Project name:
"System for bushing monitoring with a view to preventing ecological disasters caused by high power transformer damaging"

Contract no. 155/20.07.2006

Stage: IV Studies on the experimental validation of the monitoring methodology. Functionality demonstration
Phase objectives:

- Drawing up an experiment plan. Equipment purchase
- Experiments on the monitoring system within the high voltage laboratory. Functionality demonstration
- Electromagnetic compatibility verifications according to the low voltage directive (LVD) for the monitoring system
- Implementation and experimentation of the system for monitoring the bushings which fit out the power transformers into the power system assets
- Verification of communication and data transfer software
- Corrective actions to the monitoring system for reaching the proposed objectives
- Publication of papers in the field, participation in national and international conferences with a view to preparing the Partnership for participating in the 7th Framework Programme. Achievement of Web page.

Activities :
Activity IV.1: **Drawing up an experiment plan. Equipment purchase**

The project coordinator together with the partners involved in the project have drawn up an activity program able to lead to the verifications of all the modules forming the experimental model with a view to demonstrating the functionality.

Activity IV.2: **Experimentation of the monitoring system within the high voltage laboratory. Functionality demonstration**

The verifications and commissioning of the subassemblies forming the assembly of the system for monitoring the capacitor-bushings which fit out the high power transformers were performed within ICMET.

- current adapters, voltage adapters, monitoring electric switch box;
- signal acquisition and conditioning unit;
- central unit for data processing, storage and transfer

Activity IV.3: Electromagnetic compatibility verifications according to the low voltage directive (LVD) for the monitoring system

The bushing monitoring system was subjected to the following electromagnetic compatibility verifications:

- voltage dips, short interruptions and variation immunity tests;
- verification of the consumed power;
- combined voltage/current pulse (shock wave) immunity tests;
- electrostatic discharge immunity test;
- conducted disturbance measurement

Activity IV.4: **Implementation and experimentation of the system for monitoring the bushings which fit out the power transformers into the power grid assets**

For verifications and experimentations under actual operation conditions, the bushing monitoring system was implemented within a complex system for monitoring the high power transformers from the National Power Grid Company – Transelectrica SA, in the substations from Gutinas, Paroseni, Brazi Vest, Pitesti Sud

Activity IV.5: **Verification of communication and data transfer software**

For verifying the communication and data transfer software, the connection between the central unit and PC is done by using a communication cable RS 232.
The program DPD exe is launched, and if everything is OK, then the main window of survey appears.

Activity IV.6: **Corrective actions to the monitoring system for reaching the proposed objectives**

On the basis of the results got in operation, both hard and soft corrective actions were performed.

For immunity to disturbances, the connection between the monitoring electric switch box and the central unit was done with fiber optic, using two converters RS232/FO. In the electronic diagram of the signal adapting and conditioning unit, resistors were put on inputs, because if there is no input signal on one of the channels, the operational amplifiers enter into saturation, influencing the measurements on the other channels.

For increasing the processing power, the central unit UCV-02 was replaced by a unit type PC104.

Results: studies, execution documentation, functional model, experimental results.

Information dissemination:

1. Publication of papers in specialty reviews.

- Nedelcut D., Sacerdotianu D.,Marinescu A.,Purcaru I, *Monitoring of dielectric losses and own capacity for bushings*- Proceedings of the sixth IASTED International Conference on European Power and Energy Systems, euro PES 2006, pp. 234-239, Compendex
- Nedelcut D., Sacerdotianu D.,Marinescu A., *Monitoring of dielectric losses and own capacity for bushings*- Proceedings of the sixth IASTED International Conference on European Power and Energy Systems, pp. 234-239, Inspec, ISI.
- Nedelcut D., Sacerdotianu D., *Monitoring of dielectric losses and capacitor- type bushings*- Proceedings of the 3rd WSEAS/IASME International Conference on Energy, Environment Ecosystems and Sustainable Development (IEEESD 07)2007, pp. 567-572.Inspec.ISI
- Nedelcut D., Sacerdotianu D.,I*nfluence of electric substation disturbance on dielectric dissipation factor variation at bushings*- Proceedings of the Seventh IASTED International Conference on Power and Energy Systems, pp. 62-67,Inspec.
- Nedelcut D., Sacerdotianu D., *Monitoring of dielectric losses and capacitor-type bushings,* WSEAS Transactions on Environment and Development, volume 3, May 2007.

2. Participation in national and international conferences with a view to preparing the Partnership for participating in the 7th Framework Programme

- Nedelcut D., Sacerdotianu D., Purcaru Dorina Mioara, *Influence of electric substation disturbances on dielectric dissipation factor variation at bushings,* Spain 2007;
- Nedelcut D., Sacerdotianu D., *Monitoring of dielectric losses at capacitor-type bushings,* International Conference - Energy Environment Ecosystems and Sustainable Development, Crete 2007.
- Iulian Hurezeanu, Nedelcut D., Sacerdotianu D., Dorina Mioara Purcaru, Ion Purcaru, "Excellence research – favourable premise for innovation" edition 2008. *On-line monitoring of the bushings which fit out power transformers.* Brasov, July, 27-29, 2008.

3. Letters Patent: - Marinescu A., Nedelcut D., Sacerdotianu D.,Patru I.,Purcaru I. *Equipment for on-line monitoring of high voltage capacitor-type bushings,* letters patent no.121620 from 28.12.2007.

4. Diplomas and medals

- Gold medal at Invention International Fair PRO INVENT edition VI, 2008 Cluj Napoca.

Conclusions:

By achieving this project, the main objective of the Program CEEx – that one of increasing the international visibility of Romanian research with a view to participating in the programmes FP7 and EUREKA – was reached.

Having in view one of the present research desiderata, regarding the conversion of the research expenses into incomes, the research results within the project have been successfully implemented in the assets from Transelectrica Company, within the National Power Grid.

Achievement of WEB page

http://www.icmet.ro/ceex1_2e.htm