



The OMEGA Project: Open Market Energy Generation Allocation in deregulated electricity markets

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Received 24 October 2000; received in revised form 7 February 2001; accepted 17 April 2001

Abstract

The OMEGA project is part of the 5th Framework Programme for R&D that the European Union has started in the year 2000. It is a highly complex and interdisciplinary project, with five countries and several companies involved. The project aims at developing a decision support system for electricity producers to support energy management and energy trading groups within these companies in the commercial activities on open and competitive electricity markets using an e-commerce framework. This paper presents the OMEGA project, describes the objectives pursued, evaluates the project workplan, shows the complex project management structure, highlights the management problems, and presents relevant conclusions. © 2002 Elsevier Science Ltd and IPMA. All rights reserved.

Keywords: Project management; Electricity markets; E-commerce

1. Introduction

Since the European Commission presented its White Paper on the Internal Energy Market back in 1988, and especially since the introduction of its first proposal for a Directive on common rules for the internal market in 1992, a very lively debate has gone on at the European Union level as well as in the national capitals of the EU Member States regarding the liberalization of energy markets, and in particular of the electricity industry. Some Member States such as the United Kingdom had already set out on their own liberalization course during the 1980s in pursuing a general policy of liberalization and privatization of regulated industries (telecommunications, financial services, water supply) and of the energy market in particular (gas, electricity). However, it is reasonable to say that the debate at the European level was kicked off and subsequently kept going by the ideas put forward by the European Commission for the liberalization of electricity and natural

gas markets which were worked out in the late 1980s and early 1990s. Although this European debate has not yet concluded, at the national level many policies for electricity competition and liberalization have been considered and discussed and in some cases are already being implemented by individual Member States, while at the European level the debate is continuing in full force.

The energy sector, not only in Europe but all over the Western world, faces a new business scenario due to the challenges arising from operating in a competitive market. This scenario introduces new business processes and also challenges the way traditional activities are performed.

E-commerce solutions have been proved very successful in activities such as retailing, air ticketing and hotel booking, entertainment, banking and finance. The number of such solutions has grown at a fast pace and it is forecasted to grow at even higher rates. However, e-commerce solutions oriented towards the improvement of the efficiency in many traditional industrial processes is not widespread. This is the case of the energy sector. Nevertheless, there are already in place some e-commerce solutions for energy spot bidding (e.g. Spain's Electricity Market, Amsterdam Power Exchange) but,

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although very successfully implemented, they provide only the mechanism for electronic bidding once the bidding strategy has been decided. Note that a bidding scheme in the electric sector implies generators freely offering prices for their energy generation. The energy offers are accepted in order of increasing price until the customer demand is met. The dispatched power units are paid the price of the most expensive offer, which corresponds to the so-called marginal or spot price.

The OMEGA project [1] aims to the development of concepts, models and tools for virtual marketplace and business communities. The result can be seen as a package tool for brokerage to enable new business models (i.e. open electricity markets) and new types of trades (e.g. electricity spot market). The innovative side of the OMEGA project resides in the use of e-commerce (by means of Web browsers, Active Server Pages, etc.) as the underlying technology providing a framework for a decision support system for the optimization of energy allocation using a stochastic approach. Such a solution is nowadays under development. Furthermore, there are very few operative e-commerce systems in the electric sector that integrate e-commerce with decision support capabilities.

2. Project objective

The main objective of the ongoing electricity market deregulation in Europe, and all over the world, is to decrease the cost of electricity, especially for industrial customers [2]. In such a context, all electric utilities must be able to generate energy at the minimum cost and must try to achieve the best value for their own production. Therefore, electric utilities have been or are being subjected to radical changes in their market and regulatory structure [3,4].

The goal of the OMEGA project is to contribute to the economic development of the European Union by ensuring its energy producing companies are exploiting the potential of electronic commerce.

The above goal is translated into the project objective that consists of developing a set of tools for supporting the energy management and energy trading groups within a generation company in the commercial activities of the different energy markets. The project's objective will be achieved by the operational goal that consists of developing, implementing and testing a decision support software to simulate and optimize trading oriented operations of a generation company operating in an open market via electronic commerce platforms. The software will address the generation allocation problem in an integrated manner and will be able to coordinate the decision problems with different time scales characterizing the open electricity market. Fig. 1 depicts the role of the OMEGA package in this context.

The first interface layer is between the marketplace and the company managers through the e-commerce architecture. In this way, the managers are able to submit the bids and contracts selected by the OMEGA package. And the second interface layer is between the OMEGA package and the company managers, in order for them to get the right bids and contracts. In addition, the OMEGA package can access both the internal and market databases and the generating units (two-way connection) to help in the decision process.

3. Project workplan

The overall workplan consists of four main phases:

1. *Specification*. It consists of data collection for product validation, scenario generation, software definition, architecture design, model specification and electronic commerce protocol definition. This phase will be completed within the first 6 months of work.
2. *Prototyping*. Algorithm design and implementation of prototypes will be completed in month 12. The preliminary OMEGA modules will be evaluated on the data collected by the end-users; a prototype evaluation report will be delivered at month 17.
3. *Development*. The modules will be completed and integrated to form the final OMEGA package. The development will take into account the results of the intermediate validation performed in the previous phase. This phase is concluded at month 20.
4. *Assessment*. OMEGA assessment and evaluation on the data provided by the three end-users will be achieved at the end of the project (month 30).

The overall workplan is composed of 11 work-packages (WP), and within each WP there are several tasks to perform, as seen in Fig. 2.

WP1 and WP2: problem specifications, data collection and scenario generation. The end-user partners will be the major players.

WP3: the software design and requirements, the integrated architectural design, and the electronic commerce protocol definition of the OMEGA package will be established.

WP4: prototype algorithm design and software implementation.

WP5: algorithm design and software implementation for the modules 1: Medium-term Allocation of Bilateral Energy Sales Contracts, and 2: Water Future Expected Value Function Calculation.

WP6: algorithm design and software implementation for module 3: Weekly Energy Allocation.

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