

TRACTEBEL *Link*

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Editorial

Group Tractebel is focusing on its international growth strategy more than it has ever done in the past, particularly in the areas of electricity and gas.

1993 was particularly representative of this focus. The Group consolidated its shareholdings in Nigen (electricity production in Northern Ireland) and Tibsa (gas transport in the Argentine), which resulted in a large rise in the contributions of the business unit, EGI. The Group's 1993 results raise was mainly due to the performance of this unit.

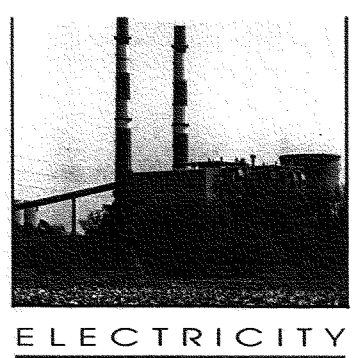
At the same time, Powerfin confirmed its role as an investor and industrial operator within EGI by acquiring the American Tractebel Corporation (A.T.C.) from Tractebel. The company generates electricity in North America. Powerfin also acquired a 19% share in Tibsa (gas distribution in the Argentine) and, for the first time, assumed all the prospecting and development costs of its international activities.

Powerfin's electricity production capacity is now a quarter of that managed by the former Unerg company while its gas distribution capacity is now triple that of the former Unerg company.

Until EGI creates its own magazine, Tractebel Link readers can keep up with its current developments through the "EGI-News" section (see page 19). It will be devoted to information provided by operational units abroad and to news releases on projects still in the negotiation phase, which are usually not communicated to the general public until their acceptance is finalised.

The Editorial Staff

HIGH-PERFORMANCE SIMULATIONS



Conducting research with top-level partners makes it easier to develop leading-edge technologies. Through its Eurostag programme, Tractebel Energy Engineering has acquired both experience and a reputation, which enhances its prospects for creating partnerships with other Group companies and foreign firms.

Eurostag is a software package that simulates electrical system dynamic performance. It has many applications: the study of both network performance under sudden disturbances, such as a short-circuit, and the slow changes that are due to load variations over the course of the day. All electrical network parts are included, enabling the real performance of a system to be simulated with high precision and for lengths of time that range from a few seconds to several hours.

To meet the challenge, a team led by Marc Stubbe, Manager of the Development and Assistance for Operation section at Tractebel Energy Engineering (TEE), Networks Department, perfected an algorithmic system using an automatically variable step-size integration process with temporal calculation distinctions that can vary by a factor of 100,000 during a single simulation.

The programme is flexible and user-friendly, in particular, it employs an advanced graphics language to enable the user to move directly from model diagram to calculation without the need to set up an equation. It covers practically every simulation problem in major electrical systems. It is used for testing network stability, for analysis of possible risks under abnormal operating conditions, for perfecting steps to prevent malfunctions and for studying start-up procedures after a general blackout. It also

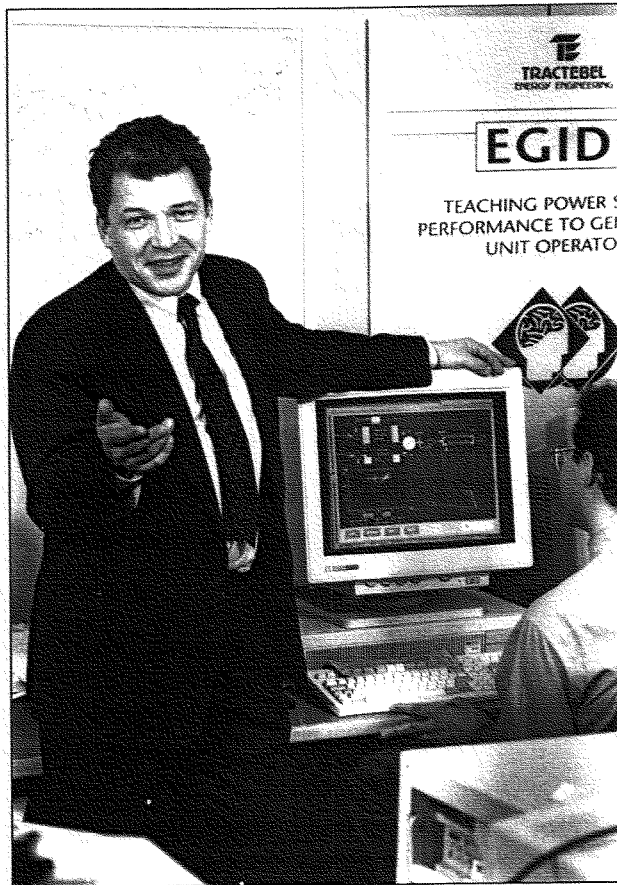
enables designers, manufacturers and operators to develop and perfect various power system regulators.

EUROPEAN PARTNERSHIPS

This type of research has its roots in the 1980s, in the days of Electrobél and Tractonél. "Companies in the electricity sector were seeking study methods to avoid major power failures like the blackout of August 1982. The Stag project ("Stabilité Généralisée") was presented to CPTÉ, the domestic organisation in charge of coordinating electricity production and transmission. CPTÉ decided to finance the project and afterwards Laborelec also did. Thus, a team was formed comprised of experts from different companies."

Articles on the first version of the programme began to receive the attention of the international scientific community. English and French electricity companies became seriously interested. While the English acquired a programme licence, the French signed a cooperation agreement with TEE for the development and operation of a software package to be named... Eurostag.

The EDF partnership enabled the project's human and financial resources to be



Marc Stubbe: Egide is used to explain the operation and limitations of power plants to operators

doubled, and it now had achieved the requisite size for an international research programme. Rivalry among the teams led to software of unmatched quality. The Belgians and the French succeeded in integrating their work completely, from the defining and dividing of development activities to cross testing.

Each partner can now, at any time, make use of the project's technology in any way it chooses. After five years of working together, Tractebel and EDF are convinced that the joint partnership was valuable. And the operation has spawned new projects.

USED BY BOTH UNIVERSITIES AND INDUSTRY

Since Eurostag is very educational, it is highly appreciated at Belgian universi-

ties, where it is used for both research and teaching purposes. "We have already called on engineers to take their first steps on the programme; one of them was operational by the afternoon of his first day", notes Marc Stubbe. Eurostag, which has been running for several years at the University of Lausanne, has also recently been acquired by several renowned foreign institutions, including MIT and the universities of Hong Kong and Capetown.

Industry, a highly targeted area, is also showing interest. Both Belgian and French electricity companies already view the programme as their standard software. Australian, English and Italian electricity companies, and manufacturers such as Alstom and Asea Brown Boveri (ABB), have also become users.

HEAVY FALLOUT

The expertise TEE developed using Eurostag and its research in network design simulation, have enabled it to explore other fields, such as emergency plans (to reduce the cascade effect that can result in a generalised power failure), research on blackstart procedures and operator training.

After their experience working together, EDF asked the Belgian consultant to undertake a portion of its emergency plan study. The office's specialists have worked more than 10,000 hours on the project. First France, and then Belgium. Knowledge that was acquired in the area of emergency plans is now being used for Belgium's national grid. "We feel in the Group that, in general, engineering must first prove itself in Belgium before its services can be exported. However, in this case, Electrabel is benefitting from the studies it undertook with EDF. Knowledge transfer can work in both directions", remarks Marc Stubbe.

TOWARDS A MODELLING STANDARD

In Belgium, restarting the network after a major breakdown (known as a black start) could require some very complex manoeuvres. For example, the hydroelectric power plant at Coo could be used as a controllable load to enable start-up of the nuclear units at Tihange. Tests for real situations have been fully prepared using simulation. Operators are being trained for these manoeuvres on a permanent basis using the simulator extension at the Tihange Nuclear Training Centre. This project was based on Eurostag design simulation standards.

TEE also drew on these standards to perfect a real-time simulation software package, Egide, used to explain the operation and limitations of power plants to operators. The programme was also installed at Lausanne's Ecole Polytechnique.

A METHOD FOR NETWORK CONTROL

Electrabel and CPTE have decided to equip control centres on the regional and national level with advanced computer software for network control assistance. This is not only to enhance network safety evaluation but also to improve network operating points. Developing such a high-level system was considered too lengthy, difficult and costly for one company to handle alone. Therefore, TEE opted for another strategy, drawing on its proven expertise in the network simulation field: a partnership with ABB. The project appears to have an even wider scope than Eurostag. The software to be developed to meet Electrabel's long-term needs will be installed in every Belgian transport centre; and developments deri-

ved from TEE's work will be available to ABB clients.

SEEKING A COMMON DESIGN

TEE has been studying a new design in the centralised voltage control. For there to be a proper technical and economic management of the Belgian grid, power plants (primary level) must be equipped with automatic control systems. Regulating systems and transformers must be controlled through instructions issued at the regional (secondary) level or the national (tertiary) level. The adjustments made by transport centre operators are becoming increasingly complex. Electricity companies would like these operations to be delegated to control systems that would have a much larger overview of the electrical system and that would be equipped with network safety and optimisation functions.

TEE created a partnership with EDF to develop this project. The common control system design will be based on some EDF developments at the regional level (the secondary level) and also on research by TEE on optimisation (at the tertiary level). The project's goal is to establish the design's complete specifications, to implement it in both countries and, over the longer term, to promote it in Europe. At the Belgian level, the project is a good example of integration because the basic specifications were determined by CPTE and Electrabel, while developments were undertaken by TEE and Laborelec.

A WORLDWIDE APPROACH

In the future, the simulation techniques that were developed through the Eurostag programme, when joined with more

In the future, simulation techniques joined with more powerful calculating potential should result in the development of extremely high-performance simulators.

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powerful computers, should result in the development of extremely high-performance simulators for large interconnected systems.

An increasingly international industry and the European Commission's project for third party access (TPA*), seriously complicate the calculations used for controlling networks.

If the principles of free exchange of goods and services were rigorously applied to electricity supply, the safe operation of networks would be seriously jeopardised. In the extraordinary situation where a government decision was taken contrary to technical demands, operators should have the expertise to minimise any negative effects on the networks.

"Most of my section's research and development activities are based on international cooperation. Europe exists. Everything must now be approached on

this level. To achieve a critical size, it is often necessary to join with top-level partners. In some specialty areas, the Tractebel Group, because of the regrouping of the electricity companies and its adoption of an expansion strategy, can be on an equal footing with other major corporations," adds Marc Stubbe.

"However, R&D cannot be improvised. It takes time to train teams and form networks of top-level contacts. In order to exchange knowledge with partners that are advanced in the field, you must have established your credibility and for this you must offer solid coinage. In the field of high-technology, only top-level research has a chance to succeed. Because everything is taking on worldwide proportions." E

* See related article, "The energy stake," in Tractebel Link n°1 (June 1992)

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