



BACKGROUND FILE

Energy Regimes and Natural Gas Supply

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In Western Europe today, the position of natural gas as an energy source depends greatly on more than just the factor of availability. Due to limited supplies and imperfect markets, and in spite of favourable conditions in Western Europe for the distribution and use of natural gas, in 1987 it accounted for only 16 per cent—less than one fifth—of primary energy consumption. This is a rather small share, especially if compared with that of the United States (23 per cent) and that of the Soviet Union (36 per cent). Of the three, the United States is by far the largest energy consumer (1849 million tons of oil equivalent, mtoe), followed by the Soviet Union (1444 mtoe) and Western Europe (1296 mtoe), and of the three, the Soviet Union is no doubt the largest producer of natural gas, with an output of 653 mtoe—almost half the amount of total consumption—whereas the output of the United States is 415 mtoe, and that of Western Europe, 161 mtoe. Indeed, although Europe is endowed with a high density of population and a strong concentration of industry in these urban areas—which should encourage its use of natural gas as a primary energy source—the ratio of natural gas output to consumption in 1987 was only 77.8 per cent for Europe, as compared to 96.1 per cent for the United States, and to 125.6 per cent for the Soviet Union.¹

With these figures in mind, several questions can be posed as to the lot of Western Europe as far as the matters of natural gas supply and energy policy are concerned. What factors, political and economic, contribute to the relatively low popularity of natural gas in Western Europe, and what possibilities does the future hold for the supply of natural gas to Europe? After 1992, and in light of the limited domestic gas supply to Europe, from what policy options will the European Community be able to choose?

Economic factors, namely high transportation costs, impede the competitiveness of imported natural gas to Western Europe. But political factors also play an important role, in particular, limitations on gas imports due to concerns over excessive dependency upon gas suppliers outside Western Europe. At least historically, the supply base has been more of a determining factor for the share of natural gas in the energy market than the conditions for transportation and distribution. Against this particular background then, the future role of natural gas in a unified Western Europe and the policy options open to the EEC after 1992 will depend upon the development of demand, the domestic supply base, the availability, competitiveness and acceptability of imported gas, and the conditions for transporting and distributing natural gas.

Monopoly

On all these issues there are likely to be important changes during the next decade. Environmental concerns and constraints on other forms of energy, especially coal, could open new markets for gas, but the domestic supply base is shrinking and the cost and acceptability of additional foreign gas supplies remain open questions. It is also an open question as to what extent and eventually in which direction the conditions for transporting and distributing natural gas in Western Europe will change.

The present West European gas market is highly imperfect, with strong monopolies in gas transportation. In most cases there are no alternative transportation routes, giving the transportation monopolies the discretionary power to set tariffs at will. Not surprisingly, this discretionary power is usually employed to enhance gas transportation profits, but also to make natural gas less competitive in relation to other fuels than might have been the case under a different transportation regime. Salient examples of such transportation monopolies are Ruhrgas of West Germany, Gaz de France, Agip of Italy and British Gas (although since privatisation, British Gas is no longer entirely free to set its transportation tariffs).

Transportation monopolies represent a particular impediment to international gas trade, where gas has to transit through third countries between the seller and the buyer. With a shrinking domestic supply base and the increasing need for imports from outside Western Europe, the gas transportation regime becomes a more critical factor in the development of the West European energy market.

Historically, the West European gas market has been largely driven by the availability of supplies at a competitive price. In the 1950's, national markets were developed for gas in Austria, France, Italy and West Germany. In the 1960's, the continental markets were opened up for Dutch gas and the UK market for North Sea gas. In the 1970's, gas was for the first time contracted from more distant sources: Algeria, Norway and the Soviet Union.

Natural gas does not have any captive market, unlike oil in the transportation sector, with demand that is little price-elastic in the short run. Today, the residential and commercial sector represents about one half of West European gas demand. Here, there is in most cases direct competition against electricity and to some extent fuel oil. About 30 per cent of the market is in the industrial sector, with direct competition against coal and fuel oil. Finally, about 13 per cent of the market today is in electricity generation, with direct competition against coal, fuel oil and nuclear power, as well as hydro-electricity where it is available.

Cautious optimism

Overall competition means that gas demand generally is fairly price elastic, and in any case much more price elastic than is the case for oil demand in the transportation sector. Hence gas demand is in general fairly sensitive to relative prices, but also to eventual setbacks or restrictions concerning competing energy sources.

Influential in the residential and commercial sectors are variables such as income levels, housing standards, temperature control habits and the growth of the service sector, as well as the competition from electricity and fuel oil. Similarly, in the industrial sector the overall level of activity, the competition from fuel oil and coal and the development of industrial cogeneration all will affect the gas demand.

In the electricity sector gas demand will be influenced by the eventual lifting of restrictions on new gas-fired facilities, by the competition from coal, fuel oil and nuclear power, and by the development of industrial and urban cogeneration, where the access of new electricity producers to the market will be a crucial factor. An enhanced use of gas in electricity generation, however, requires flexibility of contracts, in order to cope with seasonal and daily load variations. Last, but not least, the demand for natural gas in the electricity sector will be influenced by environmental concerns and eventual emission restrictions affecting the use of coal and possibly fuel oil. To complicate matters, these factors are unlikely to develop evenly over time or uniformly throughout Europe, even in the post-1992 European Community.

Recent development permits cautious optimism as to the potential for incremental use of natural gas in power generation, as concerns about atmospheric pollution and the global warming are on the increase in the industrial countries. In California, for instance, nearly all incremental power generation now is based on natural gas, with ever tighter restrictions on the use of coal and fuel oil, and in the 1990's, it is feasible that some heavily polluted regions of Europe could take similar measures. Already Italy is basing much of the incremental power generation on natural gas. Recent technological progress has made gas more competitive in power generation. Modern gas turbines can be built with short lead-times and capital costs that are

about one half of those corresponding to coal-fired turbines, with a thermal efficiency that is at least nearly 50 per cent higher. With these developments, the problems of basing power generation on gas are related to supplies, to delivery conditions and to storage costs.

Supplies and reserves

Western Europe's gas supplies are characterised by a moderate import dependency and by a high concentration on a few suppliers. In 1987, indigenous production only covered about 78 per cent, or 181 of Western Europe's consumption of 232 billion cubic metres (bcm) of natural gas. Imports from sources outside Western Europe were 52 bcm, essentially from Algeria and the Soviet Union. Internal trade in Western Europe was 64 bcm. More than two thirds of the domestic West European output was concentrated in three countries: by order of magnitude, the Netherlands, the UK and Norway. Together, these five countries in 1987 accounted for 72 per cent of total supply of gas to the West European market.

As for reserve distribution, it differs from the output pattern. At the end of 1987, Western Europe had proven gas reserves of 6.2 trillion cubic metres (tcm) with roughly one half in Norway, another 30 per cent in the Netherlands, about 10 per cent in the United Kingdom and the remainder scattered in a number of countries, such as West Germany, Italy, France, Austria, Spain and Denmark. For Western Europe as a whole, the reserve to production ratio was about 35, but varying from 10 in West Germany and 15 in the United Kingdom to 29 in the Netherlands and more than 100 in Norway. This shows the contrast between Norway and the rest of Western Europe in gas terms, and Norwegian gas reserve estimates are conservative.

Vested interests

While the present organisation of the gas market varies with the different countries of Western Europe, in all cases there are serious obstacles to competition in the form of transportation and distribution monopolies. Gas transportation is controlled by national monopolies in France, Italy and Spain, and by private monopolies in Belgium, the Netherlands, the United Kingdom and West Germany. In France and in the United Kingdom, the gas industry is integrated in the sense that gas transportation and local distribution are handled by the same company. In the other countries the two functions are institutionally separated. The historical background of the gas transportation-distribution monopolies in the various countries was essentially a policy objective to promote the use of natural gas from domestic sources. Subsequently, the various gas monopolies have been used to negotiate and handle gas imports. The number of transportation monopolies makes the West European gas market highly imperfect. Pricing, to a large extent, is not transparent and there are

often high intermediary profits as many transactions are concluded between bilateral monopolies. The various buyers often cooperate in joint deals for pipeline imports of gas. In fact, West German Ruhrgas, with its local monopoly on gas transportation, plays a pivotal role in the contracts concerning Norwegian and Soviet gas flows to the continent.

The monopolies mean that profits in gas transportation can be high, yet as mentioned, this hardly enhances the competitiveness of natural gas against other fuels. On the other hand, the centralised organisation of the gas trade strengthens the bargaining position of the West European buyers in relation to the sellers. A final, disturbing problem is that some of the major gas transportation monopolies, especially Ruhrgas of West Germany and Gasunie of the Netherlands, are controlled by the coal and oil industries. Hence their enthusiasm in advancing the market share for natural gas is understandably limited. Instead, they seem to opt for maximising monopoly profits on a limited volume. To some extent these companies are an impediment to the expansion of gas use in power generation in Western Europe. Correcting this distortion is a task for the EC competition policy.

The shifting balance

In France, limited reserves mean that its output of natural gas is falling quickly. It is also likely to decline in Austria and Italy in the early 1990's: in the second half of the 1990's, probably in the Netherlands, the United Kingdom and West Germany, as well. The prospects therefore are for an increasing import dependency on natural gas, even at the current level of demand. But increasing the share of natural gas in the West European energy market reasonably means quickly rising import dependency and an even higher concentration of supplies on a small number of countries. This could lead to serious commercial and economic risks, apart from political supply risks that may be judged differently over time. Norway is the only West European country with a reserve base sufficient to substantially boost supplies, but here, costs may be an impediment. In commercial terms, Norway is a gas exporter with interests and objectives comparable to Algeria and the Soviet Union. This outlook has profound consequences for the future strategy of the users and for the corresponding organisation of the West European gas market.

By the year 2000, French gas production could be down to zero, Italian production could become one half of its present level and Austrian production could become insignificant. Dutch and British outputs could be reduced by 10 to 15 bcm annually in each case, and the West German output could be down to 12 bcm from the 1987 level of almost 18 bcm. Hence gas production in Western Europe by 2000, except for Norway, could be in the range of between 110 and 120 bcm, compared with 151 in 1987, unless major new fields are found and developed.

Additional imports will have to replace declining domestic supplies, just in order to service current markets and to utilise the present infrastructure. Easily one half of the gas consumed in the United Kingdom and on the Continent might have to be imported from external sources. This prospect of rising import dependency raises the question of the potential for and the limits of the gas supplies to Western Europe.

Apparently, supplies should be no problem, as Western Europe is surrounded by huge reserves of natural gas in North Africa, the Middle East, the Soviet Union and Norway. The present three major exporters to the area, Algeria, Norway and the Soviet Union, together have proven reserves of 47 trillion cubic metres, corresponding to more than 200 years of the current level of West European demand. This does not exclude the possibility of finding more gas in Algeria, Norway and the Soviet Union. Recent discoveries in the Soviet Union underline the potential for large gas finds fairly close to Western Europe. In addition, the Middle East, by conservative estimates, has proven gas reserves corresponding to at least 130 years of current West European demand. Against this background there is hardly any resource scarcity threatening Western Europe's gas supplies. The problems are organisation, financing and lead-times for major projects, including the necessary adjustment of infrastructure. Long lead-times in many key projects mean that supplies may not be available to capture new market outlets unless risk-prone financing is found or prices are at a different level than today.

Algeria currently has a total export capacity of about 42 bcm a year, of which about 12 bcm is transported by pipeline to Italy, and the rest as liquefied natural gas (LNG). The existing LNG capacity is likely to be exploited by the late 1990's, some of which will go to the United States and a small volume of which will go to Yugoslavia. Additional LNG capacity could be installed by the late 1990's, but at considerably higher costs and with lead-times of four to five years. Foreign assistance might help a speedy completion of new projects. The capacity of the Transmed pipeline to Italy could probably be increased to 18 bcm a year by installing more compressors.

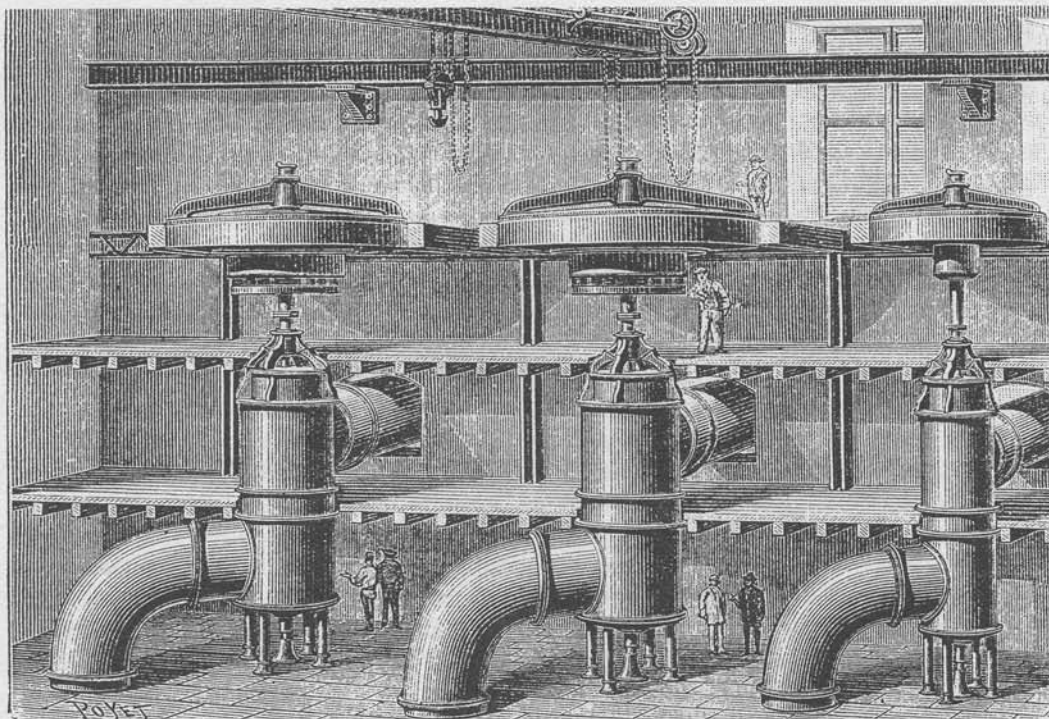
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Improved relations between Algeria and Morocco enhance the feasibility of a new project, a Transmed II pipeline under the Straits of Gibraltar to Spain. The pipeline could have a capacity corresponding to that of the existing Transmed I, but would require lead-times of at least seven to eight years. Algeria's *maximum* available export capacity to Western Europe by 2000 could be estimated at about 70 bcm, *if the necessary investment decisions are taken in the early 1990's*. A more realistic figure is 50 bcm.

Norway's current gas export capacity by pipeline to the United Kingdom and the Continent is about 40 bcm a year, but seasonal demand variations mean that capacity utilisation is only about three quarters of the total. The new pipeline to Belgium, possibly with a spur to the United Kingdom, will increase total capacity to about 50 to 55 bcm a year. In addition, about 20 bcm could be made available for new Norwegian exports in the UK part of the Frigg system around the year 2000. A new pipeline is planned to Sweden with an initial capacity of at least 5 bcm a year. Further capacity expansion to the Continent is feasible by adding compressors to the existing pipelines, or in case of large new contracts, by building a new pipeline. Lead-times are estimated to be three to five years. Finally, there are several LNG projects from central and northern Norway, each with a capacity of about 5 bcm, requiring lead-times of four to six years. Norway's *maximum* available gas export capacity by 2000, including the entire Frigg network and two LNG projects, could be estimated at 80 bcm, *provided the required investment decisions are made by 1993-94*. This figure includes the second part of the Troll project. A more likely figure is 60 bcm.

The Soviet Union today is Western Europe's largest supplier of gas after the Netherlands and the United Kingdom. Current pipeline capacity to export gas to Western Europe is probably in the range of 40 to 50 bcm a year. In spite of the huge Soviet gas reserves, some doubts have been expressed about the ability of the Soviet Union to step up gas supplies to Western Europe. Since Chernobyl, the Soviet nuclear programme has progressed much less than previously anticipated. Soviet coal and oil extraction is moving into more remote and more costly areas, and there are reportedly technical problems in the new large gas field. At the same time, domestic energy demand is rising and the East European countries are requiring additional volumes of Soviet gas. A further slow-down of the nuclear programmes in the Soviet Union and Eastern Europe and eventual restrictions on the use of coal will further limit gas volumes available for export to Western Europe. Nevertheless, the Soviet Union is highly dependent upon gas export revenues, their gas reserves remain huge and there is a large potential for energy conservation. Finally, Soviet gas exports only represent a small part of the total output.

These Soviet gas exports are also likely to be affected by the eventual economic reforms. So far, there probably has been no capital cost accounting in the way it is



done in a market economy, and there has been a premium on foreign exchange earned. If this procedure is retained the Soviet Union will probably be able to increase gas exports to Western Europe at competitive prices. With a reformed economic system, accounting for capital costs and a convertible currency, the Soviet gas supplies are likely to become less price-elastic, with a cost pattern more similar to that of Norway, meaning that the country will be less able to increase gas exports at competitive prices. On the other hand, a reformed economic system could also accommodate strong incentives for energy efficiency and conservation, saving more oil and gas for exports. Furthermore, thorough economic reform could also open possibilities for a stronger foreign participation in the Soviet oil and gas industry. There is little doubt the Soviet Union will be able to increase gas exports to Western Europe in the 1990's: the question is how much and eventually at what cost. *Prudently, the Soviet capacity to export gas to Western Europe by the year 2000 can be estimated at 80 bcm, depending upon the fate of the economic reforms and the priority given to the energy sector.*

The recent gas finds in the Soviet Union, in the Barents and the Kara Seas, illustrate the potential. There is no doubt that the Soviet Union has enormous resources of

natural gas. The problem is cost and development organisation. With large finds of this type there is generally a high up-front capital cost, making the initial volumes fairly expensive. Subsequent development, however, tends to be much less costly, with diminishing marginal costs for a field that is already developed. The recent discoveries could mean that the Soviet capacity to export gas to Western Europe could be on the order of 120 bcm a year by 2000, but this would require heavy capital investment in the field and in pipelines. Depending upon the fate of the economic reform, at least part of the cost might be carried by foreign investors.

Additional imports of natural gas to Western Europe could come from West Africa and the Middle East, but at comparatively high cost and with long lead-times. *Unless investment decisions are taken in the very early 1990's*, these sources are unlikely to contribute much to Western Europe's gas market by 2000.

Assessing all these factors, one can arrive at the conclusion that by the year 2000, Western Europe's domestic gas supplies, excluding those of Norway, could be down by 30 bcm to about 120 bcm, as compared to about 150 bcm in 1987. If investment decisions are taken early, *maximum* combined supplies from Algeria, Norway and the Soviet Union could be around 200 to 320 bcm, compared to about 85 bcm in 1987. *More reasonably*, the combined supply capacity from these three countries could be estimated at 160 to 170 bcm by 2000. Depending upon prices, risk financing and economic reforms, then, the total potential gas supply to Western Europe by 2000 could be in the range of 280 to 320 bcm.

Ripe for political attack

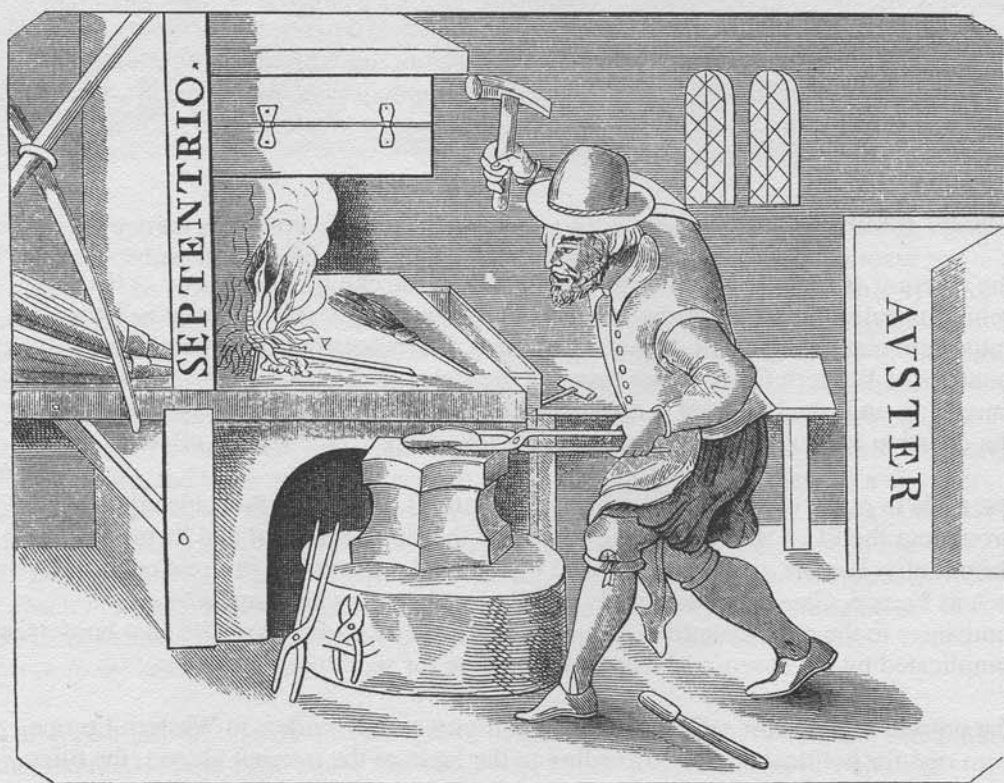
The creation of a single West European market by the end of 1992 is one of the most ambitious political and economic projects of this century. If the blueprint is fully realised, in commercial terms there will be less differences between the various countries of Western Europe than between the states of the USA or the provinces of Canada. Even if the blueprint is not fully realised, profound changes are likely. The question is to what extent and in which way energy trade will be affected.

The trade in crude oil products is already liberalised or is being deregulated throughout the EC. Coal trade is the subject of the European Coal and Steel Community. Electricity trade is handled by national monopolies in some countries, such as France, Greece, Ireland, Italy and Portugal, and by local and private companies in the other countries. Invariably, electricity trade across national borders is complicated by the absence of a common regime for such transactions.

The present regimes for selling gas and electricity across borders in Western Europe seem ripe for political attack. According to the logic of the internal market, the rules

for selling and buying electricity and natural gas across national boundaries as well as within the member countries should be modified. Transportation monopolies, often with considerable profits and resulting price discrepancies, are incompatible with the principles of free trade, open competition and harmonisation across frontiers. In theory, several solutions could be envisaged, such as the break-up of integrated gas and electricity companies, the creation of regulated gas and electricity transportation companies with single tariffs and equal access, and even competing networks. As already mentioned, the close links between coal interests, oil companies, electricity companies and gas transportation companies in countries such as Belgium, the Netherlands and West Germany distort competition and the rational use of the various sources of energy. The result is captive markets for high-cost producers, large monopoly profits and high prices for the consumers. Correcting these distortions should have a high priority for the EC Commission, but there are strong vested interests involved.

In practice, the modification of the gas and electricity regime is likely to be a long-lasting and conflictual process because of the particular interests at stake, the national



traditions involved and the perception of attack on national sovereignty through attempts at reducing the power of Ruhrgas or Electricité de France or ENEL (Italy) to name a few. The outcome will not necessarily be an open system based on free competition between various suppliers of gas and electricity throughout Western Europe. It could equally well be a political compromise between major countries, whereby France, to take an example, is permitted to sell nuclear power to West German customers in return for respecting the position of Ruhrgas and facilitating the transit of natural gas to Spain. Such a political compromise could defuse some of the basic institutional issues, at least for some time, but the distortions and imperfections in the market would be retained. Such an outcome would not exactly be compatible with the spirit of 1992, but it is nevertheless quite feasible.

In economic terms, the present gas and electricity regimes are under conflicting pressures. On the demand side, the quickly rising demand for electricity—particularly in southern Europe—intensifies the pressure for institutional changes, especially for giving new electricity producers access to the market. To the extent that demand for gas increases, most notably in the electricity sector, there will also be a pressure from end-users for a less costly transportation regime. On the supply side, however, the increasing need to secure gas supplies from outside the traditional areas, in the first instance from Algeria, Norway and the Soviet Union, enhances the need for buyers to negotiate together. This is enhanced by the need to diversify gas supplies in a long-term perspective and to finance gas projects with high costs and long lead-times. Paradoxically, the logic of demand and the logic of supply seem to pull in opposite institutional directions, with demand development favouring a more decentralised regime, and with the shifting supply pattern favouring a more centralised one. Against this background of conflicting economic pressures it seems doubtful that the logic of 1992 will be applied swiftly and consistently to the gas and electricity trade. Intermediate solutions facilitating the access of consumers and reducing transportation costs while strengthening the bargaining position in relation to external suppliers seem feasible. In practice, the solution could be either to retain the present company structure, with obligations of “common carriage”, or to allow the various regional and local distribution companies to have joint ownership in the transportation companies.

References

- ¹- BP Statistical Review, 1988.