



*Integrated ICT-platform based Distributed Control in electricity grids  
with a large share of Distributed Energy Resources and Renewable Energy Sources*

## DISSEMINATION AND USE PLAN

### Deliverable D10.1

L.F.M. Hamilton

Identifier: INTEGRAL\_D10.1\_1.4

Date: 28-02-2011

Class: Deliverable

Responsible Partners: EnerSearch, with contributions from all partners

Annexes:

1. Public flyer INTEGRAL.
2. Website [www.integral-eu.com](http://www.integral-eu.com)
3. List of publications, talks, meetings

Distribution: PU

Overview: INTEGRAL Dissemination and Use Plan

*This project is funded by the European Commission  
Under the 6th Framework Programme  
(Project FP6-038576)*



---

*INTEGRAL: Integrated ICT-platform for Distributed Control in Electricity Grids*The INTEGRAL consortium consists of:

ECN	Principal Contractor & Coordinator	The Netherlands
NTUA/ICCS	Principal Contractor	Greece
IDEA	Principal Contractor	France
Blekinge Institute of Technology	Principal Contractor	Sweden
KEMA Nederland BV	Principal Contractor	The Netherlands
WattPic Intelligent	Principal Contractor	Spain
EnerSearch AB	Principal Contractor	Sweden
INPGrenoble	Principal Contractor	France
HUMIQ	Principal Contractor	The Netherlands
CRIC	Principal Contractor	Spain
Essent	Principal Contractor	The Netherlands

---

*INTEGRAL: Integrated ICT-platform for Distributed Control in Electricity Grids*Control Versions:

Version	Date	Author	Description of Changes
0.0	18-01-2009	L.F.M. Hamilton	First draft
0.1	28-01-2009	L.F.M. Hamilton	Updated draft
1.0	29-01-2009	L.F.M. Hamilton	Issue for EU
1.1	11-06-2009	L.F.M. Hamilton	Update
1.2	1-02-2011	L.F.M. Hamilton	Update
1.3	17-2-2011	L.F.M. Hamilton	Update
1.4	28-2-2011	L.F.M. Hamilton	Final

## Table of Contents

1.	INTEGRAL Overall Dissemination And Use Approach.....	6
1.1	INTEGRAL vision and value in brief.....	6
1.2	INTEGRAL dissemination and use strategy.....	8
2.	Individual Partner Contributions to Dissemination and Use.....	9
2.1	ECN.....	9
2.1.1	Partner role and nature of intended results.....	9
2.1.2	Target groups for dissemination and use .....	9
2.1.3	Dissemination and use actions.....	10
2.1.4	Planned future dissemination and use activities .....	10
2.2	NTUA/ICCS .....	12
2.2.1	Partner role and nature of intended results.....	12
2.2.2	Target groups for dissemination and use .....	12
2.2.3	Dissemination and use actions.....	13
2.2.4	Planned future dissemination and use activities .....	13
2.3	Blekinge Institute of Technology .....	14
2.3.1	Partner role and nature of intended results.....	14
2.3.2	Target groups for dissemination and use .....	14
2.3.3	Dissemination and use actions.....	14
2.3.4	Planned future dissemination and use activities .....	15
2.4	KEMA Nederland BV .....	16
2.4.1	Partner role and nature of intended results.....	16
2.4.2	Target groups for dissemination and use .....	16
2.4.3	Dissemination and use actions.....	17
2.4.4	Planned future dissemination and use activities .....	21
2.5	WattPic Intelligent.....	22
2.5.1	Partner role and nature of intended results.....	22
2.5.2	Target groups for dissemination and use .....	22
2.5.3	Dissemination and use actions.....	23
2.5.4	Planned future dissemination and use activities .....	<b>Fout! Bladwijzer niet gedefinieerd.</b>
2.6	EnerSearch AB.....	24
2.6.1	Partner role and nature of intended results.....	24
2.6.2	Target groups for dissemination and use .....	24
2.6.3	Dissemination and use actions.....	24
2.6.4	Planned future dissemination and use activities .....	25
2.7	IDEA.....	26
2.7.1	Partner role and nature of intended results.....	26
2.7.2	Target groups for dissemination and use .....	27
2.7.3	Dissemination and use actions.....	27
2.7.4	Planned future dissemination and use activities .....	27
2.8	INPGrenoble.....	30
2.8.1	Partner role and nature of intended results.....	30
2.8.2	Target groups for dissemination and use .....	30
2.8.3	Dissemination and use actions.....	31
2.8.4	Planned future dissemination and use activities .....	31
2.9	HUMIQ .....	34

---

*INTEGRAL: Integrated ICT-platform for Distributed Control in Electricity Grids*

- 2.9.1 Partner role and nature of intended results.....34
- 2.9.2 Target groups for dissemination and use .....34
- 2.9.3 Dissemination and use actions.....34
- 2.9.4 Planned future dissemination and use activities .....35
- 2.10 CRIC .....36
  - 2.10.1 Partner role and nature of intended results .....36
  - 2.10.2 Target groups for dissemination and use .....36
  - 2.10.3 Dissemination and use actions.....36
  - 2.10.4 Planned future dissemination and use activities .....37
- 2.11 Essent New Energy BV .....38
  - 2.11.1 Partner role and nature of intended results .....38
  - 2.11.2 Target groups for dissemination and use .....38
  - 2.11.3 Dissemination and use actions.....38
  - 2.11.4 Planned future dissemination and use activities .....38
- ANNEX 1 – General presentation INTEGRAL .....40
- ANNEX 2 – INTEGRAL website [www.integral-eu.com](http://www.integral-eu.com) .....41
- ANNEX 3 – Summary of Publications, Talks, Meetings .....42

## 1. INTEGRAL Overall Dissemination And Use Approach

This chapter describes the general, consortium-wide dissemination and use approach and actions by the INTEGRAL project as a whole. In the chapter that follows, the partner-specific dissemination and use activities are described for each individual project partner. Finally, the reader will find some samples of dissemination results in the Appendices.

### 1.1 *INTEGRAL vision and value in brief*

The central objective of the INTEGRAL project is to build and demonstrate an industry-quality reference solution for DER aggregation-level control and coordination, based on commonly available ICT components, standards, and platforms.

The aim of the INTEGRAL project is to demonstrate that and how this can be practically achieved in the short to medium time frame. To this end, it will – based on the results of recent and ongoing EU projects – push the envelope much further by the **INTEGRAL solution** that is achieved through the following steps:

1. Define *Integrated Distributed Control* as a unified and overarching concept for coordination and control, not just of individual DER devices, but at the level of large-scale DER/RES aggregations.
2. Show how this can be realized by common industrial, cost-effective and standardized, *state-of-the-art ICT platform solutions*.
3. Demonstrate its practical validity via three *field demonstrations* covering the full range of different operating conditions including:
  - a. *normal* operating conditions of DER/RES aggregations, showing their potential to reduce grid power imbalances, optimize local power and energy management, minimize cost etc.
  - b. *critical* operating conditions of DER/RES aggregations, showing stability also when grid-integrated.
  - c. *emergency* operating conditions, showing *self-healing capabilities* of DER/RES aggregations.

The key result of the INTEGRAL project will be these field demonstrations *plus* their follow-up industrial guidelines, lessons learned, and standardized reference solutions, of what we summarize as *Integrated ICT-platform based Distributed Control (IIDC)* of DER aggregation clusters that successfully work under a wide range of operational conditions in the European grid.

However, it is our view that today the potential stemming from the rapid advances in industrial ICT is not yet fully known, explored and exploited by the utility industry. We believe that there is a lot of mileage to be gained by *combining the capabilities* delivered by two different critical infrastructures: the power grid and intelligent ICT networked systems.

---

*INTEGRAL: Integrated ICT-platform for Distributed Control in Electricity Grids*

Precisely here lies the unique contribution and added value of the INTEGRAL project. There is now a strong RTD need to determine and demonstrate, how one can build an industry-quality and affordable **reference solution** based on available standard components for distributed control, coordination and system-level integration of DER/RES clusters and microgrids. Building upon the many results from recent EU projects, and taking off where these projects have stopped, is precisely what the present project undertakes to do.

Accordingly, the advances made by the INTEGRAL project are:

1. To make a *comparative analysis* of the different agent-based coordination methods in DER/RES distributed control, and how they are to be *designed for integrated operations* with the higher levels of the grid.
2. Show how these DER/RES control concepts can be realized in terms of *commonly available ICT* components and platforms, especially in terms of a Service Oriented Architecture and associated Internet/Web standards.
3. To *determine and demonstrate the validity and value of the proposed INTEGRAL solution under varying field conditions*, operations, and real-time settings, by means of a range of tests and field demonstrations in different countries, and to disseminate this knowledge among relevant industrial partners
4. Summarize the results of this *Integrated ICT-platform based Distributed Control (IIDC)* for DER/RES aggregation control as a standardized reference solution, including how-to-build industrial guidelines based on commonly available, standardized, and affordable ICT platform components.

Thus, the project comprises a combination of research and demonstration activities to establish this IIDC reference solution for DER/RES intimately linked with the wider power grid. These activities will be concentrated upon a selected portfolio of *important operational aspects* of how to run DER/RES integrated with the grid, in particular:

- (a) Self-healing fault handling and automatic grid reconfiguration in the presence of large numbers of DER/RES.
- (b) Optimality of autonomous DER/RES islanded operations in interaction with higher levels of the grid.
- (c) System-level security and protection of DER/RES distributed control information and actions.
- (d) Balancing and trade services with the help of DER/RES clusters and cells.

## **1.2 INTEGRAL dissemination and use strategy**

The INTEGRAL dissemination and use strategy is a combination of consortium-wide and partner specific responsibilities and actions. Its major elements are the following:

1. For external information and promotion purposes by the consortium to the public at large, the above general summary of the INTEGRAL goals and contributions have been laid down in a project slide presentation, and a project website.
2. *“Spreading the word”*: the interaction of distributed intelligence ICT technologies with their application to energy technology and engineering by the utility business requires a special extra effort to explain the general trends, challenges and issues in the area, and to transfer cross-disciplinary expert knowledge between these rather different and still quite separate technical fields.
3. For the companies with strong relations to industry involved in INTEGRAL, the focus of dissemination and use resides in learning from and exploiting successful results ensuing from the project with a view to strengthen the business and enhance the relationships with relevant clients.
4. For the research and university partners in INTEGRAL, the focus of dissemination and use is to strengthen collaboration with industry through practically relevant research results, publicize them professionally, and do so at a large scale wherever possible, and provide new contributions to academic and executive education and expert human resource development.
5. For the consortium as a whole, an active policy is followed of involvement in EU project clustering activities in the area of Smart Energy Networks, whereby INTEGRAL has a special contribution to make regarding ICT and distributed intelligence aspects.

Concerning the first, second and fifth points, a project slide presentation (see Appendix 1), and a project website have already been produced (see Appendix 2) and will be maintained and updated during the project. *“Spreading the word”* is furthermore catered for by our substantial activity in external talks, presentations and PR, as well as by active involvement in project cluster exchange and coordination (point 5), (see Appendix 3).

Concerning the third and fourth points, Chapter 2 discusses the respective efforts of all partners in detail.

In addition to these consortium-wide dissemination actions, each individual partner is concerned with dissemination to and use by specific target groups. The company-specific dissemination and use plans are presented in the next Chapter.

## 2. Individual Partner Contributions to Dissemination and Use

### 2.1 ECN

#### 2.1.1 Partner role and nature of intended results

Together with government and industries, ECN works to achieve (and maintain) sustainable energy resources. Through performing R&D, participating in research and market networks and by sharing results with market players ECN contributes to the efficient use of energy, the accelerated implementation of renewable energy and the cleaner use of fossil fuels. This work concentrates on technologies and research knowledge that will be applied within several years.

In the INTEGRAL project ECN leads the Common Demonstrator Design (WP4) and is involved in the Demonstrator A for e-market and control aspects (WP5).

In these activities the PowerMatcher concept plays a central role. This software agent based concept implements real-time local power markets that allow competitive and/or coordinated operation of controllable loads and distributed generation. It was already developed in the CRISP project and will be further improved in the INTEGRAL project as a main advocate of ultimate customer site integration. The concept implements a market based coordination mechanism for coordination of supply and demand of electricity in networks with a high share of distributed generation.

#### 2.1.2 Target groups for dissemination and use

In the EU there are strict targets for 2020 in terms of energy efficiency increase (20%), carbon dioxide reduction (20%) and energy produced from renewable energy sources (RES) (20%). In certain countries, plans exist to set these targets even higher. The Netherlands, is an example of this approach. Ideally, with a perfect mapping of cost on environmental impact, operating the electricity system using commercial markets would be optimal. However in reality there are a lot of market imperfections and there is no level playing field between different countries.

Stakeholders in the future electricity market will be the energy delivery related parties like **retailers**, **traders** and **prosumers** and the capacity related parties like transmission, distribution operators and – again - prosumers. Benefits for them using the technology developed are different per stakeholder:

For retailers and prosumers, the overall energy bill will be lower due to sharing the revenues of the coordination mechanism. For the program responsible parties and the balancing responsible parties the benefits will come from much more accurate knowledge of their actual market position in real-time as well as the opportunity to foster the benefits of helping to diminish the overall system imbalance (both actively and passively).

As a result of the application of the PowerMatching concept the load-duration on the assets of the distribution and transmission companies (substations, transformers and cables) is lowered and flattened leading to reducing grid losses and increasing the lifetime of components. However the DSO is offered the option to actively decrease the load on network components as well in cases of undesirable overload situations. As a result investments can be deferred and the lead times to new components and, thus, investment horizons in the grids are decreased.

### 2.1.3 Dissemination and use actions

So far, ECN has informed stakeholders about the PowerMatcher development at several international conferences. Among these are the IEEE PES Power and Energy general assembly meeting in Pittsburg, 20-24 July, the IEEE Next Generation Infrastructures conference in Rotterdam, 10-12 November and the 3<sup>rd</sup> Conference on Integration of Renewable and Distributed Energy Resources, December 10-12th, 2008 in Nice. Also a public website has been setup <http://www.powermatcher.net> and a PowerMatcher leaflet has been issued.

Beside ECN, also Infotility/GridAgents, a company based in Boulder (CO) in the USA, has developed a software agent based technology to coordinate the energy demand and supply side to achieve a optimisation objectives in a bottom-up manner. The company is on the forefront of the development of SmartGrids technologies in the US. ECN has agreed a co-operation with this company for comparing results of the coordination of operation of a cluster of electricity demanders and suppliers using software agents.

ECN's aim has developed the PowerMatcher communication and coordination protocols into an energy management standard, which is in the process of being widely accepted and applied by market parties. To create sufficient critical mass and corporate clout, ECN has developed strategic partnerships with a number of industrial and research partners. In parallel to that, ECN is currently performing industry enabling activities aimed at the development of products and applications based on the PowerMatcher Technology. By initiating business case implementations and stimulating other parties in the development of new applications a process towards large-scale market introduction is established.

Target is the reuse of parts of the software components and installed hardware for further use in SmartGrid environments and projects. Technology developed in Integral is also used for offspin projects like a project for an intelligent distribution station, a number of projects related to the use of electrical vehicles and for a project incorporating the connection of a SmartHouse to a SmartGrid. A number of dissemination events has been held to exchange experiences with other projects in the EU Energy and ICT research programs.

The new ICT-framework developed in Integral and especially the PowerMatchingCity field test has been presented to the research and the user community at several levels.

### 2.1.4 Planned future dissemination and use activities

Using the momentum, created by the Integral project, a commercialisation initiative was started with a large software and ICT services provider and some leading appliance and equipment manufacturers, the PMTT, the PowerMatcher technology transition platform. The platform provides the space to co-develop new applications of the technology and to further initiate project initiatives. Some of the first include a successor to the PowerMatchingCity fieldtest with a significantly increased number of nodes and physical grid components included, a contribution to the newly started Ecogrid project, that aims at providing SmartGrid functionality for the isle of Bornholm and the W2E-project, that aims at finding new strategies to involve customers into SmartGrid applications using tariff schemes. All projects are aimed at extending the scope, increasing the number of nodes or increasing the diversity of nodes in a VPP in a PowerMatcher coordinated cluster. Notably in this respect is, that an increase in the number of nodes in the PowerMatcher cluster leads to better optimization opportunities of the VPP due to better functioning of markets. On the other hand, standardisation efforts

---

*INTEGRAL: Integrated ICT-platform for Distributed Control in Electricity Grids*

on the component and the communication protocol level are started up as well. This will allow rollout of PowerMatcher clusters in heterogeneous network environments as well.

## **2.2 NTUA/ICCS**

### **2.2.1 Partner role and nature of intended results**

The Institute of Communication and Computer Systems (ICCS) is a private law body associated with the Department of Electrical and Computer Engineering of the National Technical University of Athens (NTUA). ICCS/NTUA has been established in 1989 by the Ministry of Education in order to carry research and development activities in the fields of tele-communication systems and computer systems and their applications in a variety of applications, such as electric power systems, software and hardware engineering, control systems and biomedical engineering. The Electric Energy Systems (EES) Laboratory of NTUA which is actively involved in the INTEGRAL project has participated in several research projects on the Renewable Energy Sources (RES) and Distributed Generation dates since 1980.

The participation of ICCS in the project is to develop a multi agent system that will enable the operation of a part of the electric grid under critical grid situation by utilising the local distributed energy resources (batteries, photovoltaics, wind turbines and controllable loads). The multi-agent software enables the control of parts of the electric grids in order to support the grid operation when a voltage or a frequency disturbance occurs and ensures the operation of the controlled part in the worst disturbance scenario of islanding. A graphical interface has also been developed for each agent in order to enable the user to monitor the operation of the system. The developed Multi Agent system has been implemented and evaluated within the frame of Demo B test in cooperation with Wattpic and CRIC.

ICCS has experience in Power System Analysis & Operation, research regarding Microgrids as well in developing MAS system for Distributed Generators and implementing them in real test sites. ICCS will provide the necessary software (Multi Agent system and User Interface) and experience for monitoring and controlling the DGs in the test site of Mas Roig.

### **2.2.2 Target groups for dissemination and use**

The target groups for dissemination are related to power system operation, DG and RES as well Multi Agent Systems for Power Systems. More specific Electric Energy Systems (EES) Laboratory collaborates with several other Universities as well Utilities and private companies and will present them the results of the project.

### 2.2.3 Dissemination and use actions

ICCS has informed stakeholders about the Agent Control development at several international conferences. Among these are the IEEE PES Power and Energy general assembly meeting in Pittsburg, 20-24 July, Medpower Agia Napa, Cyprus November 7th-10th, 2010.

Furthermore ICCS organized the E-Energy Conference in Athens 14-15 October 2010. Besides the paper sessions a special Workshop has been organized where the Integral project was presented. The local power utility (Public Power Corporation) considered this concept very interesting.

### 2.2.4 Planned future dissemination and use activities

ICCS will continue to participate in activities involved for dissemination of the project results, including:

- Participation in the creation of leaflets, posters and other general dissemination activities.
- Publications in Journals and Magazines in the area of Power Systems, DG and RES.
- Participation in Conferences.

## **2.3 Blekinge Institute of Technology**

### 2.3.1 Partner role and nature of intended results

Blekinge Institute of Technology (BTH) has a focus on applied IT. This means that the institute has established research and education programmes with a focus on societal as well as scientific aspects on information processing systems. In effect, the strategy of the institute is modeled as a triple helix process based on research, applications and innovation systems.

BTH is WP leader for WP3 *ICT Reference Platform*. Furthermore BTH takes an active part in WP4 *Common Demonstrator Design*, the design and experiments of INTEGRAL Field Demonstrators, specifically WP 7 *Demo C ("self-healing")*, and WP8 *Joint Analysis and Evaluation*. Furthermore, BTH contributes to WP9 *Industrial Integration, Standardization & Guidelines* and WP10 *Dissemination and Exploitation*.

### 2.3.2 Target groups for dissemination and use

International efforts on ICT and future utilities, exemplified by the EU funded Thematic Network *Supporting Energy Efficiency in Smart Generation grids through ICT (SEESGEN – ICT)* within ICT PSP ICT for Energy Efficiency in Smart Grids. BTH is WP leader of WP3 *ICT for Energy Efficiency Monitoring in Smart Grids*.

BTH will participate in upcoming national efforts on *Strategic Research Areas* identified by the Swedish Government, specifically on *Large-scale renewable electricity production and its integration into the electricity network*.

BTH will also participate in take up efforts of INTEGRAL results by Swedish companies. The Experimental Platform EXP-II developed by BTH for INTEGRAL will also be a basis for R&D efforts at BTH on *Engineering Resilient Critical Systems*.

### 2.3.3 Dissemination and use actions

Participation of the SEESGEN-ICT project as above. Development of EXP-II and supporting documentations together with Sony-Ericsson, SEMC Lab, Lund, Sweden.

Participation with KTH in the *European Institute of Innovation & Technology (EIT)* efforts in *KIC InnoENERGY CC Sweden* (URLs: <http://eit.europa.eu/> and <http://www.innoenergy.se/web/page.aspx?pageid=141335&page=1&newsid=69587>)

Two licentiate thesis at BTH during fall 2011:

1. Björn Ståhl: *Exploring Software Resilience*.
2. Shahid Hussain: *Coordination and Monitoring in Smart grids based on Service Level Agreements*,

Publications including:

1. Gustavsson, R. (2007) Sustainable Virtual Utilities Based on Microgrids. Best Paper Award. In *Proceedings of the 3rd International Symposium on Energy, Informatics and Cybernetics (EIC 2007)*. Orlando. USA. Also in *Journal of Systemics, Cybernetics and Informatics*, Volume 6, Number 5. Pp. 53-58, 2008.
2. Gustavsson, R. and Ståhl, B. (2008). Self-Healing and Resilient Critical Infrastructures. *Proceedings of 3<sup>rd</sup> International Workshop on Critical Information Infrastructures Security*. October 13-15, Rome.
3. Gustavsson, R. and Ståhl, B. (2010): The empowered user - The critical interface to critical infrastructures. In *of The Fifth International CRIS conference on Critical Infrastructures – Proceedings Interacting Critical Infrastructures for the 21<sup>st</sup> Century*. Beijing 20-22 September, 2010. IEEE Xplore database.
4. Ståhl, B., Le Thany, L., Caire, R., and Gustavsson, R. (2010): Experimenting with Infrastructures. In *Proceedings of The Fifth International CRIS conference on Critical Infrastructures – Interacting Critical Infrastructures for the 21<sup>st</sup> Century*. Beijing 20-22 September, 2010. IEEE Xplore database
5. Hussain, S. and Gustavsson, R. (2010): Coordinating Energy Based Business Models and Customer Empowerment in Future Smart Grids. In *Proceedings of the First International ICST Conference on E-Energy – E-Energy 2010*. Athens, October 14 – 15, 2010.
6. Peppink, G., Kok, K., Dimeas, E., Hatzparygiouris, N., Hadjsaid, N., Caire, R., Gustavsson, R., Salass, J. M., Niesing, H., Hamilton, L., Akkermans, H., Tena, L, van der Velde, J., Bliet, F. and Eijelaar, M. (2010): ICT-platform based Distributed Control in electricity grids with a large share of Distributed Energy Resources and Renewable Energy Sources. In *Proceedings of the First International ICST Conference on E-Energy – E-Energy 2010*. Athens, October 14 – 15, 2010.
7. Lundberg, J and Gustavsson, R. (2011): Challenges and opportunities of sensor based User empowerment. *Proceedings of 8th IEEE International Conference on Networking, Sensing and Control, April 11-13, 2011, Delft, the Netherlands (ICNSC2011)*.
8. Hussain, S., Gustavsson, R and Svenningsson, D. (2011): Coordination and Monitoring of Smart Grids Enabled by Clusters of Service Level Agreements (SLAs). *Proceedings of 17<sup>th</sup> Power Systems Computation Conference (PSCC'11)*.

#### 2.3.4 Planned future dissemination and use activities

Focus on take-up actions of results from INTEGRAL both in industry and in our education programmes. Publications and activities in the international research community, specifically within the ongoing and upcoming EU FP7 and FP8 programmes.

## **2.4 KEMA Nederland BV**

### 2.4.1 Partner role and nature of intended results

The laboratories of KEMA are amongst the best in Europe and offer unique facilities for specialist measurements and expertise that extends over the entire energy value chain.

KEMA Gas Consulting and Services has devoted itself to the development of new technology since the nineteen-sixties focussed at the continuity and safety of gas supply, optimization of industrial processes, efficient use of (natural) gas and support the transition to a clean sustainable and renewable energy system. The centre has developed many new technologies for private and business markets, industry and the energy sector. The combined knowledge of KEMA and it's years of practical knowledge make the institute a unique partner in energy technology.

KEMA has a long tradition in the development of safe, comfortable and efficient domestic gas applications. In the early eighties KEMA has developed the condensing boiler and our current efforts in this field are focussed on its natural successor micro-CHP. Current activities are focussed on supporting manufacturers in optimization of their systems and adaptation to the north-west European market. Moreover potential market threads as well as opportunities for micro-CHP are addressed via field trials and with energy related companies, research and consultancy institutes.

KEMA is the work package leader of WP5: demonstration of an intelligent network under 'normal' operations together with ECN, Essent and Humiq. KEMA already has a strong background in field trials and demonstration of Smart Power together with ECN and/or Humiq. Humiq is fulfilling the role of system integrator, ECN provides the Power Matcher technology and Essent takes the role of the utility. The combined expertise of these parties allows the demonstration of a complete integrated cutting edge future intelligent network demonstration under realistic conditions.

This will provide KEMA's primary stakeholder deep insight into the development of future energy profiles in the domestic market especially the demand for (natural) gas, it offers new opportunities to stabilize the energy system as a whole and offers Gasunie the opportunity to support the energy transition and the EU five times 20 target (20% increase in energy efficiency, 20% energy production from renewable energy resources and 20% reduction of CO<sub>2</sub> emmissions).

### 2.4.2 Target groups for dissemination and use

The dissemination activities of KEMA are focussed on the following target groups:

- Primary Stakeholder N.V. de Nederlandse Gasunie
- Local and Central Governments
- Energy & Utility companies
- Universities as well as Research and Consultancy firms
- Manufacturers and Installation companies
- Students

### 2.4.3 Dissemination and use actions

So far, KEMA has informed stakeholders and major target groups about the opportunities, possibilities and contribution to the 5 times twenty target of the EU by Intelligent networks and the role of DER/RES devices with micro-CHP and heat pumps in particular. As well as the market implications of the introduction of intelligent networks and the Power Matcher concept in particular.

This has been done by contributions to several international conferences, forum discussions, lecturing at universities and moreover by direct knowledge transfer by participation of various target groups in the field test itself. Among these are, the IGRC (International Gas Union Research Conference, 2008) in Paris and the 3<sup>rd</sup> Conference on Integration of Renewable and Distributed Energy Resources (2008) in Nice.

Moreover KEMA offers the opportunity of participation and education of students via a joined research institute 'RenQi'. This institute is founded by KEMA, TNO and Hanze Hogeschool (University of applied sciences) and facilitated by KEMA. Currently several sub project of WP5 are carried out by students offering them a great opportunity to develop and contribute to future energy systems.

The list of Symposia & Conference Contributions of KEMA is extensive:

#### 2009

- [1] **CIREC 2009**, "Field-test upscaling of multi-agent coordination in the electricity grid", Bart Roossien, Prague, Czech Republic, June 2009.
- [2] **IRES-2009**, Rene Kamphuis, Berlin, Germany November 2009.

#### 2010

- [3] **Mini Symposium**, "*Official Opening PowerMatching City*", Groningen, The Netherlands, March 2010
- [4] **IIR Slimme Energie Infrastructuur**, "*PowerMatching City*", Frits Bliet, Soesterberg, The Netherlands, Februari 2010
- [5] **Dutch expo 2010**, Provincie en stad Utrecht, 2010, "*Centralized energy supply or distributed energy center?*", Rene Hooiveld, Shanghai.
- [6] **I-SUP 2010**, "Intelligent Heating Systems in Households for Smart Grid Applications", Bart Roossien, Brugge, Belgium, April 2010.
- [7] **EU Expo 2010**, "*PowerMatching city: an example of smart community in Europe*", Rene Hooiveld, Shanghai.
- [8] **Asia pacific dialogue on clean energy governance and regulation 2010**, "*Powermatching city: the first european city test for a smart power grid*", Rene Hooiveld, Manilla.
- [9] **COGEN Europe**, "How Smart Grids and micro CHP work together in 21ste Century", Frits Bliet, July 2010

---

*INTEGRAL: Integrated ICT-platform for Distributed Control in Electricity Grids*

- [10] **Electricity Innovation Smart Grid Conference**, "*Smart Grid Dynamics in the Netherlands: PowerMatching City & How to Define a Smart Grid*", Frank Lim, Seoul, South Korea, July 2010.
- [11] **Smart Grid Australia**, "Smart Grids in Europe", Pier Nabuurs, September 2010, Australia.
- [12] **SORCER workshop**, "*PowerMatching City*", Frits Verheij, Apeldoorn, The Netherlands, September 2010.
- [13] **HVC congres**, "*PowerMatching City a Living Lab Smart Grid Demonstration*", Frits Bliet, Zaanstad, The Netherlands, September 2010.
- [14] **IIR Business en IT-architectuur in de energiesector**, "*Proeftuin Smart Grid Groningen (Hoogkerk)Praktijkcase*", Albert van den Noort, September 2010.
- [15] **Kivi Niria Jaarcongres**, "A Living Lab Smart Grid Demonstration", Pier Nabuurs/Frits Bliet, Arnhem, The Netherlands, October 2010.
- [16] **IEEE Conference ISGT**–"PowerMatching City, A living lab smart grid demonstration"- Frits Bliet, Goteborg, Sweden, October 2010.
- [17] **e-Energy**, "Market optimization of a cluster of DG-RES, micro-CHP, heat pumps and energy storage within network constraints: The Power Matching City field test", Rene Kamphuis, Athens, Greece, October 2010.
- [18] **Klimaatcongres 2010**, "Alles over Smart Grids: PowerMatching City", Albert van den Noort, Utrecht, The Netherlands, November 2010.
- [19] **Smart Grid Smart Utility forum 2010**, "PowerMatching City", Albert van den Noort, Bangkok, Thailand, November 2010.
- [20] **Smart Energy Networks Europe**, "CASE STUDY: Power Matching City - Hoogkerk, The Netherlands ", Rene Kamphuis, December 2010.
- [21] **Energy Delta Convention**, "*PowerMatching City*", Rene Kamphuis, Groningen, The Netherlands, November 2010.

**2011**

- [22] **Ronde tafel "Smart Grids, hoe nu verder"**, "*PowerMatching City*", Albert van den Noort, Bussum, The Netherlands, January 2011
- [23] **IIR Slimme Energie Infrastructuur**, "*PowerMatching City*", Frits Bliet, Breukelen, The Netherlands, Februari 2011

Also the PowerMatching City activities received many attention from TV, Radio and generated many Newspaper articles:

**Publications – TV/Radio**

- **YTN (Korea)**, "Smart Grids", December 2010
- **France24**, "Europe's Electrical Intelligence", October 2010
- **VNO – NCW**, "Symposium duurzame energie - Item: Smart Grids", June 2010.
- **RTL4**, "RTL News, 20:00 hour", March 2010.
- **RTV Noord**, "Duurzame proef in Hoogkerk Europese primeur", Februari 2010.
- **OogTV**, "Woningen in Hoogkerk energiezuinig gemaakt", Februari 2010.
- **NOS**, "Slimme wasmachine weet wanneer stroom goedkoop is", Februari 2010.
- **NOS**, "CV's die stroom opwekken in Hoogkerk", Februari 2010.
- **EenVandaag**: "Energie verspreid volgens internetprincipe", November 2009.

**Publications – Newspapers**

- **Leeuwarder Courant**, "*Een slim energienetwerk in Groningen*" – Dirk van der Meulen, 20 augustus 2010.
- **Algemeen Dagblad**, "*Slim energiegebruik in nieuwe Groningse wijk*" – 9 maart 2010
- **Dagblad van het Noorden**, "*Slimme Energie en knappe mannenkoppen*" – Anita Pepping, 10 maart 2010
- **Dagblad van het Noorden**, "*en ook nog sneller warm water*" – Hans Knijf
- **Gelderlanders**, "*KEMA realiseert energieproject in Groningen*" – 18 februari 2010.
- **NRC**, "*Liever wassen als het waait*" – Warna Oosterbaan
- **Trouw**, "*Buurvrouw heeft u misschien een kopje stroom voor me*", Ellis Ellenbroek, 13 march 2010.
- **Volkscrant**, "*Hyves voor energie is toekomstbeeld, Groningen begint proef met huizen als energiecentrales*", Rene Didde, 6 march 2010.
- **Parool**, "*Elektriciteit kopen bij de burens, Groningen heeft de wereldprimeur: een slim energienet dat zelf stroom inkoopt*", Jan Libbenga, 24 april 2010.

**Publications – Magazines**

- **Installatie Journaal**, "Thema Duurzaam: De Eerste PowerMatching City in de Wereld" June/July 2010.
- **Power-gen Worldwide**, "Implementing micro-CHP within a Smart Grid", May 2010.

---

*INTEGRAL: Integrated ICT-platform for Distributed Control in Electricity Grids*

- **Energie Nederland (EnergieNed)**, "KEMA-Proef in Hoogkerk is een opmaat voor toekomstige smart grids" – Alexander Haje – April 2010
- **Smart Grids Today**, "*KEMA touts microgrid trial in Netherlands city of Hoogkerk*" – March 2010.
- **Alternative Energie**, ČTVRŤ V NIZOZEMSKÉM GRONINGENU REAGUJE NA POPTÁVKU A NABÍDKU ELEKTRINY
- **Technisch Weekblad**, "Slim Energienet in Groningen", Thomas van de Sandt, March 2010.
- **Transmission & Distribution**, "Full Scale PowerMatching City Goes Live", April 2010.
- **Ingenieur**, "Slimme Stroomprosumenten, Groningse Wijk Speelt in op vraag en aanbod van elektriciteit" – Frank Biesboer
- **Utilities**, "*Huishoudens bezitten sleutel tot slimme netten*", Tseard Zoethout, Februari 2010
- **Stedenbouw en architectuur**, "*Proefproject Smart Grids in Groningen*", Tsaerd Zoethout, Februari 2010.

### **Publications – Internet**

In November 2010 over 18.000 references to PowerMatching City can be found on Google.

### **Tours / Visitors PowerMatching City**

In 2010 over 20 visits by delegations from several national and international governments, companies and research institutes have been hosted.

### **Education**

In 2010 over 25 students have contributed to PowerMatching City:

- "*Designing and Implementation of the Control system for the Remeha e-Vita*", Alaa Alzughayyar, Master Sustainable Energy Technology- UTwente, September – December 2010.
- "*Integration of an existing Capstone microCHP in the Smart Grid of PowerMatching City*", Yorick Jager, Wim Bos, Thijs Dijk, Peter Bolhuis, Martijn Pik, RenQi, Hanzehogeschool, September – Today 2010.
- "*How Flexible is Smart*", Wouter Maas, Master Programma Energy and Environmental Studies, University of Groningen, September 2010

---

*INTEGRAL: Integrated ICT-platform for Distributed Control in Electricity Grids*

- *"Smart Freezer"* – Mark Middelburg, Chiel Datema, Jeroen Etten, Arnold Feenstra, Niels Gibcus, Jeroen Koekoek, Jasper van de Straat, Erik Waals, Slava Gutman, RenQi, Hanzehogeschool, Februari 2010.
- *"PV system optimization and power prediction according to local weather forecast"*, Nsengiyumva Arthemon & Semukanya Jacques, IPGD Course 2009, Hanzehogeschool, July 2009.
- *"Smart Freezer & Capstone"*, Arnold van der Drift, Bart Tenfelde, Hanzehogeschool, Februari 2010 – Juli 2010
- *"Integratie Capstone C30 gasturbine in Integral netwerk"*, Rob Eerland, Hogeschool Windesheim, Augustus 2009 - Januari 2010

#### 2.4.4 Planned future dissemination and use activities

KEMA aim is to develop models of future energy demand, energy infrastructures and market mechanisms supported by open standardized communication and coordination protocols. KEMA is performing industry enabling activities aimed at future proof energy efficient energy conversion and (natural) gas applications that contribute to a reliable and sustainable energy infrastructure. Our activities are based on strategic partnerships in the industry stimulating in the development of new energy efficient applications towards an integrated sustainable and renewable energy system.

KEMA continues following activities for dissemination of the project results:

- Publications in Journals and Magazines in the area of Energy, Power Systems, DG and RES.
- Participation in Conferences
- Supporting demo site visits. For this purpose KEMA has constructed a demo site in its laboratory where all applications of the field trial are live demonstrated and their interaction with each other.

## **2.5 WattPic Intelligent**

### 2.5.1 Partner role and nature of intended results

Founded in 2004, WATTPIC Energia Intelligent is a technology-based company working in the field of distributed sustainable energy. WATTPIC strives to a new energetic model based on local resources and intelligent demand side management. WATTPIC introduces innovative technologies into the market with a clear focus on safe, clean and secure energy. WATTPIC promotes the development of distributed energy generation systems and market introduction. WATTPIC is located in Barcelona and has an international branch in Amsterdam. The company main expertise focuses on generation, management and consumption of energy. WATTPIC is specialised in photovoltaic energy projects and realises both grid connected and autonomous installations. WATTPIC has broad experience in various distributed generation applications. WATTPIC participates in different EU funded research FP6 projects.

Core company brand is the Autonomous Solar Source technology (FSA system). This brand has resulted in the market introduction of various innovative solar energy products in the European market. Examples are the FSA Centaurus and FSA Classic, rotating PV structures, working both grid connected and stand alone. Wattpic introduces the combination of analysing technologies, economics and simple functionality in order to develop advanced energy systems. Core activities include developments regarding energy generation and intelligent agents steering and optimising these processes. WATTPIC develops, develops and applies a variety of products and services dedicated to sustainable energy production.

WATTPIC is as partner in INTEGRAL hosting the Demonstration B site with the adaptation of the distributed control system by using multi agent systems and hardware system (Zig Bee system). WATTPIC collaborates with NTUA and CRIC for the proper setup, testing and analysis of this demonstration site within INTEGRAL. Contribution to the configuration of the distributed multi agent system in a real life situation and the communication technology are core activities. Translation of the R&D objectives into an experimental test site without aggravating its operational functioning is a key activity in the project.

### 2.5.2 Target groups for dissemination and use

The identified target groups by WATTPIC for the INTEGRAL project are:

Innovative operating entities, which can collaborate in further development of INTEGRAL technologies, or contribute to the market uptake, such as: Universities, knowledge centres, innovation oriented companies, ICT and energy targeting programmes, (national and regional) governments interested in energy innovation programmes etc. With a special attention for innovative energy/IT based companies, working in the field of Distributed Generation.

Three aspects can be distinguished in the dissemination activities, 1) the energy components regarding the demand and offer tuning and their prediction to the contribution of intelligent, distributed grids and the handling of critical situations, 2) the Intelligence component (algorithms and programming) deciding the overall grid management/control and 3) the communication technology between energy consumers, producers and carriers.

---

*INTEGRAL: Integrated ICT-platform for Distributed Control in Electricity Grids*

Each of the mentioned aspects are of interested regarding the results of the Demo B site results and are objective of dissemination use and publication.

### 2.5.3 Dissemination and use actions

WATTPIC has published a short leaflet in November 2007, a general poster in 2008 and various local information boards describing the main objectives of INTEGRAL, the partners and the foreseen activities. This was distributed at various occasions.

In several of the below given presentations the INTEGRAL project was presented and served as example of demonstrating Distributed Generation:

- Summit for Europe conference (Nov 2007, Andorra) Presentation by Hugo Niesing, Innovative Energy Management, Ideas Operational experiences and suggestions..
- European Sustainable Energy Week (EUSEW 31 Jan – 1 Feb, Brussels). Participation at: Perspectives for Renewable Energy Development – Recent Findings from Germany and the IEE presentation.
- Solar 2008, The annual solar conference in United States, (May 5-9, San Diego USA California). Poster presentation and fact sheets on stand.
- DERBI 2008, conference in Perpignan, France June 2008. INTEGRAL poster presentation and fact sheets on stand.
- Annual European solar conference, Valencia 1-5 September Poster presentation and fact sheets on stand.
- PV Tech 2008, Annual conference regarding renewable energies (PV) and technological innovations, Milano November 2008. Poster presentation on INTEGRAL.
- GENEDIS 2009, The First Congress on Distributed Generation in Spain, Madrid. Presentation by Pep Salas. INTEGRAL PROJECT Integrated ICT-platform based Distributed Control (IIDC) in electricity grids with a large share of Distributed Energy Resources and Renewable Energy Sources.
- November 2010 a presentation is given at the Energy Delta Convention in Groningen <http://www.rug.nl/energyconvention/index>

## **2.6 EnerSearch AB**

### 2.6.1 Partner role and nature of intended results

The role of EnerSearch in the INTEGRAL project is leading the Work package on dissemination and exploitation (WP10). It follows from the EnerSearch mission that dissemination of produced knowledge on IT and Energy is a key function for EnerSearch.

The main mechanisms to do so are:

- Promoting awareness and knowledge exchange on business and technology trends and issues in IT in Energy. This is done through organizing a variety of events, meetings, talks, and publications targeted at stakeholders in industry, academia and policy-making.
- Publicizing recent advances in IT in Energy research and industrial innovation and enhancing their visibility through appropriate industrial, academic, and electronic public media.
- Playing an initiating and strengthening role in establishing RTD collaboration and exchange between industry and academia in Europe, crosscutting the traditional disciplinary and organizational boundaries existing in the fields of energy and IT.

These are also the main channels through which EnerSearch will disseminate the results of the INTEGRAL project.

### 2.6.2 Target groups for dissemination and use

For EnerSearch, the main target groups for the dissemination and use activities are:

- Companies in the utility and IT industry.
- The energy and related IT industry sector in Europe.
- Research, technology, and policy organizations and individuals in the area of ICT and Energy.

### 2.6.3 Dissemination and use actions

To support the dissemination activities of the consortium as a whole, the INTEGRAL public *website* ([www.integral-eu.com](http://www.integral-eu.com)) has been activated and an INTEGRAL *project presentation* (slides) have been produced (see the Appendix).

EnerSearch is making strong efforts to present and promote the INTEGRAL-related topics to a significant number of parties outside the project. These activities are very successful and attract a significant audience. Invited talks and meetings where results of INTEGRAL were presented by EnS were:

- Presentation held at EU Project Cluster Workshop, Frankfurt, Germany, 25 June 2008
- Contribution to conference presentation and preparation of poster presentations at the 3rd International Conference on Integration of Renewable and Distributed Energy Resources ;10-12 December 2008 in Nice, France.

---

*INTEGRAL: Integrated ICT-platform for Distributed Control in Electricity Grids*

- Invited talks at Innsbruck (20 August 2008), Zoetermeer 2 December 2008
- Meeting EU taskforce on ICT and Energy, Brussels 11 June 2008
- VITO, Mol, Belgium, 24-26 Feb 2009
- EU DELLIISS Service Innovation ThinkTank meeting, Amsterdam, NL, 12 June 2009
- Service Science Second Summit, Karlsruhe, Germany, 25 June 2009
- Smart Grids Summit, Rotterdam, the Netherlands, 15 Sep 2009
- ADINE Workshop, Tampere, Finland, 17 Feb 2010
- ADDRESS Workshop, Paris (EDF, Clamart), France, 09 June 2010
- Service Value Networks workshop (keynote), Dagstuhl, Germany, 26 July 2010
- e-Energy Conference, Athens, Greece, 15 Oct 2010
- EDC Conference, Groningen, the Netherlands, 23 Nov 2010

Furthermore, EnerSearch produced:

- Newsletters on INTEGRAL results that were distributed at the above-mentioned meetings, and also available from the website.
- A set of professional videoclips on smart energy networks, the first one made ready for presentation at the 4th Int. Conf. on Integration of DER/RES, Albuquerque, NM, United States, 6-10 December 2010.

Finally, in terms of exploitation as follow-up after the INTEGRAL project, we are involved in:

- International industrial executive master education in Service Science (in a collaboration of universities and institutes in Luxembourg, Geneva, Porto, Barcelona, Brno, and Amsterdam), where in the Amsterdam week attention is paid to Smart Grids as an important case in service innovation
- The municipality of Amsterdam (with partners such as Alliander, ECN, IBM, the universities (VUA and UvA), Amsterdam Smart City, CapGemini, Amsterdam Innovation Motor, Green ICT Foundation NL, etc.) is currently planning a big follow-up project of INTEGRAL where an order-of-magnitude scale-up (order 1000 connections) compared to the Hoogkerk field experiment of INTEGRAL is envisaged, in the newly established Science Park Amsterdam (Watergraafsmeer South-East region in Amsterdam). This activity is planned as part of the Economic Development Board Amsterdam *flagship* projects (EDBA, chaired by the Mayor of Amsterdam that is drafting a Knowledge and Innovation Agenda for the Amsterdam Metropolitan Region).

#### 2.6.4 Planned future dissemination and use activities

Scheduled activities for dissemination are:

- Keep public website [www.integral-eu.com](http://www.integral-eu.com) with demo site descriptions and produced output/results available for the public;
- Make available the video materials, presenting the INTEGRAL objectives, showing the workings of the demonstrators and achieved results.

## **2.7 IDEA**

### 2.7.1 Partner role and nature of intended results

IDEA (*Inventer la Distribution Electrique de l'Avenir*) is a collaborative RTD centre founded by INPG, EDF, and Schneider in Grenoble (F) investigating the Electric Power Distribution of the Future. The main axe is based on technical expertise, system modelling and simulating and analysis, but includes also economical, market and ICT aspects. IDEA based on an advanced and innovative vision of the electric distribution network, mainly studies distribution networks including distributed generation, in order to help his partners measure and understand the stakes of the current and future evolutions in these fields.

Indeed the principal vocation of IDEA is to work for and with his partners. It also gets involved in other outside projects. Therefore, IDEA is regularly present in European contracts and keeps regular contacts with various research organisations and companies in order to offer them its know-how in the research of solutions and innovating developments. At the same time it increases its knowledge by an intellectual, scientific and technical opening toward foreign countries.

IDEA has got the most recent and optimised tools for validation and experimentation in the field of modelling and the studying of electric systems. These tools help it to improve its skills and its comprehension of the physical or economical phenomenon to be developed. Moreover, the simulation in real time, in laboratory giving the possibility to test and validate the behaviour of some network materials, IDEA has access to a digital micro network and to an analogical micro network which allows it to study the interactions between network materials and an actual network.

Besides its research activities and anticipation, IDEA actively transfers knowledge and skills, by taking part in the training programs through professional instructors and professors who intervene in many French and international universities, but also in the organisation of seminars of formation or in participating as contributor in meetings or in formations organised by other entities all over the world.

The role of IDEA in the INTEGRAL project is leading the WorkPackage 2 (WP2) on "High level functionalities definition and Integrated Distributed Control Concept for future distribution network". These issues are also the advantage skills of IDEA that have been established for many years through various research projects on distribution networks with EDF and Schneider Electric.

The nature of intended results consists of:

- Developing their knowledge about electric distribution network on the new paradigm of high level autonomous with the significant integration of novel ICT system and controllable DG-RES. Thereby, to adapt their equipment and operating mode to the new constraints of distribution network.
- Promoting awareness and knowledge exchange on business and ICT trends and issues from others partners.
- Playing an initiating and strengthening role in establishing RTD collaboration and exchange between industry and academia in Europe, crosscutting the traditional disciplinary and organizational boundaries existing in the fields of energy and IT.
- Setting some new training courses and specially benchmark and labs within the Grenoble InP energy engineering school in line with the state of the art of the research and the forecasted systems for future distribution energy networks.

## 2.7.2 Target groups for dissemination and use

For IDEA, the main target groups for the dissemination and use activities are:

- Its own shareholding companies in the utility, its own founded actors: Grenoble INP, EDF (major distributor of electric energy in France, directly impacted by the novel technologies), Schneider Electric (as a major worldwide provider of power and control grid components),
- The energy and related IT industry sector in Europe.
- Research, technology, and policy organizations and individuals in the area of ICT and Energy.

## 2.7.3 Dissemination and use actions

IDEA has informed industrial stakeholders (EDF, Schneider Electric) and other power research team in Grenoble-INP about the contribution of IDEA into INTEGRAL project. The opportunities and possibilities to increase and to strengthen the cooperation with the European partners, which work closely in power system and ICT domain, have been addressed in some periodic conference meeting.

IDEA has presented the objective and the target of the demonstrator about emergency operation in distribution network, which will be carried out in Grenoble within INTEGRAL Project. This demonstrator will be a proof of feasibility stage which will be able to allow commercial uses afterward.

For the others partner of INTEGRAL project, IDEA has already carried out the following dissemination (status February 2011).

- Deliverable 2.1: High-level specification of the functionalities for novel electricity distribution grid control.
- Deliverable 2.2: Guidelines for practical algorithm implementation
- Deliverable 4.3: Demo C design for Self Healing Advance Distribution Automation Validation
- Deliverable 7.1: Functional & Technical specifications for self healing test site
- Deliverable 7.2 Technical and Specification for fault location algorithms using decentralized measurement
- Deliverable 7.3 Self Healing philosophy and operation process (automatic reconfiguration based on fault location outputs)
- Deliverable 7.4 Self-Healing analysis performance report (to be issued in march 2011)

## 2.7.4 Planned future dissemination and use activities

Two articles were accepted in major power system conferences (co-written with Grenoble InP and with BTH, in few cases):

(1)T. L. Le, Q.T Tran, O. Devaux, O.Chilard, R.Caire, « Reduction and aggregation for critical and emergency operation of distribution network in presence of distributed generators », 20<sup>th</sup> CIREN Conference, Prague, 8-11 June 2009

- [CIREN](#), the major International Electricity Conference & Exhibition is the leading Forum where the Electricity Distribution Community meets every two years in various venues in Europe, with a world-wide perspective and participation. The 2009 CIREN Conference is the 20th in the series and will fittingly take place in Prague, known as “The Heart of Europe”, at the Prague Congress Centre. It will be from the 8<sup>th</sup> to the

---

*INTEGRAL: Integrated ICT-platform for Distributed Control in Electricity Grids*

11<sup>th</sup> of June 2009. The article in promoting the aggregation of DER and others grid areas for fast exchange of data between agents.

(2) Thanh Luong LE, R. Caire, B.Raison, S.Bacha, F.Blache, G.Valla, « Test bench for Self-healing Functionalities Applied on Distribution Network with Distributed Generators », IEEE Bucharest PowerTech Conference, 28<sup>th</sup> June – 2<sup>nd</sup> July 2009, Bucharest, Romania.

- The Bucharest [PowerTech](#) Conference continues the tradition of the Power Tech Conferences held in odd years in Athens, Stockholm, Budapest, Porto, Bologna, St. Petersburg and Lausanne. PowerTech is the anchor conference of the IEEE Power & Energy Society in Europe It is intended to provide a forum for scientists and engineers interested in electric power engineering to share ideas, results of their scientific work, to learn from each other as well as to establish new friendships and rekindle existing ones. The article is presenting the managerial network mandatory to validate the self healing concept with real grid components and our proposed ICT common framework.

(3) : C. Kieny, N. Hadjaid, B. Raison, Y. Besanger, R. Caire, D. Roye, T. Tran-Quoc, O. Devaux, G. Malarange, "Grid Security Management with High DG Penetration Rate: Situation in France and Some Future Trends", IEEE/General Meeting/, Panel Session, Pittsburgh, Pennsylvania, USA, June 2008

- - The [2008 General Meeting](#) features a comprehensive technical program that is focused on significant issues facing the global community of power and energy professionals. The intent of the meeting is to provide an international forum for attendees to promote, share and discuss a myriad of ongoing developments that relate to today's power and energy industry. This panel session article is presenting the needed development in ADA function such as voltage management, reconfiguration and post fault restoration, linked with the interdependency with ICT infrastructure.

(4) : N. Hadjsaid, R. Caire, B. Raison "Decentralized Operating Modes for Electrical Distribution Systems with Distributed Energy Resources", IEEE PES General Meeting 2009, 26 - 30 July 2009, Calgary, Alberta, Canada

- The [2009 General Meeting](#) was scheduled for July 26-30, 2009 at the Calgary Telus Convention Centre in Calgary, Alberta, Canada. The conference, with its theme "Investment in Workforce and Innovation for Power Systems", will provide an international forum to address policy, infrastructure and workforce issues. During the meeting, many high-quality technical sessions and tours, committee meetings, networking opportunities and more were presented. This panel session article is presenting the opportunity to create the demo C test bench for ADA function testing.

(5) : B. Stahl, L. Le Thanh, R. Caire, R. Gustavsson, "Experimenting with Infrastructures", The Fifth international CRIS conference on Critical Infrastructures, NCEPU, Beijing, 20-22 September 2010

- The [5th CRIS conference](#) follows a series of successful international conferences on the theme of critical infrastructures (Beijing 2002, Grenoble 2004, Virginia 2006, Linköping 2009) in which research workers from several communities come together to discuss the latest studies of vulnerabilities, research challenges, and results within the area of critical infrastructures. Presentation of state-of-the-art research is combined with participation by the audience in which a range of experienced workers from industry, Universities and government organizations as well as vendors and

technology providers exchange their latest findings. This paper presents the ICT infrastructure and adequation to test Self Healing ADA function

(6) : N. Hadjsaid, L. Le- Thanh, R. Caire, B. Raison, F.Blache, B. Ståhl, R. Gustavsson “Integrated ICT framework for Distribution Network with Decentralized Energy Resources: Prototype, Design and Development”, IEEE conference, General Meeting 2010, 25-29 July 2010, Minneapolis, USA, papier invite

- The Power & Energy Society (PES) was proud to be holding its [2010 General Meeting](#) in Minneapolis, Minnesota USA. The technical program theme of “Power Systems Engineering in Challenging Times” was providing a platform through which to offer new insights, innovative ideas and answers to some of the tough questions facing the power industry today. The intent of the meeting was to provide an international forum for attendees to promote, share, and discuss a myriad of ongoing developments that relate to today's power and energy industry. During the meeting, attendees had the opportunity to participate in many high quality technical panel and paper sessions, several tutorials, technical tours, committee meetings, networking opportunities, PES award presentations, social functions, and more. The article was presented in a super session as an invited paper

(7) : L. Le- Thanh, Member IEEE, R. Caire, Member IEEE, D. Thermoz-Liaudy “Real-time communication between MATLAB and IEDs in electrical distribution systems using OPC Technology”, IEEE conference, ICCE 2010 - The Third International Conference on Communication and Electronic, 11 – 13 August 2010, Nha Trang, Vietnam

- The [International Conference on Communications and Electronics \(ICCE 2010\)](#) has been bringing together the world's leading scientists from academia and industry since 2006. Following the previous successful ICCE conferences, ICCE 2010 was focusing on cutting edge research, development, and applications of communications and electronics technologies, and aim at continuing and accelerating the momentum of researching in electronics and telecommunications areas. ICCE 2010 also provided the best and most up-to-date tutorials, research results, industry-oriented technical contents, thereby facilitating a global exchange of ideas and the identification and shaping of future trends and directions on these fields. This paper was presenting hardware parts both on ICT and electrotechnical parts.

## **2.8 INPGrenoble**

### 2.8.1 Partner role and nature of intended results

Grenoble InP through its 30 affiliated laboratories has a long experience and expertise in the area of ICT for energy as well as implementing distributed intelligence into buildings and distribution grids. As such, it has a common industrial research centre with the French utility-EDF and the world wide know manufacturer Schneider Electric in this area. In addition, it has an advanced experimental platform "PREDIS" for distributed energy and smart grids.

Grenoble Institute of Technology (Grenoble-INP) – Grenoble Electrical Engineering Laboratory (G2Elab) is the first French engineering university, both for training and research (30 affiliated laboratories). 1100 engineers are graduated, 350 students receive a Master of Science degree and 150 students their PHD every year. ICT and Energy are two of its most important research topics. The G2Elab research group involved in GRID is the "Electrical systems and networks" group. It has strong industrial and academic links in Europe, USA and Asia. The Network & System Group within G2Elab is particularly involved in researches dealing with the architecture, control and security of the transmission and distribution electrical grids and the devices connected to them (security of power system against terrorist attacks, blackout mitigation strategies, congestion management, power quality, fault isolation), in cooperation with the main TSO and Power companies. The G2Elab is an active shareholder of the International Institute for Critical Infrastructures (CRIS). It was also involved in FP5 "CRISP" project on Distributed intelligence in critical infrastructure for sustainable power, in FP6 "GRID" CA for building an European RoadMap for Future Research in ICT Vulnerabilities of Power System and FP6 "FENIX" IP on new architectures of distribution networks highly dependant from ICT.

### 2.8.2 Target groups for dissemination and use

For Grenoble InP, the main target groups for the dissemination and use activities are:

- Training for his own students (engineer, MSc and PhD).
- Its own shareholding companies in the utility, its industrial partners.
- The energy and related IT industry sector in Europe.
- Research, technology, and policy organizations and individuals in the area of ICT and Energy.

Further Grenoble InP will be able to use his modelling, simulating and experimentation tools to realize basic test and demonstration of specific component (well proportioned to the resources). The PREDIS platform enables to test coupled ICT and electrical infrastructures, through a flexible combination of prototypes, emulation and simulation. More precisely it could provide about the advanced functionalities (as congestion management, fault detection, isolation and restoration, voltage regulation), and about the reconfigurable electrical network necessary for a smarter energy management in the future generation of the electrical grid.

Hence, it will contribute to provide the ICT specifications which enable to build advanced services for the service management from the distributed energy resources located on the end-user side (flexible load, distributed generation including renewable resources or storage through the electrical vehicle) through the future Internet.

---

*INTEGRAL: Integrated ICT-platform for Distributed Control in Electricity Grids*

Grenoble InP will be also involved in Smart Grids national demonstrator(s) (scale 1:1) and will provide all his knowledge and lessons learned during INTEGRAL projects. Test bench will be then also help the sizing of the grid (both protective and fault detection) and ICT components on the scale 1:1 demonstrator(s).

### 2.8.3 Dissemination and use actions

INPG has already carried out the following dissemination and use actions (status February 2011).

- Deliverable 2.1: High-level specification of the functionalities for novel electricity distribution grid control.
- Deliverable 2.2: Guidelines for practical algorithm implementation
- Deliverable 4.3: Demo C design for Self Healing Advance Distribution Automation Validation
- Deliverable 7.1: Functional & Technical specifications for self healing test site
- Deliverable 7.2 Technical and Specification for fault location algorithms using decentralized measurement
- Deliverable 7.3 Self Healing philosophy and operation process (automatic reconfiguration based on fault location outputs)
- Deliverable 7.4 Self-Healing analysis performance report (to be issued in march 2011)

### 2.8.4 Planned future dissemination and use activities

Grenoble\_INP is planning to present and promote INTEGRAL related-topic, particularly the demonstrator C which based on a micro network RD-PREDIS, to show the progress of platform PREDIS at Grenoble. Platform PREDIS was set up on November 15, 2004 by Grenoble-INP to promote innovation, training and experiments on energy distribution. (<http://www.grenoble-inp.fr/>)

Two articles were accepted in major power system conferences (co-written with IDEA (see exploitation plan above) and with BTH, in few cases):

(1) T. L. Le, Q.T Tran, O. Devaux, O.Chilard, R.Caire, « Reduction and aggregation for critical and emergency operation of distribution network in presence of distributed generators », 20<sup>th</sup> CIRED Conference, Prague, 8-11 June 2009

- [CIRED](#), the major International Electricity Conference & Exhibition is the leading Forum where the Electricity Distribution Community meets every two years in various venues in Europe, with a world-wide perspective and participation. The 2009 CIRED Conference is the 20th in the series and will fittingly take place in Prague, known as "The Heart of Europe", at the Prague Congress Centre. It will be from the 8<sup>th</sup> to the 11<sup>th</sup> of June 2009. The article in promoting the aggregation of DER and others grid areas for fast exchange of data between agents.

(2) Thanh Luong LE, R. Caire, B.Raison, S.Bacha, F.Blache, G.Valla, « Test bench for Self-healing Functionalities Applied on Distribution Network with Distributed Generators », IEEE Bucharest PowerTech Conference, 28<sup>th</sup> June – 2<sup>nd</sup> July 2009, Bucharest, Romania.

- The Bucharest [PowerTech](#) Conference continues the tradition of the Power Tech Conferences held in odd years in Athens, Stockholm, Budapest, Porto, Bologna, St.

---

*INTEGRAL: Integrated ICT-platform for Distributed Control in Electricity Grids*

Petersburg and Lausanne. PowerTech is the anchor conference of the IEEE Power & Energy Society in Europe It is intended to provide a forum for scientists and engineers interested in electric power engineering to share ideas, results of their scientific work, to learn from each other as well as to establish new friendships and rekindle existing ones. The article is presenting the analogical network mandatory to validate the self healing concept with real grid components and our proposed ICT common framework.

(3) : C. Kieny, N. Hadjaid, B. Raison, Y. Besanger, R. Caire, D. Roye, T. Tran-Quoc, O. Devaux, G. Malarange, "Grid Security Management with High DG Penetration Rate: Situation in France and Some Future Trends", IEEE/General Meeting/, Panel Session, Pittsburgh, Pennsylvania, USA, June 2008

- The [2008 General Meeting](#) features a comprehensive technical program that is focused on significant issues facing the global community of power and energy professionals. The intent of the meeting is to provide an international forum for attendees to promote, share and discuss a myriad of ongoing developments that relate to today's power and energy industry. This panel session article is presenting the needed development in ADA function such as voltage management, reconfiguration and post fault restoration, linked with the interdependency with ICT infrastructure.

(4) : N. Hadjsaid, R. Caire, B. Raison "Decentralized Operating Modes for Electrical Distribution Systems with Distributed Energy Resources", IEEE PES General Meeting 2009, 26 - 30 July 2009, Calgary, Alberta, Canada

- The [2009 General Meeting](#) was scheduled for July 26-30, 2009 at the Calgary Telus Convention Centre in Calgary, Alberta, Canada. The conference, with its theme "Investment in Workforce and Innovation for Power Systems", will provide an international forum to address policy, infrastructure and workforce issues. During the meeting, many high-quality technical sessions and tours, committee meetings, networking opportunities and more were presented. This panel session article is presenting the opportunity to create the demo C test bench for ADA function testing.

(5) : B. Stahl, L. Le Thanh, R. Caire, R. Gustavsson, "Experimenting with Infrastructures", The Fifth international CRIS conference on Critical Infrastructures, NCEPU, Beijing, 20-22 September 2010

- The [5th CRIS conference](#) follows a series of successful international conferences on the theme of critical infrastructures (Beijing 2002, Grenoble 2004, Virginia 2006, Linköping 2009) in which research workers from several communities come together to discuss the latest studies of vulnerabilities, research challenges, and results within the area of critical infrastructures. Presentation of state-of-the-art research is combined with participation by the audience in which a range of experienced workers from industry, Universities and government organizations as well as vendors and technology providers exchange their latest findings.

(6) : N. Hadjsaid, L. Le- Thanh, R. Caire, B. Raison, F.Blache, B. Ståhl, R. Gustavsson "Integrated ICT framework for Distribution Network with Decentralized Energy Resources: Prototype, Design and Development", IEEE conference, General Meeting 2010, 25-29 July 2010, Minneapolis, USA, papier invite

- The Power & Energy Society (PES) was proud to be holding its [2010 General Meeting](#) in Minneapolis, Minnesota USA. The technical program theme of "Power Systems Engineering in Challenging Times" was providing a platform through which to offer new insights, innovative ideas and answers to some of the tough questions

---

*INTEGRAL: Integrated ICT-platform for Distributed Control in Electricity Grids*

facing the power industry today. The intent of the meeting was to provide an international forum for attendees to promote, share, and discuss a myriad of ongoing developments that relate to today's power and energy industry. During the meeting, attendees had the opportunity to participate in many high quality technical panel and paper sessions, several tutorials, technical tours, committee meetings, networking opportunities, PES award presentations, social functions, and more. The article was presented in a super session as an invited paper

(7) : L. Le- Thanh, Member IEEE, R. Caire, Member IEEE, D. Thermo-Liaudy "Real-time communication between MATLAB and IEDs in electrical distribution systems using OPC Technology", IEEE conference, ICCE 2010 - The Third International Conference on Communication and Electronic, 11 – 13 August 2010, Nha Trang, Vietnam

- The [International Conference on Communications and Electronics \(ICCE 2010\)](#) has been bringing together the world's leading scientists from academia and industry since 2006. Following the previous successful ICCE conferences, ICCE 2010 was focusing on cutting edge research, development, and applications of communications and electronics technologies, and aim at continuing and accelerating the momentum of researching in electronics and telecommunications areas. ICCE 2010 also provided the best and most up-to-date tutorials, research results, industry-oriented technical contents, thereby facilitating a global exchange of ideas and the identification and shaping of future trends and directions on these fields. This paper was presenting hardware parts both on ICT and electrotechnical parts.

Many other articles and specially transactions will be written, presented and Grenoble promote the public results and lessons learned within INTEGRAL from the power system side, those article will be co-signed with both BTH and IDEA partners.

## **2.9 HUMIQ**

### **2.9.1 Partner role and nature of intended results**

With 800 employees, HUMIQ is one of the large independent Dutch software developers. HUMIQ, before named ICT, which was set up in 1978 in a complex world of industrial and technical-scientific computerisation, has become the market leader in the field of embedded software, is strong in technical computerisation and thanks to this and its knowledge of automated processes has acquired a strong position in its field. The most advanced technological developments define its day-to-day work, so that the company operates in environments that are both complex and dynamic. HUMIQ is successful because in these environments it adds value to its clients' processes. HUMIQ meets high standards in the field of project development, so that one of its strengths is being able to guarantee that projects are delivered on time and within budget.

By concentrating on a limited number of market segments, HUMIQ now has a large number of professionals working in them. "Energy and Utilities" is one of those market segments. This focus has enabled HUMIQ to acquire market and product knowledge in these market areas, so that, as well as providing knowledge and managing projects, HUMIQ has developed services that assist its clients in preparing projects, setting up development environments and architectures, carrying out preliminary studies and drawing up specifications.

The main contribution of HUMIQ is in Work package 5 (WP5 Demonstrator A). In WP5 HUMIQ fulfils the role of system integrator, taking care of the complete information- and communication infrastructure. This includes remote reading of smart meters, controlling the distributed energy generators and consumers, controlling the charge process of electric cars, collecting all data in central database and the creation of web portals for different stakeholders.

It follows from the role as system integrator that dissemination is not one of the key aspects of HUMIQ's contribution to the INTEGRAL project. HUMIQ will participate in and contribute to the activities involved for dissemination by Work package 5, and the consortium, for example participation on the creation of leaflets and posters and other general dissemination activities.

### **2.9.2 Target groups for dissemination and use**

For HUMIQ, the main target groups for the dissemination and use activities are:

- Its own shareholding companies.
- Its own employees and shareholders.
- Partners in related projects in which HUMIQ takes part.
- (Potential) customers in the market segment "Energy and Utilities".
- Students.

### **2.9.3 Dissemination and use actions**

---

*INTEGRAL: Integrated ICT-platform for Distributed Control in Electricity Grids*

HUMIQ participated and or contributed to a large part of the dissemination activities performed by the Work package 5 consortium which are mentioned by KEMA in chapter **Fout! Verwijzingsbron niet gevonden..**

Apart from that HUMIQ has carried out the following dissemination and use actions to date:

- Presentation within another project where HUMIQ is involved (SmartProofS).
- Direct mail newsletter "ICT Procos NIEUWSBRIEF", may 2009, Authors Eric Bakker / Johan de Wit.
- Articles within our internal newsletter (issue 61, Author Johan de Wit), read by a lot of colleagues working on location at different customers.
- Articles within our external newsletter (June 2010, Author Johan de Wit), read by a lot of colleagues working on location at different customers.
- Created a leaflet for our sales manager that allow them to bring forward INTEGRAL, and PowerMatching City as a reference project.

Besides HUMIQ actively supported the next groups of students that contributed to PowerMatching City:

- "Integration of an existing Capstone microCHP in the Smart Grid of PowerMatching City", Yorick Jager, Wim Bos, Thijs Dijk, Peter Bolhuis, Martijn Pik, RenQi, Hanzehogeschool, September 2010 – January 2011.
- "Smart Freezer" – Mark Middelburg, Chiel Datema, Jeroen Etten, Arnold Feenstra, Niels Gibcus, Jeroen Koekoek, Jasper van de Straat, Erik Waals, Slava Gutman, RenQi, Hanzehogeschool, Februari 2010.
- "Smart Freezer & Capstone", Arnold van der Drift, Bart Tenfelde, Hanzehogeschool, February 2010 – July 2010
- "PowerMatching City Mobile portal", Pablo Feirrer, August 2010 – February 2011

#### 2.9.4 Planned future dissemination and use activities

At present HUMIQ planned the following dissemination and use action:

- More exposure within own organization.
- Dissemination activities towards (potential) customers like energy retailers and net operators, bringing forward INTEGRAL as a reference project.
- A new project based on the Work package 5 results is being defined. HUMIQ will participate in that project.

## **2.10 CRIC**

### 2.10.1 Partner role and nature of intended results

CRIC is a private, multidisciplinary Research Centre based in Barcelona, Spain, founded in 1998. Top-ranked among the most successful European research centres, our R&D services are targeted mainly to small and medium sized enterprises (SMEs) and utilize state of the art technology and innovation to overcome technological problems in a variety of industrial areas. As a result, CRIC projects are near to application, yielding patents or pre-competitive prototypes. They have been involved in several EU funded projects, as well as in National and Regional projects. Particularly, CRIC has been involved in 35 EU funded projects in FP4, FP5 and FP6 (CRAFT, Collective Research projects, Thematic Networks, ETIs...) and it has acted as coordinator in many of them.

CRIC's research activity is focused on the areas of wireless technologies (ZigBee), information technologies and artificial intelligence for industry developments. Multi-agent systems, intelligent agents, expert systems, and natural language processing are all significant fields of interest. They have also been involved in information technologies and artificial intelligence tasks in: 'E-Commerce of bread-making equipment based on an expert system, distributed agents and virtual reality' (E-BREADMAKING), Proposal No Craft-2003-508134; 'Agent-based engineering in a cost-estimation model for composites', (E-COMP) Proposal No Craft-2003-508149.

The participation of CRIC in the project is to the technical development of Demo B site with the adaptation of the distributed control system by using multi agent systems (basis provided by NTUA) and hardware system (ZigBee system).

The results provided by CRIC are the multi agent system associated to each element in the field, plus the ZigBee system associated to each element for control and communication with the real site. CRIC will install these elements in the real Demo B site and test its working feasibility. It will help also in adaptation of the software elements (agents) for each device present in the real world and development and adaptation of the fast control of the ZigBee devices and communication.

### 2.10.2 Target groups for dissemination and use

The target groups are the ones with interest not in electrical distribution, but in distributed control and wireless communication. Two are the main fields of interest for dissemination: i) Wireless and telecommunication and ii) Advanced control programming.

Each of the two groups are interested on the results of the Demo B site results and are objective of use and publication.

### 2.10.3 Dissemination and use actions

CRIC has entered the consortium by autumn 2008, so no dissemination activities have been carried out by CRIC up to date but to include mentions of the project to its public web site.

#### 2.10.4 Planned future dissemination and use activities

CRIC will participate to the activities involved for dissemination by the consortium, including:

- Participation on the creation of leaflets, posters the video, and other general dissemination activities:
- Publications in wireless focused institutions and issues:
  - o On Wireless:
    - Paper on UPF institution events (University Pompeu Fabra – Spain).
    - Issue on IEEE publication.
  - o On energy and control:
    - Energy and Sustainability – July 2009. Bologna, Italy.
    - Innovation – Hannover Messe, 2009.

At present CRIC planned the following dissemination and use action:

- More exposure within own organization.
- Dissemination activities towards (potential) customers in the field of sensor monitoring (applied to energy, transport, agrofood..etc).
- Mention INTEGRAL as a reference project. Presenting a poster in the Genera<sup>1</sup> Workshop that will take place in Madrid, 2011.

---

<sup>1</sup> <http://www.ifema.es/ferias/genera/default.html>

## **2.11 Essent New Energy BV**

### 2.11.1 Partner role and nature of intended results

Essent is the largest energy company in the Netherlands. Belgium is its second home market. In total about 2.6 million private and business customers purchase gas, electricity, heat and energy services from Essent. Next to that, Essent is investing in innovative developments such as e-mobility, through the New Energy business unit. Essent is the leading producer of sustainable energy in the Netherlands.

The objectives for Essent's participation in INTEGRAL are:

1. Further explore the capabilities of demand response and its commercial possibilities in the energy market with respect to
  - a. Electric vehicles
  - b. Micro CHP
  - c. Heat pump
2. Provide a more thorough understanding of the value and integration of distributed energy resources in the electricity system, such as PV
3. Get insight into client perception of demand response systems and human technology interaction.
4. Gain hands on experience in the application of demand response systems
  - a. Gain in-depth knowledge of characteristics of demand response systems for trading purposes.
  - b. Gain knowledge about the implementation aspects of demand response systems
5. Build a showcase for commercial opportunities based on demand response, both Essent internally and externally.

### 2.11.2 Target groups for dissemination and use

The results from especially work package 5 are used internally within Essent and RWE to provide input for business cases and strategic planning. Externally the results are used as a show case of smart grids and automated demand response especially for the government and industry (not only by Essent, but by all partners).

### 2.11.3 Dissemination and use actions

Several presentations are given on congresses. The main part of the dissemination however is done by the knowledge institutes ECN and KEMA. KEMA is organizing tours for both government and industry in order to create an interest to invest in smart grid technology and create momentum within the industry. An example of this is the Dutch Smart Energy Collective.

### 2.11.4 Planned future dissemination and use activities

Essent considers itself as a user of smart grid technology, as automated demand response can provide flexibility to the power system that will be necessary both to accommodate intermittent power sources as well as create additional added value to customers.

---

*INTEGRAL: Integrated ICT-platform for Distributed Control in Electricity Grids*

Essent plans to continue with the Hoogkerk pilot (work package 5) with the same parties involved including the local DSO. The results from work package 5, as well as its infrastructure will be used for a new pilot (PowerMatching City II). This pilot will:

- The number of households and cars will be increased. Especially with electric vehicles to gain more insight in 'smart charging';
- The pilot will be used to test a number of business models and product propositions (for this the portfolio needs to be integrated in both the market settlement processes (allocation /reconciliation) as well as connected to the billing system (real time pricing);
- Gain more insight in multi purpose optimization with the participation of the local DSO;

The results of work package 5 are used as a foundation of this pilot, as well as provide input to several other (e.g. the Task Force 'Intelligent networks' of the Dutch government, and the private consortium 'Smart Energy Collective' that already consists of 29 companies.)

## ANNEX 1 –INTEGRAL FLYER



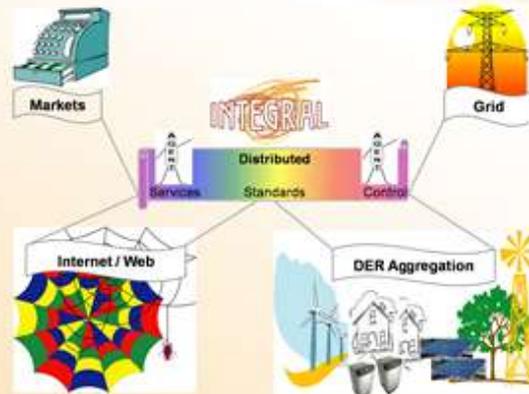
A common integrated ICT platform to implement the Smart Grids of Europe

To follow the EU project INTEGRAL, go to <http://www.integral-eu.com>

Partners



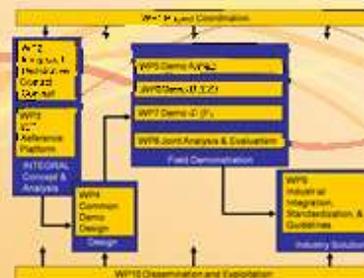
Being smart *and* sustainable is key to the future power networks of Europe. Being a Smart Grid, means to be able to integrate and manage large numbers of distributed energy resources (DER) in real time. Renewable energy sources such as PV, wind, CHP and  $\mu$ -CHP, as well as electrical cars and smart appliances in homes and offices - they all contribute as components of a Smart Grid. The dynamic coordination of active distribution networks, energy trading markets, and active loads of end customers: that's what makes a grid into a Smart Grid.

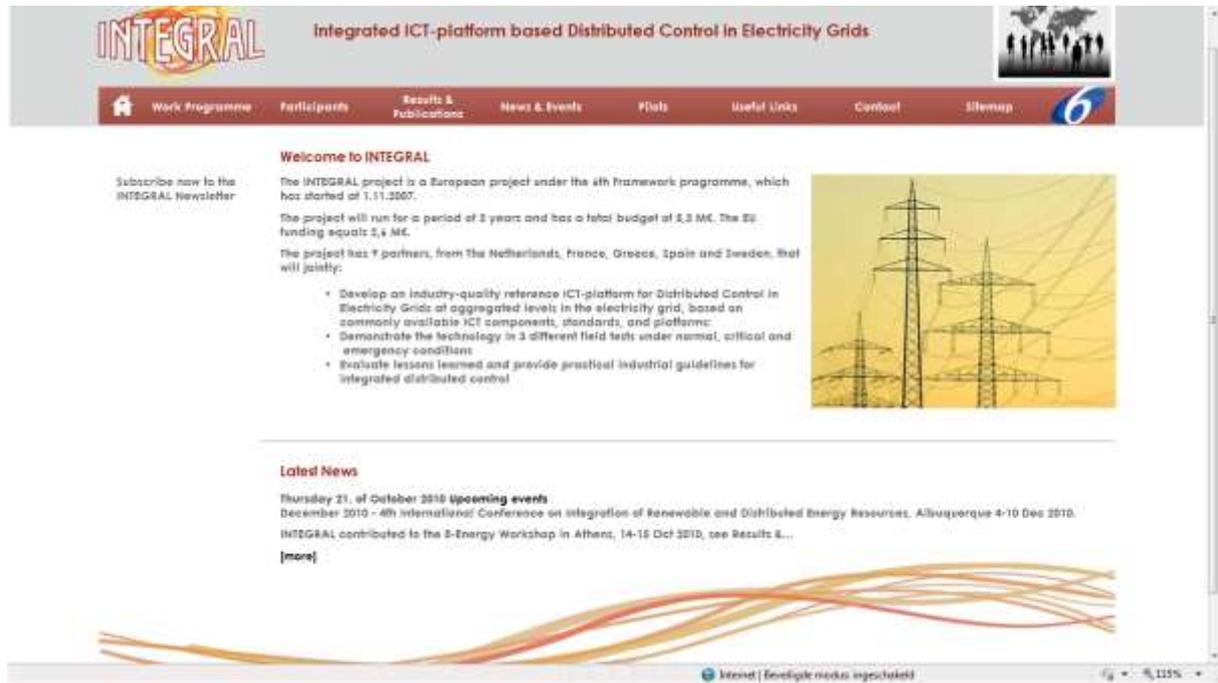


To implement the future Smart Grids of Europe, information and communication technologies (ICT) play a crucial role. This is the focus of the EU project INTEGRAL. It builds and demonstrates an industry-quality reference solution for the aggregation, distributed control and optimal coordination of distributed energy resources.

INTEGRAL demonstrates the practical validity of its Smart Grids ICT architecture and platform through three field demonstrations in different countries, together covering the full range of operating conditions: normal, critical, and emergency conditions.

INTEGRAL is an EU project co-funded by the European Commission (No. FP6-038576), with partners from the Netherlands, France, Greece, Spain and Sweden, and with an overall budget of 5.3 M€. It has started late 2007 and runs until 2011.



**ANNEX 2 – INTEGRAL website [www.integral-eu.com](http://www.integral-eu.com)**

**INTEGRAL** Integrated ICT-platform based Distributed Control in Electricity Grids

Work Programme Participants Results & Publications News & Events Flats Useful Links Contact Sitemap

Subscribe now to the INTEGRAL Newsletter

**Welcome to INTEGRAL**

The INTEGRAL project is a European project under the 6th framework programme, which has started at 1.11.2007.

The project will run for a period of 3 years and has a total budget of 5.3 ME. The EU funding equals 3.6 ME.

The project has 7 partners, from The Netherlands, France, Greece, Spain and Sweden, that will jointly:

- Develop an industry-quality reference ICT-platform for Distributed Control in Electricity Grids at aggregated levels in the electricity grid, based on commonly available ICT components, standards, and platforms;
- Demonstrate the technology in 3 different field tests under normal, critical and emergency conditions;
- Evaluate lessons learned and provide practical industrial guidelines for integrated distributed control

**Latest News**

Thursday 21. of October 2010 **Upcoming events**  
December 2010 - 4th International Conference on Integration of Renewable and Distributed Energy Resources, Albuquerque 4-10 Dec 2010.  
INTEGRAL contributed to the E-Energy Workshop in Athens, 14-16 Oct 2010, see Results &...  
[\[more\]](#)

Internet | Energie netzes integrations | 100%

## ANNEX 3 – Summary of Publications, Talks, Meetings

- Gustavsson, R. (2007) Sustainable Virtual Utilities Based on Microgrids. Best Paper Award. In Proceedings of the 3rd International Symposium on Energy, Informatics and Cybernetics (EIC 2007). Orlando. USA. Also in Journal of Systemics, Cybernetics and Informatics, Volume 6, Number 5. Pp. 53-58, 2008, (BTH)
- Summit for Europe conference (Nov 2007, Andorra) Presentation by Hugo Niesing, Innovative Energy Management, Ideas Operational experiences and suggestions (WattPic)
- European Sustainable Energy Week (EUSEW 31 Jan – 1 Feb, 2008, Brussels). Participation at: Perspectives for Renewable Energy Development – Recent Findings from Germany and the IEE presentation (WattPic)
- Presentation within project consortium SmartProofS, 2008 (ICT)
- Contribution on IGRC (International Gas Union Research Conference, 2008) in Paris (Gasunie)
- Solar 2008, The annual solar conference in United States, (May 5-9, San Diego USA California). Poster presentation and fact sheets on stand (WattPic)
- Presentation held at EU Project Cluster Workshop, Frankfurt, Germany, 25 June 2008 (EnerSearch)
- Meeting EU taskforce on ICT and Energy, Brussels (11 June 2008), (EnerSearch)
- DERBI 2008, conference in Perpignan, France June 2008. Integral poster presentation and fact sheets on stand (WattPic)
- Presentation held at EU Project Cluster Workshop, Frankfurt, Germany, 25 June 2008, (EnerSearch)
- Meeting EU taskforce on ICT and Energy, Brussels 11 June 2008 (EnerSearch)
- C. Kieny, N. Hadjaid, B. Raison, Y. Besanger, R. Caire, D. Roye, T. Tran-Quoc, O. Devaux, G. Malarange, “Grid Security Management with High DG Penetration Rate: Situation in France and Some Future Trends”, IEEE/General Meeting/, Panel Session, Pittsburgh, Pennsylvania, USA, June 2008 (IDEA, INPG)
- IEEE PES Power and Energy general assembly meeting in Pittsburg, 20-24 July 2008 (ECN)
- Annual European solar conference, Valencia 1-5 September 2008 Poster presentation and fact sheets on stand (WattPic)
- Gustavsson, R. and Ståhl, B. (2008). Self-Healing and Resilient Critical Infrastructures. Proceedings of 3rd International Workshop on Critical Information Infrastructures Security. October 13-15, Rome, BTH)
- IEEE Next Generation Infrastructures conference in Rotterdam, 10-12 November 2008, (ECN)

---

*INTEGRAL: Integrated ICT-platform for Distributed Control in Electricity Grids*

- PV Tech 2008, Annual conference regarding renewable energies (PV) and technological innovations, Milano November 2008. Poster presentation on INTEGRAL (WattPic)
- Participation in 3rd Conference on Integration of Renewable and Distributed Energy Resources, December 10-12th, 2008 in Nice (ECN, all)
- Contribution to conference presentation and preparation of poster presentations at the 3rd International Conference on Integration of Renewable and Distributed Energy Resources ;10-12 December 2008 in Nice, France.(All)
- Contribution to conference presentation and preparation of poster presentations at the 3rd International Conference on Integration of Renewable and Distributed Energy Resources ;10-12 December 2008 in Nice, France (EnerSearch)
- Invited talks at Innsbruck (20 August 2008), Zoetermeer 2 December 2008 (EnerSearch)
- GENEDIS 2009, The First Congress on Distributed Generation in Spain, Madrid. Presentation by Pep Salas. INTEGRAL PROJECT Integrated ICT-platform based Distributed Control (IIDC) in electricity grids with a large share of Distributed Energy (WattPic)
- Presentation INTEGRAL at VITO, Mol, Belgium, 24-26 Feb 2009 (EnerSearch)
- Presentation INTEGRAL at EU DELLISS Service Innovation ThinkTank meeting, Amsterdam, NL, 12 June 2009
- Presentation INTEGRAL at Service Science Second Summit, Karlsruhe, Germany, 25 June 2009
- T. L. Le, Q.T Tran, O. Devaux, O.Chilard, R.Caire, « Reduction and aggregation for critical and emergency operation of distribution network in presence of distributed generators », 20th CIRED Conference, Prague, 8-11 June 2009
- CIRED 2009, "Field-test upscaling of multi-agent coordination in the electricity grid", Bart Roossien, Prague, Czech Republic, June 2009. (ECN)
- Thanh Luong LE, R. Caire, B.Raison, S.Bacha, F.Blache, G.Valla, « Test bench for Self-healing Functionalities Applied on Distribution Network with Distributed Generators », IEEE Bucharest PowerTech Conference, 28th June – 2nd July 2009, Bucharest, Romania.
- N. Hadjsaid, R. Caire, B. Raison "Decentralized Operating Modes for Electrical Distribution Systems with Distributed Energy Resources", IEEE PES General Meeting 2009, 26 - 30 July 2009, Calgary, Alberta, Canada (IDEA, INPG)
- Presentation INTEGRAL at Smart Grids Summit, Rotterdam, the Netherlands, 15 Sep 2009
- IRES-2009, Rene Kamphuis, Berlin, Germany November 2009. (ECN)
- Market optimization of a cluster of DG-RES, micro-CHP, heat pumps and energy storage within network constraints: The PowerMatching City field test. René Kamphuis, Frits Bliet, Jorgen van de Velden, Johan de Wit Contribution to IRES-2009, November 2009, Berlin (ECN, HUMIQ, KEMA)
- Ronde tafel "Smart Grids, hoe nu verder", "PowerMatching City", Albert van den Noort, Bussum, The Netherlands, January 2011 (KEMA)

---

*INTEGRAL: Integrated ICT-platform for Distributed Control in Electricity Grids*

- Presentation INTEGRAL at ADINE Workshop, Tampere, Finland, 17 Feb 2010
- IIR Slimme Energie Infrastructuur, "PowerMatching City", Frits Bliet, Soesterberg, The Netherlands, Februari 2010 (KEMA)
- Mini Symposium, "Official Opening PowerMatching City", Groningen, The Netherlands, March 2010 (KEMA)
- I-SUP 2010, "Intelligent Heating Systems in Households for Smart Grid Applications", Bart Roosien, Brugge, Belgium, April 2010 (ECN)
- Dutch expo 2010, Provincie en stad Utrecht, 2010, "Centralized energy supply or distributed energy center?", Rene Hooiveld, Shanghai (KEMA)
- EU Expo 2010, "PowerMatching city: an example of smart community in Europe", Rene Hooiveld, Shanghai (KEMA)
- Asia pacific dialogue on clean energy governance and regulation 2010, "Powermatching city: the first european city test for a smart power grid", Rene Hooiveld, Manilla (KEMA).
- Presentation INTEGRAL at ADDRESS Workshop, Paris (EDF, Clamart), France, 09 June 2010
- N. Hadjsaid, L. Le- Thanh, R. Caire, B. Raison, F.Blache, B. Ståhl, R. Gustavsson "Integrated ICT framework for Distribution Network with Decentralized Energy Resources: Prototype, Design and Development", IEEE conference, General Meeting 2010, 25-29 July 2010, Minneapolis, USA, papier invite (IDEA, INPG, BTH)
- COGEN Europe, "How Smart Grids and micro CHP work together in 21ste Century", Frits Bliet, July 2010 (KEMA)
- L. Le- Thanh, Member IEEE, R. Caire, Member IEEE, D. Thermo-Liaudy "Real-time communication between MATLAB and IEDs in electrical distribution systems using OPC Technology", IEEE conference, ICCE 2010 - The Third International Conference on Communication and Electronic, 11 – 13 August 2010, Nha Trang, Vietnam (INPG)
- B. Stahl, L. Le Thanh, R. Caire, R. Gustavsson, "Experimenting with Infrastructures", The Fifth international CRIS conference on Critical Infrastructures, NCEPU, Beijing, 20-22 September 2010 (IDEA, INPG, BTH)
- Smart Grid Australia, "Smart Grids in Europe", Pier Nabuurs, September 2010, Australia (KEMA)
- SORCER workshop, "PowerMatching City", Frits Verheij, Apeldoorn, The Netherlands, September 2010 (KEMA)
- HVC congres, "PowerMatching City a Living Lab Smart Grid Demonstration", Frits Bliet, Zaanstad, The Netherlands, September 2010 (KEMA)
- Kivi Niria Jaarcongres, "A Living Lab Smart Grid Demonstration", Pier Nabuurs/Frits Bliet, Arnhem, The Netherlands, October 2010 (KEMA)
- IEEE Conference ISGT—"PowerMatching City, A living lab smart grid demonstration"- Frits Bliet, Goteborg, Sweden, October 2010 (KEMA)
- e-Energy, "Market optimization of a cluster of DG-RES, micro-CHP, heat pumps and energy storage within network constraints: The Power Matching City field test", Rene Kamphuis, Athens, Greece, October 2010 (ECN)

---

*INTEGRAL: Integrated ICT-platform for Distributed Control in Electricity Grids*

- Presentation at the Energy Delta Convention in Groningen <http://www.rug.nl/energyconvention/index> , Nov 2010 (WattPic)
- Klimaatcongres 2010, "Alles over Smart Grids: PowerMatching City", Albert van den Noort, Utrecht, The Netherlands, November 2010 (KEMA)
- Smart Grid Smart Utility forum 2010, "PowerMatching City", Albert van den Noort, Bangkok, Thailand, November 2010 (ECN)
- Energy Delta Convention, "PowerMatching City", Rene Kamphuis, Groningen, The Netherlands, November 2010 (ECN)
- PowerMatchingCity fieldtest, René Kamphuis, ECN Efficiency and Infrastructure Intelligent Energy Grids, Petten, the Netherlands 15-11-2010 e-Energy Athens (ECN)
- Coupling the gas, heat and electricity infrastructures, The Power Matching City fieldtest Ren Kamphuis, ECN Efficiency and Infrastructure Intelligent Energy Grids, Petten, the Netherlands Energy Delta Convention, Groningen, 23-11-2010 2010 (ECN)
- Smart Energy Networks Europe, "CASE STUDY: Power Matching City - Hoogkerk, The Netherlands ", Rene Kamphuis, December 2010 ECN)
- Architectural design and first results evaluation of the PowerMatching City field test Ren Kamphuis, Bart Roossien<sup>1</sup>, Frits Bliet, Albert van den Noort<sup>2</sup>, Jorgen van der Velde, Johan de Wit Contribution to IRED-2010, 4-9 December 2010, Albuquerque, US (ECN, HIMIQ, KEMA)
- SmartGrids in action. Power Matching City. René Kamphuis, ECN Efficiency and Infrastructure Intelligent Energy Grids, Petten, the Netherlands Smart Energy Networks Europe, Brussels 30 november-1 december, 2010 (ECN)
- Electricity Innovation Smart Grid Conference, "Smart Grid Dynamics in the Netherlands: PowerMatching City & How to Define a Smart Grid", Frank Lim, Seoul, South Korea, July 2010 (KEMA)
- IIR Business en IT-architectuur in de energiesector, " Proeftuin Smart Grid Groningen (Hoogkerk)Praktijkcase", Albert van den Noort, September 2010 (KEMA)
- IIR Slimme Energie Infrastructuur, "PowerMatching City", Frits Bliet, Breukelen, The Netherlands, Februari 2011 (KEMA)