charge for use of the network. However, the bilateral contract between the generator and the user is drawn up to bypass the Pool's pricing mechanism. If the Pool pays the generator less than the fixed contract price, the user pays the generator the difference. If the Pool charges the user more than the fixed contract price, the generator pays the user the difference. Such 'contracts for differences' are a sort of first cousin to a normal business deal, freely negotiated and agreed between seller and purchaser but couched in obliquely roundabout terms to accommodate the essential intermediary role of the network. To date, contracts for differences do not appear to have been tested in the courts; sellers and purchasers have all been able to fulfil their contractual commitments despite having to rely on dispatching for access to the network. That happy state of affairs may not last indefinitely.

Experience elsewhere with introducing bilateral business relations into synchronized AC systems is similarly limited. In California, leading the process of liberalization in the US, the 'independent system operator' (ISO) recently established is reported to have decreed that all the existing coal-fired stations on the system must be dispatched at base load - that is, operated and connected to the network continuously. This will substantially reduce the network capacity available for bilateral business transactions, and may well provide a legal test-case for the feasibility of the whole approach sooner rather than later.

Similar issues may arise elsewhere. Unilateral control from the centre is unlikely to evolve smoothly into bilateral business dealings. In the institutional as in other contexts, liberalization entails a culture change. For electricity institutions in a traditional context, powers and responsibilities tend to be implicit and only obscurely defined - 'to keep the lights on'. If electricity transactions become businesslike, powers and responsibilities will become explicit and clearly defined, not least by contracts. Defining powers inevitably limits them. Institutions whose powers have hitherto been vague but open-ended, effectively an extension of government with its prerogatives for planning, land-use, finance, and other unilateral decision-making, will be reluctant to surrender these powers or see them more narrowly construed in a business context. Electricite de France is the most obtrusive example, but only one of many. Institutional inertia or active opposition may be the single most intractable stumbling block on the way to making electricity businesslike.

Ironically enough, one institutional arrangement that could be an early casualty of liberalization is the cooperative partnership between unilaterally powerful bodies. Cross-border partnerships such as the Union for Coordination of Production and Transmission of Electricity (UCPTE) in Europe, and the US 'electric reliability councils', have always been quintessentially cooperative arrangements between monopoly franchise systems. How they will cope with serious inter-system competition is as yet an open question. Again, the Electric Power Research Institute (EPRI) in the US has been financed and operated as a cooperative research group to support the investor-owned electricity companies. As competition looms, mounting tensions threaten to cripple the inter-company cooperation that has made EPRI arguably the world's leading electricity research organization.

On the other hand, some former institutions and organizations have already begun rapid evolution into entities better suited to the new business context. Mergers and acquisitions, diversification, divestment and company reorientation are creating new business organizations whose strategies no longer rely on the monopoly franchise, central control or unilateral decision-making. Examples abound. To take but one: in only some fifteen years, Enron has evolved from a natural gas pipeline company active only in the US to a leading independent power producer with assets across the world, and a business centre for electricity contracts, trading, futures and other financial instruments. What Enron may look like in another fifteen years even Enron probably does not know.

One major change can nevertheless be foreseen with some confidence. As yet most business transactions involving electricity continue to treat it as a commodity, with institutional arrangements to match. Over time, efforts to differentiate companies one from another, to offer customers what they actually want to purchase, and to build customer loyalty, will supersede and invalidate the commodity approach to electricity. An international market not in electricity by the unit but in electricity services will emerge, and with it the institutions it will require.

## **6. Business, electricity and the environment**

So long as electricity is provided by a monopoly franchise system, on the basis of Hobson's choice - take it or leave it - the environmental impact of doing so is equally beyond the influence of the user, as user. To be sure, the user as citizen may help to elect the government that lays down the environmental framework within which the electricity system operates. In some circumstances, the user as activist may be able to influence government electricity policy, notably on the siting of power stations and other facilities, or even government policy on emission controls and other environmental regulations. In the capacity of electricity user, nevertheless, the individual is powerless to affect the environmental performance of a monopoly franchise system. Environmental campaigners have sometimes attempted to refuse payment for electricity generated, say, by nuclear power; but such attempts can always be frustrated by a monopoly system, not least by simple unilateral disconnection of the non-paying objector.

Introducing a business dimension into transactions for provision and purchase of electricity, in which both parties to the deal can withdraw if dissatisfied, opens up a whole new range of opportunities for purchasers to influence providers if they so desire. One obvious focus of such influence is the environmental aspect of the transaction. Even for the most straightforward transaction, provision and purchase of electricity by the unit, a major environmental distinction can be made: how is the electricity for this transaction generated?

On a monopoly franchise system the question is meaningless. All the electricity generated on the system enters the network, and is delivered to all users as anonymous indistinguishable electrons. If, however, the system is restructured to support bilateral transactions between generators and users, a significantly different situation arises. If a user contracts bilaterally with a generator for a given quantity of electricity, the generator must feed into the network the contracted quantity, to match the quantity the user is drawing from the network. The electrons fed in will not be the electrons drawn out, but the difference is immaterial; for system stability, electricity in must match electricity out. Accordingly, the user-purchaser can seek out a generator-seller who will generate the purchased electricity in a certain way - perhaps, and in particular, to satisfy the purchaser's environmental criteria.

In the late 1990s this possibility has become a practical reality on an increasing number of systems in Europe, North America and elsewhere, giving rise to concepts called 'green electricity' and 'green electricity marketing'. In the Netherlands, for instance, electricity users invited to specify that their electricity be generated from renewable sources, and pay a small premium accordingly, have substantially oversubscribed the currently available renewable generation. Similar schemes in the US have also attracted enthusiasm, and efforts are under way in the UK. However, some commentators identify issues that must now be addressed if 'green electricity' is to be more than a public

relations exercise. At the moment the possibility exists that a system can offer purchasers the option to receive 'green electricity', by paying a premium rate, can designate existing renewable capacity for this purpose, and can then deliver the remaining 'brown' electricity from its other generation to the remaining non-premium users. The system makes a windfall gain from the premium rate without having to install any more 'green' generation. Policy analysts are now insisting that any premium rate payment for 'green electricity' should be tied to a commitment to invest in new 'green' capacity accordingly. How such a policy might be enforced in a liberal context remains, however, unclear.

A related problem is that of establishing whether electricity generation qualifies as 'green' - that is, as environmentally acceptable, sustainable or some related criterion. Arguments are already heated as to whether, for instance large hydro, energy-from-waste and indeed nuclear electricity should qualify as 'green'. Whether or not a convenient but tendentious label such as 'green' can become accepted may be immaterial. Some commentators propose that the essential measure is a requirement to disclose the sources of generation to purchasers, perhaps on electricity bills, and to have this disclosure independently certified for accuracy. The label on a tin of soup must list the ingredients; the electricity bill should do likewise, to enable the 'active buyer' to make an informed choice. Such information, even listed as a percentage breakdown of average generation for individual bills, would not be difficult to provide. It could nevertheless become a potent lever for consumer organizations and environmental groups, to apply pressure for more environmentally acceptable generation. That factor alone may make most generators, whose existing units are predominantly coal-fired, nuclear and large hydro, hostile to the idea of labelling electricity. In a liberal context, however, labelling of some kind is almost certainly on its way. Environmental concerns may even help to stimulate the emergence of active buyers of electricity.

The environmental implications of business transactions involving electricity as a commodity are already being debated in detail too rich and subtle to pursue in this overview. But the next stage of the process will be yet more multifarious, as purchasers and providers both come to appreciate the potential for mutually beneficial deals not in electricity by the unit but in electricity services. To be sure, energy service companies, so-called ESCOs, have been around for some years, without ever making much of an impact. With liberalization, however, the concept of an ESCO may come into its own, unhindered by the constraints of dealing with a monopoly franchise electricity system. In particular an ESCO can now offer prospective clients a complete package, integrated and optimized, including not only all the requisite end-use technology and control technology but also the electricity to run it, either as part of a contract involving a generator elsewhere, or as on-site generation or - better still - cogeneration. The package can also of course include operating, maintaining, and upgrading the client's facilities. The numerous companies already providing on-site generation and cogeneration may likewise extend their activities to cover the rest of the site, either as consultants or as full-fledged electricity service management for the entire site.

Integrated packages of this kind will offer entrepreneurial ESCOs a chance to make money out of all the opportunities for improved efficiency that have long been recognized but seldom adequately exploited. Earlier Working Papers have described the potential for local systems, including on-site and local generation and local networks under local control. ESCOs with the appropriate competence and experience will be key players in establishing and running such local systems. Environmental benefits will be an inherent part of the package, a commercially attractive feature to be stressed in contract negotiations with clients, not in isolation but in conjunction with other benefits including control of quality, reliability and cost of electricity services.

Among prospective clients, one category should stand out. Governments should recognize the potentially crucial role of ESCOs to deliver integrated services, not only for government facilities themselves - offices, schools, hospitals, prisons, military installations and so on - but in particular for social housing and other facilities providing for the poor. As Working Paper 1 discussed, governments that recognize an obligation to the poor in a society may try, for instance, to mitigate the costs of fuel and electricity to the poor by paying them some form of benefit intended to help cover fuel and electricity bills. Such a contribution to running expenses does nothing, however, to improve the usually substandard premises where they live, or the substandard energy appliances they have to use. An alternative approach might be to invite ESCOs to compete for tenders to provide not only electricity and gas but also draught-proofing, thermal insulation, efficient lighting and other end-use improvements to social housing for the poor - paid for out of the government budget for social services. The costs of the improvements would be rapidly repaid in reduced bills for electricity and gas. The government funds would thus be spent not merely on continuing running costs, but on investments, to improve living standards for the poor on a more permanent basis.

The topic is complex, and requires further study in depth. But such a policy might achieve two quite separate objectives, both desirable. It might be a way to ensure that the poor are not excluded from the benefits of liberalizing electricity. This is already a genuine and serious concern. Competition fosters 'cherry-picking' of the best customers to the disadvantage of the others, as pilot programmes for both gas and electricity competition have unambiguously demonstrated. Governments that accept a responsibility towards the poor will have to devise policy measures appropriate to the liberal framework they have established. Competitive tenders to provide not just electricity but electricity services to the poor would fit into such a framework. At the same time, active and vigorous government engagement of ESCOs in such programmes would provide a valuable stimulus to the ESCO concept itself, and early opportunities to demonstrate its real potential under attentive scrutiny.

Over time, the true scope of the ESCO concept will ramify, to encompass an ever-wider range of business activities for energy services. Its most impressive potential may prove to be international. For example, international ESCOs may find themselves working with agencies such as the refocused World Bank, no longer on megaprojects but on whole-

system local service packages for those who most need them. With entrepreneurial imagination and initiative, the revitalized ESCO concept may bring business, electricity and environment together for mutual benefit, both local and global.

## **7. Business and electricity futures**

Electricity need not be businesslike. The worldwide spread of monopoly franchise systems, the 'public service' role of 'utilities' under government aegis, demonstrates - if demonstration were needed - that electricity users do not have to be offered business deals. Many, probably the great majority, of electricity users would rather not bother. The hassle factor and transaction costs are bad enough, without being told that the government no longer can and no longer wants to guarantee to keep the lights on. The fact remains, nevertheless, that the longer-term implications of changes already well under way in electricity systems in many parts of the world are shrinking the role of government and expanding the role of business in electricity.

Business is still getting used to the idea. Most of the changes that have occurred to date, the early stages of liberalization, have merely laid a thin veneer of business practice and business attitudes over relations with users still largely shaped by the monopoly franchise, central control, abundant redundancy, arbitrary revenue flows and implicit rather than explicit decision-making. Allusions to traditional electricity as a 'low-risk' activity are misleading. They have, however, been low-risk for most of those with large sums at stake. The risks have been carried, instead, by very large numbers of electricity users and taxpayers. None have necessarily lost substantial sums, even in the most egregious cases of failure, because the risk has been so widely spread; but those carrying the risk have done so willy-nilly, with no opportunity to demur. In the emerging business context, this lop-sided and unilateral assignment of risk will gradually give way to explicit acceptance of risk, in return for commensurate reward. As governments draw back from active involvement in electricity, taxpayers will fade out of the picture. The risk they have previously borne will fall on others. Users who become active buyers of electricity and electricity services will no longer be implicit bearers of unspecified and open-ended risk. They or their agents will know what risk they bear, and who bears the rest.

The implications for investment, choice of technology, financial arrangements and other decision-making have been ventilated in earlier Working Papers. The new business dimension of electricity will make the relevant criteria for such decisions, including risk and who bears it, much clearer and more explicit. Redistribution of risk in a business context will reinforce the changes of technical configuration already discussed in earlier Working Papers, towards more and smaller units, under an increasing measure of local control. Some of the business entities involved may be very large, possibly multinational companies; but they will have to keep their customers happy to keep their business. Active buyers will want to buy not only quality and reliability of services but also control of these services and how they are provided. New types of electricity commerce

become possible, on a reciprocal business basis with recourse to commercial law if contracts are not fulfilled.

Governments themselves, as noted earlier, could become major and influential participants in such commerce. In transition and emerging countries, too, if electricity systems are liberalized, such business deals could provide more rapid access to electricity services for more people than through the traditional centralized bureaucracies, especially if international funding agencies recognize and support the possibility. Establishing integrated local systems, bypassing the centralized bureaucracy, might even facilitate technology transfer on a basis acceptable to those holding the intellectual property rights. Political resistance from the centre will undoubtedly present a stubborn obstacle; but comparatively inconspicuous small-scale activities are already succeeding in places where larger-scale activities attract political interference.

Electricity does not have to be businesslike. But it can be businesslike. Over time, as electricity becomes more and more like a normal business, in more and more places around the world, it will have to face challenges it has not confronted since the days of Edison. But it will also find opportunities that would have made Edison's eyes light up.

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