

Project MAN-REM – Multi-agent Negotiation and Risk Management in Electricity Markets (PTDC/EEA-EEL/122988/2010), (FCOMP-01-0124-FEDER-021489) is recruiting 2 young researchers graduated in Computer Science/Informatics or similar, with experience in computer applications for Power Systems. This call concerns research activity in the area of intelligent short term management of distributed energy resources in a multi-player competitive environment. This project is funded by Portuguese funds through FCT/MEC (PIDDAC), and co-funded by “Fundo Europeu de Desenvolvimento Regional” (FEDER) through COMPETE – “Programa Operacional Factores de Competitividade” (POFC). The following conditions are applied to this recruitment process:

**1. SCIENTIFIC AREA**

Computer Science

**2. EDUCATION**

Graduation in Computer Science / Informatics or similar.

**3. DURATION**

From July 28<sup>th</sup> 2014 until October 27<sup>th</sup> 2014 (03 months duration, eventually to be renewed according to the project execution and respective budget).

**4. ACTIVITIES AND WORKPAN**

Electricity markets (EMs) are systems to purchase and sale electricity using supply and demand to set energy prices. Two key objectives of EMs are to ensure a secure and efficient operation, and to decrease the cost of using electricity. To achieve these goals, three major models have been considered: pools, bilateral contracts, and hybrid models. Opening up the electrical power industry to competition would be an important tool to improve efficiency, and to benefit energy customers. Competitive forces would lead companies to innovate and operate in more efficient and economic ways. Innovation would lead to lower prices and a better use of energy resources. However, the analysis of important European electricity markets (e. g., the Iberian market involving Portugal and Spain) yields the main observation that they are still far from the liberalization. Nowadays, there is still a lack of both theoretical and practical understanding, and important challenges are still waiting to be addressed more thoroughly. Among these are the additional complexities to coordinate technical and economic issues, and the technical difficulties to understand EMs internal dynamics. In other words, tariffs do not reflect the pressure of competition. EM simulators can give important contributions to this problem, and a number of prominent tools have been proposed.

However, most energy management tools present limitations concerning the application field, i.e., they are tailored to specific market models and/or particular market operations.

Multi-agent systems (MAS) represent a relatively new area of research and development which is rapidly expanding. MAS can deal with complex dynamic interactions and support both Artificial Intelligence (AI) techniques and numerical algorithms. In this way, a multi-agent approach, in which software agents are capable of flexible autonomous action in order to meet their design objectives, is an ideal fit to the naturally distributed domain of a deregulated energy market. Therefore, this project addresses the challenge of using software agents to help managing the complexity of EMs.

Specifically, the overall goal of this project is to develop an EM simulator which enables market participants to:

- (i) Negotiate the terms of forward bilateral contracts, considering dynamic pricing tariffs (efficient management of DR), reach (near) Pareto-optimal agreements, and unilaterally decommit from contracts by paying de-commitment penalties;
- (ii) Ally to beneficial coalitions - notably coalitions involving end-use customers - to achieve more powerful negotiation positions, and thus negotiate better tariffs;
- (iii) Manage a portfolio of customers taking into account trade-offs between the risk and return of bilateral contracts – notably contracts involving traders and customers.

Additionally, this project aims at integrating the EM simulator into the MASCEM system. The main expected result will be an improved energy management software tool able of simulating EMs in a complete and realistic way, thus overcoming most technical limitations of the existing EM simulators.

Finally, this project addresses the application of the energy management tool to the Iberian market. The consideration of a real problem will provide additional challenges, making the tool more powerful towards, and ensuring the full benefits of deregulation.

The candidates to be selected will participate in the following project tasks:

- T5 – Energy management software tool
- T6 – Iberian market (MIBEL): real problem simulation

The selected candidates work includes:

- Upgrade of previously developed models, methodologies and applications;
- Software conception and development;
- Preparation of case studies and result analysis;
- Technical reports and scientific papers preparation and writing.

This work includes the design of the foreseen methodologies, their implementation, and test.

## 5. LEGISLATION AND REGULATIONS

“Estatuto do Bolseiro de Investigação Científica”, approved by Law no. 40/2004, of 18 August, modified and e republished by Decree-law no. 202/2012, of 27 August and modified by Decree-law no. 233/2012, of October and by Law no. 12/2013, of 29 January; “Regulamento de Bolsas de Formação Avançada do ISEP - ”Regulation no. 405/2010, May.6.2010 (published in “Diário da República” no. 88, II Serie, 06.May.2010); “Regulamento de Bolsas de Investigação da Fundação para a Ciência e a Tecnologia, I.P. – 2013.

## 6. SUPERVISION AND WORKPLACE

The candidate to be selected will be scientifically supervised by Professor Zita Vale.

The workplace is at GECAD – Knowledge Engineering and Decision Support Research Center in the following address:

Instituto Superior de Engenharia do Porto  
Rua. Dr. António Bernardino de Almeida, 431  
4200-072 Porto – Portugal

## 7. MONTHLY MAINTENANCE STIPEND

As defined by FCT (€ 745.00/month), according to the table of stipends of the country (available in <http://www.fct.pt/apoios/bolsas/valores.phtml.en>), paid by bank transfer).

## 8. CANDIDATE SELECTION METHODOLOGY AND EVALUATION PANEL

Only candidates that have presented the complete set of application documents and show evidence of having the required minimum profile will be admitted. The selection method will take into account the following components: the BSc graduation classification (50%), and the Curriculum Vitae evaluation (50%). To clarify the candidates’ motivation and profile, according to the fellowship requirements, an interview may be conducted in English language. In this case, the following components will be taken into account: the BSc graduation classification (25%), the Curriculum Vitae evaluation (50%), and the interview (25%).

The evaluation panel includes: Prof. Zita Maria Vale (panel coordinator), Prof. Goreti Marreiros and Prof. Praça.

## 9. RESULTS PUBLICATION AND NOTIFICATION

The candidates will be individually notified by email message on the final evaluation results.

10. APPLICATION

Minimum profile required: Knowledge and experience in artificial intelligence, modeling, simulation, multi-agent systems, and some experience in computer applications for Power Systems. At least 6 months of experience in scientific research activities, and authorship of one paper published and written in English. Writing and speaking proficiency in English. Preferred profile: Previous work experience in research activities in the area of power systems, and multi-agent systems. Good programming skills and experience in the development of artificial intelligence based computer applications.

Candidates must have availability to start this research scholarship on the date mentioned.

11. DEADLINE AND APPLICATION DOCUMENTS

Application period: from June 17<sup>th</sup> until July 3<sup>rd</sup> 2014

Curriculum vitae; graduation diploma; document with courses marks; copy of any previously published works that are relevant for the application evaluation. An application letter with the fellowship reference (ref. **MAN-REM\_2014-01**) should be included, indicating clearly the motivation of the application and the full contact information (as minimum: email address, mobile phone number, postal address) of the candidate. All the documents prepared by the candidate for the application should be written in English. Documents should be sent to [zav@isep.ipp.pt](mailto:zav@isep.ipp.pt). Additionally, they should also be sent to the following address:

GECAD (Knowledge Engineering and Decision Support Research Center)  
ISEP/IPP  
A/C Professor Zita Vale  
Rua Dr. António Bernardino de Almeida, 431  
4200-072 Porto – Portugal

12. ADDITIONAL INFORMATION can be obtained by phone +351-22-8340511 or by email [zav@isep.ipp.pt](mailto:zav@isep.ipp.pt).