The Electric Power Industry Structure And Integrated Resource Planning

Aviel Verbruggen, University of Antwerp - STEM

ABSTRACT

The paper discusses a normative model for the European electricity industry. A sustainable use and generation of electricity is our goal. Cost economies in organizing the major functions of a power system, i.e. generation, transmission and distribution, are the constraints. The main characteristics of the normative model are as follows

- the power industry structure is opened up for competition in generation. Competition is maximized by competitive bidding procedures in licensing plant construction and in committing units for energy deliveries
- the distribution utilities are preferably public companies with a multi-scope working area and regulated for service companies
- complete unbundling of the three major functions of power supply, i.e. generation, transmission and distribution is necessary
- a central role is assigned to the single pool operator, owning and governing the transmission grid, ordering or accepting generation capacities and selling power at the large load centers
- there is no free TPA (Third Party Access). Generators can only sell to the pool and customers can only buy at the pool. The system is levelized so that only large generators and customers deal with the pool directly. The other ones deal with the distribution utilities
- here is one common tariff structure for large customers (industries and distribution utilities alike) based on the short-run marginal costs of power supply
- a distinction is made between generation companies and Independent Generators of Own Power (IGOPs). The latter are recognized to have a special position as both suppliers and consumers of grid power
- the proposed system can only function with a regulating office at the European level supervising the pool, and with national or regional offices supervising the distribution companies.

The performances of the normative structure and of the vertically integrated structure are assessed with a set of five criteria, i.e. sustainability, economic efficiency, regulatory efficiency, institutional feasibility and equity. We conclude that the open structure is more promising for realizing Integrated Resource Planning (IRP), when the latter focuses more on Resources than Planning.

1. A CRUCIAL ROLE FOR LOCAL UTILITIES

To extend the implementation of energy conservation to its technico-economic limits, and to develop renewable energy resources to the fullest, a local approach of energy issues is required[1].

- Renewables are decentralized energy sources

The future of renewable energy lays in its decentralized applications. Buildings have to be faced to the sun, roofs and walls should carry solar collectors for heat and for power supply, micro-hydro sources should be tapped, and biomass residus converted into usefull energy, etc. Understanding local conditions and exploiting local opportunities are important when implementing renewable technologies.

- Energy is to be saved by the numerous people that use it

Energy is used by numerous people on numerous occasions for numerous purposes. It is the individual microeconomic decision-maker that decides on energy use and thus also on energy conservation. To reach lower levels of energy use one will have to increase energy taxes (the marginal rate of tariffs). To reach the lowest levels of energy use one has to levy the barriers, and to offset social disparities resulting from very high energy taxes. One of the major barriers is the lack of or bias in information about energy technologies with the end-users. This barrier cannot but lifted by addressing the individual decision-makers with the right information at the right time. This asks for a very decentralized and extended information system. Remedying social problems caused by high energy taxes, is best done by direct technological support, i.e. someone should invest in energy efficiency for the poor.

- A meshed and grounded organisation is needed

From a policy point-of-view, influencing energy use requires one to address numerous decision-makers, and this in turn requires a very meshed organisational network, highly To extend the implementation of energy conservation to its technico-economic limits, and to develop renewable energy qualified and thus disposing of ample means. Are this type of organisations available in the energy world? Presumably the ideal is nowhere there, but the energy distribution utilities at least meet some of our criteria: they have a meshed network of structures and people reaching every least and last decision-maker, they have resources, capital, know-how, etc..., in other words they have the means to influence the decision making processes of numerous people. And so they did in the past, being it often in the wrong direction by stimulating energy consumption rather than conservation.

- Are conflicting organisations a solution ?

Are there other candidates for our meshed energy network? We do not know of any. So if we are not satisfied with our local utility, we can think of starting a government sponsored energy network for the promotion of energy conservation. In the aftermath of 1973/1979, some nations have devoted resources to this type of solution. These resources were wasted when no modus vivendi could be found with the energy utilities as was the case in nations with a dominant vertically integrated power structure (Belgium, France, UK). In other nations (Germany, the Netherlands, Sweden) the governmental initiatives sometimes stimulated the utilities to consider new roles and new goals. When the newly created energy network comes in conflict with the vested utilities, its actions will be little effective, nor efficient. Consumers will be approached with contradictory messages and the majority will soon give up any effort to conserve energy. To overrule the utilities with a competitive organisation, one needs a lot of resources, and one can doubt this being a good outlet for taxpayers' money.

- The energy distribution utilities must do it2

We consider the only suitable way to establish and to strenghten the meshed network for supporting energy conservation with the end-users, to lay in the recovery and retraining of the existing distribution utilities towards energy servicing and conservation utilities. In some countries this will be a challinging task, because the very same utilities are now promoting energy consumption and de facto obstructing the road to energy conservation. This however emphasizes the necessity and urgency of the task, because the turn-over of this type of utilities is a real Pauline victory.

Tax receipts provide the financial backing for a new energy policy

Another responsibility of the local utilities will be the recycling of the massive money flows of the energy tax payments back to the citizens and enterprises. The expenses for the promotion of energy efficient technologies and of renewables should be paid out of the energy tax receipts, and the local utilities will play a crucial role in the effective and efficient allocation of these financial resources in the transition period.

Having defined the task to undertake, we now have to find out how to do it. Of course no overall recipe can be offered because local circumstances play a major role in the turn-over process, but we will try to discuss some major necessary conditions in the next chapters.

2. CRITERIA MEASURING PERFORMANCE

For the traditional power planner the goal of the electricity system is to provide high quality power at the lowest price for the consumer. In a wider societal context this would be extended to providing energy services at the least social cost. In order to monitor the realisation of the goals assigned to a power system, one best can call upon a series of criteria to measure performance. We propose five criteria: sustainability, economic efficiency, regulatory efficiency, institutional feasibility and equity. This selection and also the inter pretation of the meaning of the five criteria is open for discussion, but the core elements suggested are given next in a brief overview.

2.1. Sustainability

- The conservation of energy and other natural resources (e.g. materials, space) should be stimulated continuo usly beyond the levels reached at a given moment and place

- The implementation of renewables should receive priority, whenever their overall resource balance is more favourable than the one of traditional solutions

- The use of energy sources with negative environmental and/or security impacts should be reduced. The phase-out should proceed along the weight of these impacts with emphasis on irreversible, long-term and global effects
- The vulnerability of the electricity supply infrastructure should be as low as possible

2.2. Economic efficiency

- Use of electricity for its suitable applications and in harmony with other energy solutions (e.g. natural gas for heating, renewables for heat and light)
- Steering electricity demand by efficient pricing, i.e. short-run marginal cost prices including social costs and incentive taxes.
- Electricity supply at lowest cost (construction of new plants, operation of available capacity in optimal merit order by optimizing unit commitment and maintenance scheduling, minimization of transport and distribution costs, minimization of bureaucratic slack, ...)

2.3. Regulatory efficiency

- Minimize the amount of information (and thus people and budgets) necessary to supervise the power sector
- Create self-sustainable and self-enforcing incentive mechanisms (i.e. behaviour that the regulator considers necessary should avoid conflict with economic interests of the regulated parties)
- Regulations must be auditable and enforceable at low cost

2.4. Institutional feasibility

- The departure from present structures and habits should be as low as possible, and take place in a gradual way (e.g.
  in most European nations market-oriented thinking and practices are less spread than in the U.S.A.)
- None or a minimum of new organisations should be created
- Electricity policy-making should be embedded in the overall energy policy process

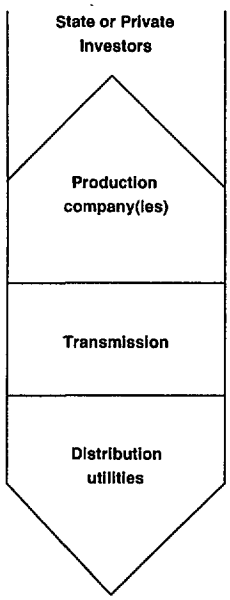
2.5. Equity

- Monopoly profits should not be feasible
- Cross-subsidies among electricity consumers should be avoided. Many people consider the application of uniform tariffs as an equitable solution. We argue the opposite : equity means that the party that causes particular costs also is fully charged for these costs. Therefore, one should ban all types of cross-subsidies between and within consumer groups. In particular, the price-discrimination inherent in uniform tariff structures should be reduced by applying to the fullest marginal cost based tariffs.
- Pricing (taxing) of energy should also look after a more equal distribution of incomes, and especially take care f the poor. This consideration may be in contradiction to the former one emphasizing marginal cost pricing. owever,in practice small-scale customers will be billed through rather simple tariff structures that cannot fully eflectmarginal costs. When tariffs are deviating from the marginal costs, equity considerations can be brought in.

3. THE OLD REFERENCE STRUCTURE: VERTICAL INTEGRATION

In the power business there has long been the belief, still defended vigourously by many, that the vertically integrated power system (see figure 1) is the most optimal structure to supply power in an efficient way. In the vertical structure the monopsony of the wholesale market is incorporated within one company; the monopoly in the retail market was considered to be checked by rate-of-return and tariff regulation; the growth of Independent Generators of Own Power (IGOPs) was drown by several factors at once (e.g. technological improve ments in large scale generation technologies, free access to large fossil fuel and nuclear resources, a hostile regulatory environment for decentralized producers, ...).

Figuur 1 : Vertical Integration in the power sector



The vertically integrated industry structure has grown historically in most industrialized nations. The dominant position within the vertical column was claimed by the generation-top, assigning a followers-role to the distribution activities (cfr. the old adagio that the marketing department must sell what the production plants can generate). The interest of the power companies in distribution has been the most secure way for controlling the demand side of the electricity markets (e.g. helping to absorb overcapacities in the fast growing generation systems); it has been the basis of a wide-spread support by local politicians, and it has made the monopoly powers more acceptable for the general public. This control over the distribution sector is now considered by some as a necessary condition for Least Cost Planning3. The vested vertically integrated power companies of course favour this point-of-view, stating that controling the demand side is a requirement for equipment planning especially of large-scale (nuclear) plants. We think that this point-of-view is focusing too much on the planning aspect of Least Cost Planning, and forgets that long-term sustainability needs a very decentralized (renewable) power basis. Evaluating the vertical s cture against our five criteria (chapter 2), may shed more light on the issue at hand.

Sustainability is not promoted by the old reference system. It has been the vehicle and still is the promotor of large-scale production with a devastating impact on nature and the environment (large dams, nuclear fuel cycle, risks, proliferation, coal mining and burning, off-shore oil and gas exploitation and transports, etc...). Rolling-off the considerable negative externalities on the environment and on the future was common practice, and the costs of this practice were not accounted for. Large-scale solutions are twin with growth in consumption, necessary to acquire the economies of scale. Proliferation of nuclear know-how, technologies and capabilities to manufacture weapons, affects global security in a long-term and irreversible way4 5. Centralized systems are prone to call on nuclear power.

Economic efficiency is advocated as the major trump of the vertical model. This allegation is based on the amazing gains in efficiency by integrating generation plants into a centrally dispatched network, also allowing the construction of larger plants in a period of increasing economies of scale. The advantages of central dispatch in an interconnected network should be preserved and even extended in future power systems by introducing a system of central coordination. In the vertical structures, there have been also major inefficiencies, e.g. the systematic expansion of power systems into chronous overcapacity, the suppression of small scale alternative sources such as renewables and independent combined heat and power, the foregone economies of scope in local distribution, the neglect of electricity end-use efficiency opportunities, etc... . As D. Tenenbaum, head of the Federal Energy Regulatory Commission (FERC) of the U.S.A., summarizes : "The traditionally vertically integrated structure (...) has the worst incentives for efficiency. This is because (it) provides no competition and is usually accompanied by some form of cost of service regulation"6. Also industrial companies emphasize the necessity of competition to check efficiency7.

Regulatory efficiency has been the subject of a vast debate, reflected in numerous publications. There has been pointed to inefficiencies caused by the applied rate-of-return rule, e.g. incentives to invest in capital-intensive equipment (Averch- Johnson effect), suboptimal tariffs, discriminatory pricing, losses in X-efficiency, ... The 'capture' theory states that regulatory commissions can switch into a tool in the hands of the regulated party to avoid firm control. The old assumption that state-owned companies should not be regulated because they are owned by the state and therefore their formal mission is the general welfare of citizens, has lost all credibility. Public utilities that are not supervised with market conform incentive and control mechanisms can (will) deteriorate into very inefficient organisations. The vertical structure is difficult to regulate for several reasons. Mostly one has to do with very powerful structures, related through many channels with officials at all levels. Also the borders between the three major functions of the system are long (see figure 1), and a long border is difficult to control for transfers. Regulation becomes really a bravura when the vertical structure should pursue conflicting goals (e.g. electricity supply and electricity conservation). It will require a highly competent, independent, well-equiped and large staff of regulators to clear this job. This kind of regulation exists in some states of the U.S.A., but is not wide-spread in Europe (Holmes A., Electricity in Europe, Financial Times Business Information, 1988). Therefore attempts to introduce competition in generation in a vertically integrated structure have failed (e.g. U.K. 19838), if not guided by extremely complex

and continuing buyer regulation (e.g. USA since 1978). This is mainly due to a lack of transparancy at all levels, making it very difficult to control the real conditions of access to the grid. Even under advanced competitive procurement in a vertically integrated structure (e.g. the regulatory approach of the Massachussets regulatory agency) the power companies have no direct economic incentive to purchase from a non-affiliated supplier since they earn no profit on the purchase (Tenenbaum et.al., 1992, p. 1150).

Institutional feasibility of the vertical model poses little problems because it is the dominant model of today. However one sees a growing opposition against the vertical monopolies by industrial customers operating in a competitive environment, by supra-national authorities (Commission of the European Community), by liberal economists, politicians and citizens, by environmental and consumer groups, ...

Equity has received much less attention than efficiency in the discussion on the sector regulation9. The aspect of cross- subsidization has been studied (also from an efficiency point- of-view with the Ramsey-Boiteux pricing rules), but the direction of cross-subsidies has been either unclear or different from nation to nation depending on national policies. Uniform pricing within consumer classes is accustomed in most systems. Special tariffs for the poor and elderly (mostly considered to be small consumers) are established, but initiatives to help them save electricity are rather exceptional. The profits and benefits of the monopoly statute are mostly divided among the power system itself and public interests (officials, local or state treasury). The employees of the power companies have been criticized because of privileged statutes and payment.

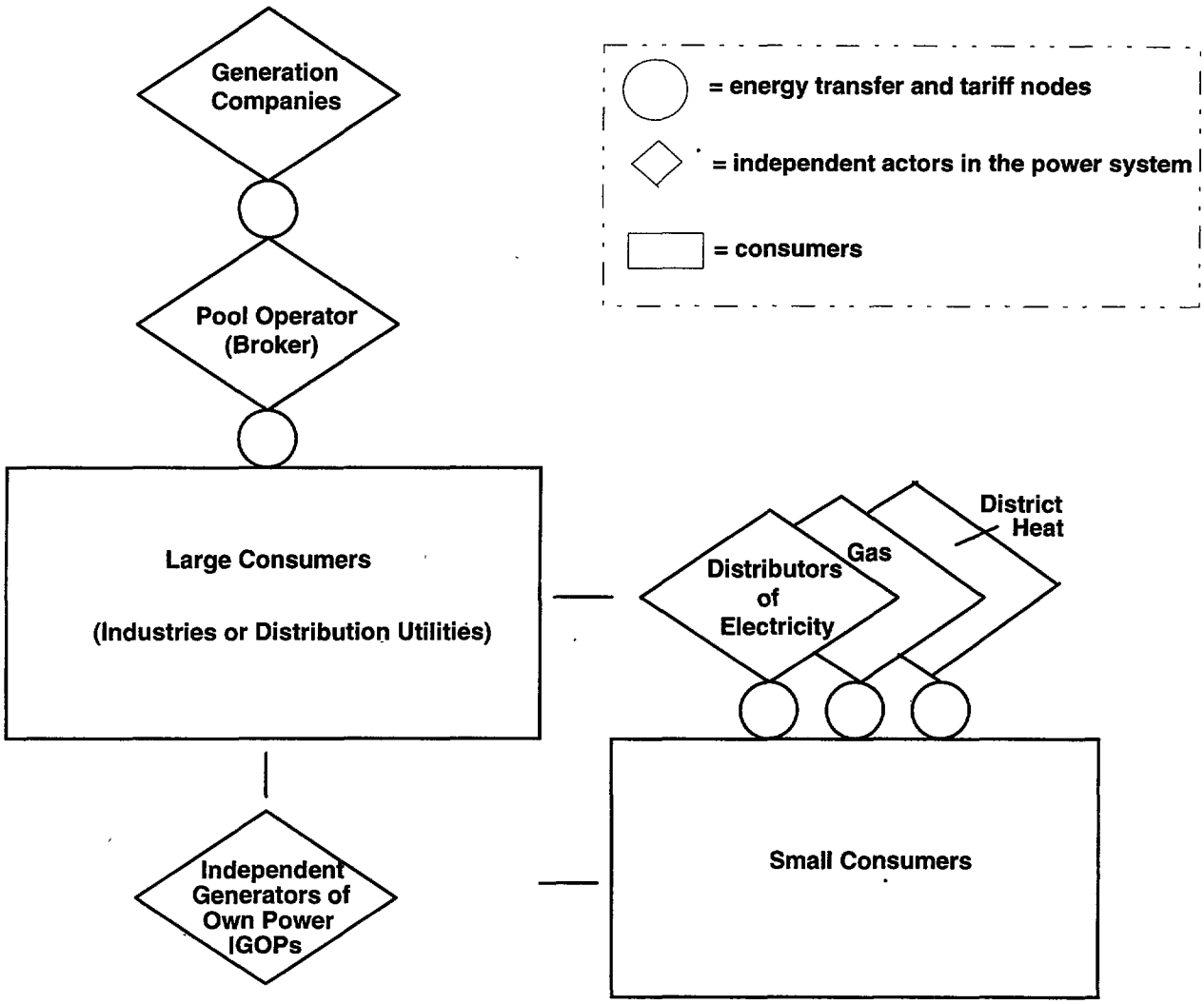
4. AN OPEN STRUCTURE FOR THE ELECTRICITY INDUSTRY

The debate about another, more open and more competitive structure for the electricity industry is ongoing. Three major and interrelated developments are influencing the progress and will determine the turn-out of this debate: deregulation, technological evolution and environmental constraints. All three are subject to great uncertainty. The deregulation process even can be stopped with a return to bureaucratic control. Technological evolution can be directed more to the development of sustainable solutions, or it may involve further environmental decay when the systems go for more energy intensive futures. Preserving nature and environment will continue to ask for more attention and economic resources. Continuing pressure to deregulate, the new technologies (esp. efficient end-use technologies, telecommunication, microelectronics) and the environmental arguments in favour of energy conservation and renewables, make the changing of the power industry inevitable. Reforming and restructuring the vertical model is possible and desirable.

4.1. Blueprint for an open structure

An open structure for the electric industry is shown in figure 2.

Figure 2 : Open structure for the electricity sector



At the top, one has the generation companies, working in a competitive environment and not related by ownership nor management control to the remainder of the sector. Labelling the generation companies as independent or as foreign, makes no longer sense given the equal access to the generation market by any entrepreneur. Generation companies build and operate power plants, and deliver the output to the interconnected grid (as they do today). Entering the power market requires to be successful in two bidding processes: the first (e.g. quarterly) one to get the right to build a particular plant, the second (e.g. hourly) one to get the right to deliver power to the grid. Both biddings are organized by the pool operator, because he has to look after the optimal composition and the optimal operation of the European power system. There is no valid argument why the pool contracts should be limited to spot transactions. Like in one of the most competitive markets of the world (oceanborne crude oil shipment), it can be expected that the market stratifies from spot to long-term (e.g. 20 year) arrangements. The second rhomb in figure 2 represents the pool operator, occupying the central role in the integrated functioning of the power system (see the UK system). The pool operator owns and controls the high-voltage network, and thus the wholesale market for power (being a European market). The pool should also be allowed to own and operate non-spinning peak capacities (e.g. turbojets) and (pumped) storage plants, eventually ceiled in total capacity. The pool operator dispat ches the production of electricity (merit-order operation, unit commitment, and maintenance scheduling) and ships bulk power over the grid.

Panel 1

The role of the pool operator can best be compared with the role of the broker in other wholesale markets. The broker buys power at the generation companies at marginal generation cost (being the profit maximizing equilibrium of competitive producers). The high voltage grid delivers electricity only to large consumers. This can be large industries or distribution utilities. The transfer of power and energy is priced for all large consumers at the same tariff, and prices reflect truely the marginal cost of the kWh delivered. We strongly support the idea of an instantaneous measurement and billing of power flows between the interconnected grid and the premises of large customers, being industries or distribution utilities. Instantaneous power supply is priced economically right when short-run marginal costs are charged. This pricing practice will generate sufficient cash-flow for the suppliers to cover all costs including investment (Boiteux, 1949). Of course it is also feasible to work out a broader range of contracting terms taking into account more explicitly the aspects of place (type of connection) and of reliability (interruptible loads). Still we emphasize that the tariff contracts should be coined as posted standard offers that can be underwritten by large customers. In figure 2 the distributors of electricity are represented by the overlapping rhombs at the right side, suggesting their multiscope structure for at least all energy types charac terized by a natural monopoly. The distributors are considered as utilities supplying energy services to the end-users in their franchised areas. They are responsible for energy conservation, the development of local and renewable energy resources, Least Cost Planning for the area. They are regulated utilities with incentives to gain profits the more conventional energy is conserved or replaced by renewables. The local utilities should organise bidding processes for Negawatts (savings of electricity). This would guarantee a fair treatment for the cheapest solutions to provide electricity services. A real "open bidding" will be easier to organise in an open than in a vertically integrated structure. In the longer term, the competition should not be between different distribution companies, but between distribution companies and energy service companies. Some utilities start to realize that the question is not whether they shall sell energy saving devices to their customers, but who shall do it10. The fourth rhomb in figure 2 shows the IGOPs, that may be either large or small consumers of electricity. The difference between an IGOP and a generation company is that the former has installed production capacity to serve own needs and not to deliver to the grid. The output of IGOPs is best understood as a reduction in demand to the integrated system. Grid connection is however necessary for supplementary and back-up power, and for trading excess production to the grid. Depending on their scale IGOPs will be connected to the transport or to the distribution grid. There need to be a separate regulation and tariff setting for this type of producers/consumers of electricity. On the one hand one should stimulate IGOPs firmly because they are the carriers of a decentralized power system. On the other hand one must avoid an unjustified use of the IGOP statute. There are at least two ways in which this statute can be abused. First, generating companies can try to escape from full competition by fellow generators by hiding as an IGOP supplier. Therefore large-scale IGOPs connected to the transmission grid should deal directly with the pool operator. Secondly, IGOPs may be favoured too far by distribution utilities with ambitions to control a large generation capacity. This will occur mostly when joint-ventures or other types of partnership between IGOPs and distribution utilities are allowed. With the rhombs, figure 2 wants to tell that the four blocks of the power system are four independent activities, owned and operated by different organisations. The coordination among the activities is based mainly on price signals. Regulation comes in by controling on the spot the pool operator, by setting transfer tariffs between the rhombs and by monitoring the performance of the distribution utilities (especially with respect to demand side management, energy conservation and development of renewables). In the proposed system, TPA plays a minor role: generators must be guaranteed free entry in the market (when room is there), all large consumers (industries and distributors alike) would face comparable conditions all over Europe for getting power in their plugs. Small consumers would be the principals of their distribution utility, functioning as a regulated agent. In the following discussion about the expected performance of the open structure for the five criteria, we will explain its functioning more in detail.

4.2. Expected performance of the open structure

Sustainability is not guaranteed for free in neither structure, and also not in the open one. Sustainability is promoted by two characteristics of the open structure. First, the conflict in interest between production growth and between energy conservation is no longer pursued by one organisation. Second, demand management is the mission of local utilities, being in touch with end-users and local circumstances, both necessary for developing local (renewable) resources and for trading-off various energy sources. Transforming distribution companies from the local sales departments of vertically integrated power systems, towards local utilities regulated for a new mission, will lift a lot of barriers to energy conservation and to renewable energy. Barriers will become vehicles for change. This we call the Pauline victory that should be realized in power systems. The open structure provides fair opportunities to efficient technologies for decentral generation and for end-use, both lowering the dependence on the central system. Nuclear technologies as they are today, are unlikely to flourish in the open structure, when they have to compete with market-tested solutions, and when subsidies are abrogated.

Economic efficiency in the open structure will certainly be higher than in the vertical monopolies. Competition in generation is coupled with the merits of planning for an optimally composed generation system, while the merits of

the present optimal dispatching are conserved. This is realised by the double bidding process: first to build and become a member of the pool, second to operate on the basis of its marginal cost. The pricing of power supplied by the producers to the grid and of power supplied by the grid to large consumers, is based on the marginal costs of power generation and transport. This way of pricing is the best one in attaining economic efficiency, as the former president of EDF, M. Boiteux has shown in his masterpieces on tariffs for electricity11. A ceiling is put on the chronous over-expansion of power systems when peak demand is charged the full cost. The local utilities for energy servicing must integrate the economies of scope and of the development of local resources and energy savings. They should be regulated in an efficient way, and in many countries with a poor tradition in local authority, it will prove necessary to support the local utilities by national agencies. The local utilities need to be regulated for efficiency, but we believe this being a more accessible task, because of the separation from other activities in the power sector, because of the clear and non- conflicting new mission, and because of the direct control by their constituent end-users. The latter factor must be improved significantly compared to present practices. Consumer councils, procedures to file complaints and get payment for quality shortfalls, etc.. should be a continuous check on the utilities' performance. In our proposition the small consumers do not get the opportunity to shop around for another supplier because we think this would increase transaction costs significantly without improved efficiency gains. Quality performance control by regulators and consumers alike open brighter perspectives for keeping the X-efficiency of local activities in line. The stimulation of the IGOPs by a fair regulatory regime and by fair tariffs, will guarantee a spawning of activities in local electricity generation, including renewables. In addition, the energy tax instrument will promote high levels of energy conservation, opening the way to renewables. The local utility must support conservation efforts with information, investment credits, third party financing, etc... When local utilities are publicly owned, they should be organised as a limited company, allowing to apply flexible and efficient procedures as any other private company.

Regulatory efficiency in the open structure is expected to score higher than in the vertical structure. We see the need for a two-level regulatory authority. The top level works at the European scale, supported by offices in every member state. This level has to regulate the working of the pool. The second level of regulation is at the local level, with support from the national offices. This level regulates the local utilities. The expectation of high regulatory efficiency is based upon the unbundling of the various power functions, reducing the borders between the functions to a limited number of gates that are more easy to control. Generation will be organised as a competitive bidding activity, an area that is well under regulatory control and well understood by private enterprise. Collusion at producers' side can be avoided by high penalties when uncovered. The widening of the market to the European scale offers even more hedging against opportunistic behaviour. Regulating the pool operator is the most central task for the European regulator, encompassing several aspects. Above was mentioned the regulation of the bidding processes for generation. Next the dispatching function (merit-order loading, unit commitment and maintenance scheduling) should be verified. The investments in the grid and quick start and storage capacities must be monitored too. Finally tariffs for power purchased and power sold by the pool must be set based on the marginal costs of generation and transport. One should aim at an incentive based regulation, comparable to the way earnings are paid to brokers in commodity markets. The pool operator's profits should increase with the number of kWh he can ship, be inversely related to the price of the traded power (or preferably to the sales volume), while quality and reliability measures should adjust his profits to his technical performance at any moment of time. Regulating local utilities should also be based on incentive regulation promoting the conservation of energy. It will be necessary to develop reliable energy-intensity indicators as yardsticks for measuring performance. Presumably one will need also some kind of conduct regulation, being difficult and costly. A lot of advantage may be expected from the procedures that give power to the end-users in filing claims and in getting payment for shortcomings by the utilities. Local utilities will be given the franchise of their service area; they will be obliged to serve all end-users (except the large ones).

InsItitutional feasibility of the open structure remains a big question mark, because it will not be welcomed by the vertically integrated power companies in Europe, neither by the free marketeers because it does not entail TPA. However, the structure strives for the maximum economic efficiency and regulatory effectivity and efficiency, with the outlook on the path to a sustainable energy future. It also takes into account the concerns of many interest groups12 , and it heavily underpins the integration of the European market. The structures needed to make it operational are at armslength available (e.g. the UCPTE is the embryo of the pool operator; a European regulatory office has to be set up with national regulatory commissions such as OFFER (U.K.) being its national offices). The major obstacles for the open structure are the weak local authorities in many member states and the strongly organised power of the vested vertically integrated power companies.

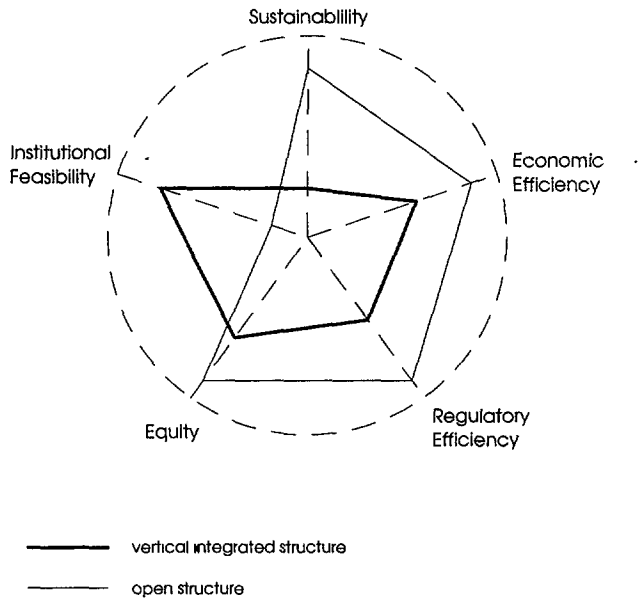
Equity is but partly realized when structuring economic activities for sustainability and efficiency. Because of the transparent structure of the open sytem, cross-subsidies between the various customer groups becomes impossible. Bulk power supplies by the grid will be priced at standardized tariffs for all large consumers, being it industries or distribution companies. Within the service area of local utilities one may expect the application of uniform tariffs,

entailing implicitly cross-subsidies among the consumers. One should strive for cost based tariffs anyhow, and carry out its social policy through other means, e.g. direct investment in energy conservation for the poor. When tariffs are changed to stimulate energy savings (e.g. by making the rates progressive), this will not necessarily have negative income distribution effects. In the open structure, monopoly profits become much more unlikely than they are today.

5. CONCLUSION

A comparison between the performance of the vertical and of the open structures, is shown in figure 3, with the pentagone as a tool, used frequently in multicriteria analysis. Our arguments in 3 above result in a better score for the open structure on four of the five criteria: sustainability, economic efficiency, regulatory efficiency and equity. As expected it falls behind the vertical structure regarding institutional feasibility. Overall the open structure covers a larger area of the pentagone than the vertical structure, even without weighing differently the five criteria (e.g. sustainability may be assigned far more weight than institutional feasibility).

Figure 3 : Performance of the vertically integrated and the open structure for the five criteria



The open structure will support Least Cost Planning in a more consistent way than the vertical structure with its ambivalent and conflicting goals will do. The local utilities play a central role in the transition to a sustainable energy system. They only can play this role when not governed by the interests of large-scale production companies, but directed by effective and efficient regulation (e.g. profits of the local utilities should be related to the success of Demand Side Management and of energy conservation campaigns). It is a deep rooted misunderstanding to prefer vertically integrated monopolies for realizing Least Cost Planning when one wants Least Cost Planning pending towards a sustainable energy future. It is much better to create transparent structures, where every party can play its natural role and pursue its natural objectives. Clear and slim regulatory authorities must conceive the mechanisms for correlating the natural objectives of every part (being generally selfish goals), with the progress in social welfare. They will be far more successful in an open structure than in the house of many rooms of our vested power monopolies.

REFERENCES

1LEONHARDT W., KLOPFLEISCH R., JOCHUM G., "Kommunales Energie- Handbuch", Verlag C.F. M•ller, Karlsruhe, 1991. See also e.g. H. GRASSL (Max- Planck-Institut f•r Meteorologie Hamburg) "Warum eine "kologische kommunale Energiepolitik ? Aktuelle wissenschaftliche Hintergrundinformationen", in 'Neue Wege in eine "kologische kommunale Energiepolitik', Schonau, 1992. 2See e.g. PRAUL C., "Energy Service Corporations : Opportunities for California Utilities", California Energy Commission, Sacramento, December 1980. 3See e.g. Association for the Conservation of Energy (ACE), "Least-Cost Planning in the European Community", prepared for the Commission of European Communities, DG for Energy, London, 1991. 4Nuclear Energy Policy Study Group, "Nuclear power Issues and Choices", Ballinger Publ. Cy , 1977. 5GOLDEMBERG J., JOHANSSON T.B., REDDY A.K.N., WILLIAMS R.H., "Energy for a Sustainable World", Wiley Eastern Ltd, 1988. 6TENENBAUM D., LOCK R. and BARKER J., "Electricity privatization : structural, competitive and regulatory options", Energy Policy, 20.12, p. 1134-1160, 1992. 7"We would like to believe that every power supplier today is most efficient throughout the whole spectrum of this operations, each in his particular market place, but we also believe that the real yardstick for this efficiency is the ability to compete with others in the same market place". (DECLERCQ D.,"View on the European Power Market by Large Customers"), Powergen Europe 1993, May 25-27, Paris, France. 8HAMMOND E.M., HELM D.R. and THOMSON D.J., "Competition in electricity supply: has the Energy Act failed ?", Fiscal Studies, Vol. 7, Nø. 1, 1986. 9MOSCA Laura, "BEUC's opinion on the Commission's proposed Directives concerning the Internal Market in electricity and natural gas", POWERGEN-Europe, Paris, May 1993. 10E.g. LOVINS A., "Four revolutions in electric efficiency". Adress at the Western Economic Association International 64th Annual Conference, Lake Tahoe, Nev., 1989. In Contemparory Policy Issues, Vol. VIII, Nø. 3, July 1990. 11BOITEUX M., "La tarification des demandes en point : application de la th,orie de la vente au co–t margınal", Revue g,n,ral de l',lectricit,, august 1949. 12Powergen Europe 1993, May 25-27, Paris, France, "Changes in the European Power Industry" (European Institutional Framework) with contributions by - Mr.Lionel Taccoen, EDF - dr. Daniel Declercq, IFIEC and Air Products NV - Ms. L. Mosca, BEUC - Ms. Penny Boys, OFFER