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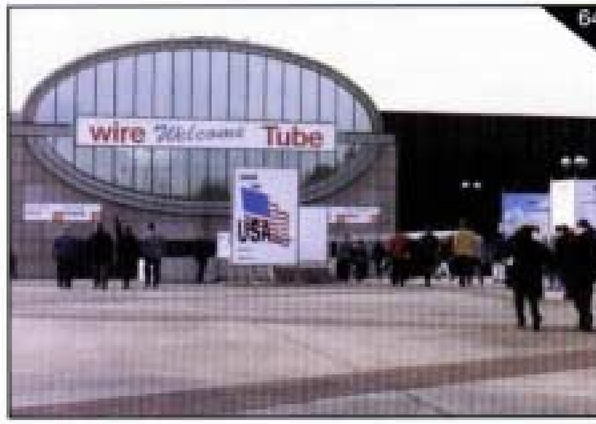


TECHNICAL PAPERS

(continued)

This month's cover: An assortment of building wire from General Cable Corporation and (inset) magnet wire used in motors by U.S. Electrical Motors.

Forecasting investments in electric power: trends or opportunities for wire and cable in main world regions

Countries following the energy scenario will observe the fastest growth in the wire and cable market.

By Dr. André R. Teissier-duCros

Our firm's experience in forecasting the future market of conductive wires and cables grew out of the consulting work we do with three key industries: the utilities themselves; the wire and cable industry; and the primary aluminum industry, which is both a large consumer of electricity and a metal supplier for the high voltage cables used in energy transportation and distribution. Based on our recent experience, the author will attempt to show how general deregulation or privatization of utilities should accelerate growth of investments in the three industries across the board. This paper will suggest how each of the three industries could take advantage of that new environment, by sharing the same vision of the future instead of fighting each other over apparent conflicts of interest.

The wire and cable industry's future remains largely dependent on the future of generation, transmission and distribution of electric power. Abundant, low-cost energy is the backbone of economic growth. Countries which have consistently invested in power generation, aiming at self sufficiency and at low energy costs, have achieved the highest GDP per capita in the past. They continue to enjoy the fastest growth of GDP per capita. Such countries also witness a booming market for other wire and cable use, such as telecommunications, video, automotive, electrical appliance and machinery. Because their energy policy boosts massive infrastructure investments, they also consume more steel cable. We call this policy the "energy scenario."

Countries that applied the energy scenario in the past include the U.S. until the 1970s, Canada until now, Switzerland from 1900 until the 1950s, Scandinavia from the 1920s, France from 1945 on with great success, Japan until the 1970s, and Belgium. To determine if a country is following the "energy scenario," check to see if that country:

- is a net exporter of electric power to neighboring countries;
- has a capacity, or is investing to reach a generation capacity of at least 2kW per capita; and
- has become a producer of primary aluminum which is an enormous energy consumer and the best "buffer" to minimize the peak hour effects on the power network and allow for better load of generation capacity, thus reducing generation costs.

As a consequence, countries that meet those criteria favor heavy, energy-intensive industries which in turn offer a sound manufacturing base for most industries, and key raw materials to agri-businesses.

Unfortunately, several of these countries have deviated from this scenario, often since the oil crisis of the 1970s, notably the U.S. In Europe, most countries now are net energy importers, with utilities which may be state monopolies like EDF in France, or regional monopolies owned by local governments. One can easily relate the loss of U.S. manufacturing competitiveness since the 1980s to the relative increase of energy costs for the manufacturing sector. Today these costs are higher than the French costs, which was unthinkable in 1960.

We currently observe in these old countries a major turnaround in favor of the energy scenario in a context of privatization and deregulation. This is a consequence of the dramatic increase of tax pressure in most developed countries, especially in Europe.

In the U.S., general concern with tax increases combined with a persistent budget deficit favors privatization and deregulation of public services, which is a boost for investment by both privately held and government-owned utilities of all kinds.

In Europe, an already sky-high tax pressure combined with public debt forces governments to divest huge state monopolies—electrical utilities being high on the list—and to deregulate energy generation, transmission and distribution. Germany, by pushing all its partners in the European Union to meet the guidelines of the Maastricht Treaty regarding budget deficits and public debt, is indirectly favoring the largest privatization effort ever. The most aggressive deregulation plan is now put into place by Spain and will create a new standard for Europe. In Spain, it will be possible to buy, sell and invest in all stages of electric power, and each time be in a position to shop for the best customer, supplier, investor or partner. The deregulation level is even higher than the British level. In Italy, Alcoa acquiring the state-owned aluminum producer Alumix is the consequence of a dramatic privatization package.

France is a special case, which interests most of the wire and cable industry. EDF is state-owned, and at the same time enjoys the absolute monopoly of power transmission and distribution. But Alsthom Alcatel, the large diversified manufacturer in electrical engineering, was itself state-owned until recently. It owns Alcatel Cable, the largest wire and cable manufacturer in the world, with more than $6 billion in annual sales. Alcatel Cable grew through an ambitious acquisition program in Europe and elsewhere, that was mostly financed through debt. Debt financing is always easier for a state-owned company. Now the group is privately held and must reduce its leverage and its manufacturing costs at the same time, at a period when Europe is pursuing deregulation of its wire and cable market, thus trying to push prices down. We expect this to create an opportunity in Europe, extending into Eastern Europe, for the low-cost producers.

In Eastern Europe, most governments are already managed in a state of permanent bankruptcy and private investment is the only way out. These countries, to catch up with the Western European level in energy consumption, must multiply their available capacity by five to six times. This means that there will be a windfall market, lasting several decades, for power imported from Western Europe. EDF in France is aggressively pursuing this market. So is Norsk Hydro in Norway.

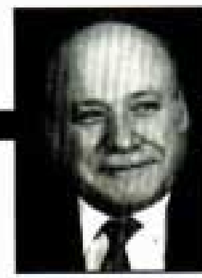
In the Asia-Pacific Rim, the only way to increase generation capacity fast enough is to allow for foreign investment. The Asia-Pacific Rim's economies are growing fast, therefore they need energy. Prevailing policies favor private and foreign investments, free trade, free competition. The present financial crisis will favor these policies. This is where the highest growth is observed today. Yesterday it was China, but its communist government still strongly resists, for strategic reasons, foreign investment in any business acting in their energy scenario. Recent customs duties increases on imports of machinery and technology products are cause for concern. One small encouraging sign: a tiny aluminum smelter in YongTcheng has been privatized and acquired by Hong Kong investors who are in the process of quadrupling its capacity. It will be enlightening to see how successful are investment projects pursued by Alcan, Alumax, and Kaiser Aluminum. India is more advanced in privatization of power generation and aluminum production, but the battle is not won yet.

Latin America combines the high growth perspectives of the Asia-Pacific Rim with the statist environment of Eastern Europe. Its major aluminum producers, which are at same time major energy producers, are Venezuela and Brazil. Both are struggling ahead with ambitious privatization programs addressing their energy sector plus their mining, metals and minerals conglomerates. The structure of these combinats is so diversified, the level of job protection and of social liabilities and the losses generated in the past are so high, that these programs imply at same time a breakdown of each entity into viable core businesses and hard negotiations with labor unions and local interests. Chile offers the most favorable environment today, followed by Argentina, which is already a small but successful aluminum producer.

South Africa and several Middle East countries, despite having different regulatory context, are setting an example with ambitious energy programs. South Africa, for example, has built a new aluminum smelter with 500,000 tons capacity. In Bahrain and Dubai, integrated energy/aluminum complexes are highly competitive and set an example for similar projects nearby.

Canada, Australia and New Zealand have generally been ahead of the game. Canada has vigorously developed Quebec's and British Columbia's hydroelectric resources a long time ago, and Australia has done the same with its coal resources more recently. Both are now facing political hangovers expressed by the more liberal and "greener" political parties in their spectrum. New Zealand, which has no major resources, has put into place the most radical privatization model in the world. It became the first country to introduce general double entry accounting in its public finances so that one can actually see its balance sheet. New Zealand does not receive the attention it deserves, the country being small and far away, but Comalco is expanding the capacity of its excellent aluminum smelter in Tiwai Point, and that is an excellent sign.

Scandinavia deserves special attention because Norway enjoys both tremendous hydro-electric and oil resources, and Sweden and neighboring countries represent a larger population with a strong manufacturing sector, therefore a logical energy consumer. Norway is a major world producer of aluminum, but until recently it was facing two bottlenecks: old, polluting aluminum plants, and political resistance to any increase of CO_2 emissions and of hydro-electric



Teissier-duCros

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capacity. This political dispute now seems resolved, and the country is moving ahead with major investment programs. The main producer, Hydro Aluminium, is doing intelligent research to favor and prepare for the all-aluminum automobile. Finland also has investment plans.

Later we will investigate specific countries which are implementing the energy scenario today, and the ones who would be good candidates to do this. These countries are the new generation of manufacturers and producers of aluminum and of wire and cable. They are building state-of-the-art plants and mills at the lowest possible capital costs. They enjoy a lower cost of living and of doing business and they pay less taxes. They are in a better position to fight inflation than countries that import most of their energy. They are becoming the low-cost producers of tomorrow. Europe and Japan are high-cost producers while North America, in the western world, has the best chances to remain competitive.

In those countries, the aluminum industry came to play a key role: aluminum smelting needs a fixed generation capacity and draws on it all year round. Aluminum smelting acts as a buffer in the energy distribution network. Countries that applied the "energy scenario" became, or are becoming, aluminum producers.

The primary aluminum industry is, at this moment, paying for energy at a world average of 18 to 20 mills/kWh, which is much less than the operating cost of power plants burning fossil or nuclear fuel. That industry could enjoy faster growth if there are continued stable and lower energy costs in the future.

The automobile industry is gradually using less steel and more aluminum and plastics per car produced. That industry could shift to an all-aluminum automobile if it could depend, in the future, on aluminum prices per lb. consistently around three times steel prices. (Today's figure fluctuates around four times.) If such a scenario took place, aluminum consumption would grow from roughly 18 to 30 million tons/year. And if conductive wire in each car shifts from copper to aluminum for weight reasons, you can throw in another million tons.

The total operating costs of utilities that deliver energy to industry and the public—including all depreciation and financial costs and all overheads—are most often between 45 and 60 mills/kWh.

In the past, hydro-electric power has been the most economical source of energy and still is when the dam already exists and is fully depreciated. To build new hydro capacity at low rates, favorable sites are needed in which the dam is small and the height of the waterfall between the dam and the turbines is huge. The world is running out of such natural sites. Most projects being discussed today are controversial because they divert an enormous mass of water at very high economical and environmental costs.

After coal, natural gas is the second most important fossil fuel available. It is a clean fuel that can be used as is for heating and cooking and will be used more and more as motor-fuel. In the long run it will command a higher price than coal. That price, in the short term, is compensated by lower capital costs of gas-fired power plants. If the amortization period is around 30 years, coal is more economical than gas except if excess gas, which is costly to transport, is locally available at very low costs.

Nuclear power can be more economical than fossil power, but the technology presently used imposes very high capital costs and costs of reconstitution of investment because of the relatively short life of the base equipment. As long as there is no definite solution for elimination of nuclear waste, and as long as a nuclear plant is perceived by the public as a potential Chernobyl, nuclear power cannot be a contestant in the race to low cost energy. For it to be so again will take a new generation of foolproof generators that enjoy a longer life with lower decontamination costs and waste elimination. Such a technology will not be available and proven for at least 20 years.

At first glance it would seem that the aluminum industry will not find more energy available at less than, say, 26 to 30 mills, which is what most U.S. utilities offer today. However, all greenfield aluminum smelters planned today are based on energy costs of 14 to 22 mills. How could that kind of long-term arrangement be obtained when the utilities' operating costs are 45 to 60 mills? Why would they offer 30 mills or even less to existing smelters?

These two questions are one and the same, only differently formulated.

The answer is that the kWh consumed by an aluminum smelter is not the same as the one you switch on in your home.

For a utility the worst customer base is found on a beautiful coastline in a nice, warm climate with plenty of vacation resorts and no local industries. All available energy is consumed during the tourist season, with the highest peaks in the evening. If this is your only customer, you have to build a capacity that will accommodate the peak hours even though it will be idle most of the time. The rates would have to be sky high. Hearing such rates, no industry would ever establish itself in such an environment.

Think for a moment what would happen to you if you were looking for a job in such a place. Few jobs would be available unless you considered public and government services: education, health care, government itself and the utilities: municipal water, mail service, telephone operating networks and electricity. Political pressure of all kinds acts on the utilities to create jobs. In the New York area, two 1,200 MW power plants can be compared today, one in the hands of a regulated public utility, the other a co-generation plant operated by a private investor. The second one employs 43 people, the first one 900. Utilities tend to employ too many people because the local public and politicians want them to; they are regulated, so they must please the public.

In the meantime, our beautiful coastline will attract only tourists, and the overstaffed utility will go on charging very high rates while the local politicians are dreaming about attracting industry. "Your energy rates are too high, your roads are too narrow, we couldn't compete if we invest here," foreign manufacturers would tell them. The politicians would ask the utility: "What can you do to reduce your rates?" "If enough industry promises to come," the utility would say, "I can build a new power plant and operate at a higher load. My costs will go down. Where do you want me to put the power plant?" "No power plants allowed here, you won't pollute our beautiful coastline with your ugly and dirty generators," the powerful Trade Association of Hospitality Industries, supported by the environmentalists, would answer.

Another problem is financing. The utility is regulated, which means that anything that impacts on its fixed costs and therefore its future rates must go to a regulatory board. This in itself is cumbersome. Investments mean debt, loans that are often guaranteed in some way by local government which, chances are, is already in debt. A utility doesn't look nice when it fires people or runs into debt to increase capacity and productivity. A politically correct utility, in most parts of the world, is overstaffed, has strong assets and little debt, is late in all investment decisions, and operates obsolete, fully amortized plants. Low depreciation and financial costs compensate somewhat for high labor costs, so that energy rates are not absurdly high. But the bottom line is that total operating costs are high.

Let us suppose that an aluminum producer notices that there are deep-sea harbors on that coastline, good deposits of bauxite in the mountain nearby, and that the country is importing aluminum on which customs duties are charged. He approaches the politicians and the utility: "We are thinking about exploiting the bauxite, and building an alumina plant and aluminum smelter here. At what rate can you sell us the power?"

Now, an aluminum smelter of 230,000 metric tons of capacity consumes close to 400 MW of power annually. It is the best customer a utility can find to stabilize the load. It represents absolutely predictable demand, on the basis of which it is easy to finance investments. This is why aluminum smelting is the best "buffer" for power generation. This is why utilities will generally favor this industry with very special rates. How low can these rates be?

It is difficult for the utility to sell energy below the power plant's own operating costs. This means already forfeiting the utilities's overheads. Such costs vary according to the origin of energy, whether fossil, hydro, or nuclear, and according to the technology, from 10 to 40 mills. This is why, in our case, the utility may offer as low as 30 mills to attract the new investment.

Today, however, this will not be enough to convince the investor. He is looking for better than average rates, from 14 to 22 mills, to face existing competition. Besides, while negotiating with the utility, he will notice that its management is not that enthusiastic about new investments because of public resistance and of future debt. In fact, the public is more favorable to an aluminum smelter and alumina plant, combined with, for instance, a rolling mill, the whole "caboodle" directly and easily creating 1,200 jobs. That project can inject three times more activity into the local economy than a power plant alone, which may have at most 200 jobs, if overstaffed as usual.

This is why the idea to invest in the power plant itself and integrate it to the smelter comes more and more naturally, if the utility will let you do so. Today, the trend is privatization and deregulation, and private investment in power generation is favored, except in statist countries such as China. It comes to reason that if the utility is operating at a total cost of 50 mills, and if a well-managed, coal-fired power plant running at 80 percent of capacity has operating costs of 30 mills, it is possible to trade 50 percent of the power to the utility at, say, 45 mills and get power for the smelter at a marginal cost of 15 to 20 mills. Several projects conceived on these bases are under consideration in the world today.

It is striking to notice that, when it comes to addressing growing industrial needs today for low cost energy, utilities are somewhat paralyzed, an example of which is aluminum. According to a 1994 study by Energy Ventures, a research firm, a state-of-the-art, coal-fired power plant of 1,200 MW today would have operating costs, if run by a U.S. utility, of 37 mills with a 70-percent load factor. If an aluminum smelter invests in and operates the power plant, sells 50 percent of power to a local utility at 45 mills (close to most utilities's total operating costs) and guarantees the smelter an 87-percent load factor thanks to the constant load fitting the smelter's needs, the marginal cost to the smelter falls to 26 mills, using the same cost structure imposed by the utility.

But if the power plant is managed as lean as allowed, and if investment costs are kept down by avoiding the public tender procedure which typically increases capital costs by 30 percent, marginal cost to the smelter decreases to 8 mills.

Then, we could take into account what would bring more economical technology such as pressurized fluidized bed burners, which not only bring costs down to the level of burners and boilers, but also almost eliminates scrubbers.

Therefore we can expect that rates of 12 to 15 mills will be available for aluminum smelting at the turn of the century. This means further increase of use of aluminum instead of copper and bigger market share in packaging and automotive, especially if the industry has the vision to go back to the old Alcoa strategy of stabilizing long-term prices through long-term contracts based on cost plus instead of LME prices. When energy was contracted at rates indexed on LME, it was the best way to amplify the fluctuations of such prices and discourage future aluminum users.

Conclusion

In this general context, where will we observe the fastest growth of the wire and cable market? The answer is in the countries that follow the energy scenario, and in their neighboring countries, where they will sell extra power.

These include:

• in Asia, most notably Malaysia and Indonesia, which represent booming economies and big markets;

• in Latin America, it will be Venezuela, if it succeeds with its general privatization project for the hydroelectric plus alumina and aluminum complex on the Caroni river; Brazil, in the same context; Chile; Trinidad and Tobago;

• in Europe, it will be Norway and Spain. The latter is leading the trend toward deregulation and privatization. France has successfully pursued this scenario since 1945 and made the most of it then, therefore it is now a major energy exporter in Europe, even planning to sell its nuclear power in Eastern Europe. Italy might take a different course now that Alcoa owns its aluminum industry. In that region we see only Slovakia so far following the scenario;

• in Africa, South Africa only for the time being, but with ambitious undertakings and a will to industrialize fast in order to solve racial tensions through job creation;

• in the Middle East, Iran has made the initial steps of the scenario but is hampered by its political environment; Iraq would love to engage it but faces the same problem; only Bahrain and Dubai have so far engaged the scenario but they are very small countries; and

• Australia, and New Zealand.

Countries that could follow the energy scenario or come back to it are:

• the U.S., which very naturally followed it during most of its history and abandoned it in the seventies, with the consequence that energy costs in the U.S. are now higher than in France, something which was unthinkable 30 years ago; the new deregulation trend is encouraging in that sense,

• in the Middle East, Egypt, Saudi Arabia, Qatar, Abu Dhabi and Oman; Turkey, which is importing 40 percent of its energy and has a booming manufacturing sector, is probably now engaging the scenario with its ambitious privatization program; Iran is silently pursuing its investments but still constitutes a high political risk and its institutions are not reassuring for foreign investors,

• related to Scandinavia, Iceland is already a major electricity producer with huge potential for growth, and an aluminum producer with at least one future greenfield plant on its agenda with U.S., Swiss and Dutch investors,

• in Europe, we should also watch the Netherlands, Slovenia, Croatia, Poland, Hungary;

• in Africa, Mozambique, Guinea, Cameroon, Nigeria, Ghana, also Madagascar; and

• in Latin America, Argentina. ■