European Commission

Information Society and Media Directorate – General

SmartCoDe Expert Cooperation Workshop Final Documentation

Project No.:	ICT-2009-247473
Deliverable No.:	D-5.3.3
Deliverable Title:	Expert Cooperation Workshop Final Documentation
Due Date:	M36

Nature:	Report
Dissemination Level:	Public
Author:	Peter Neumann
Lead Beneficiary No.:	1
Lead Beneficiary:	ECN

SmartCoDe has received funding from the European Community's Seventh Framework Programme (FP7/2007-2013]) under grant agreement n° 247473

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1 Introduction

The SmartCoDe delivery D-5.3.3 is the document reporting about the SmartCoDe Expert Cooperation Workshops in 2010 and 2011 and the cooperation with the “Sustainable Energy in Buildings and Urban Areas Symposium” (SEBUA) in 2012 in Kusadasi, Turkey.

Note:

Originally it has been planned to organize yearly SmartCode Expert Cooperation Workshop in 2010, 2011, and 2012 (as described in the Description of Work, DoW).

During the discussion at the SmartCoDe project review in Brussels in April 2012 the coordinator has been asked by the reviewers to cooperate this event with other workshops to foster dissemination of results. Although time for such a cooperation of events was very short, the project was successful and did actually chair a special SmartCoDe session at SEBUA-2012.

2 Workshops

2.1 ECWS 2010

The SmartCode Expert Cooperation Workshop 2010, the first of three workshops throughout the life-time of the project, has been held in Vienna on Nov. 16, 2010.

One of the main goals of the workshops is to connect the project's research to the adjacent research communities. This first workshop therefore had two keynotes and one invited talk from the areas of *Climate Change*, *Energy Storage*, and *Energy Concepts for Large Buildings*. The full program can be seen in figure 2.1.

Agenda

Start	Duration		Titel	Speaker	
8:30	1:00		Registration / Coffee		
9:30	0:10	edacentrum GmbH	Welcome	P. Neumann / Dr. C. Hansen	
9:40	0:45	Vienna University of Technology	**Global Energy Perspectives and the Role of New Technologies**	**Prof. Dr. N. Nakicenovic**	Keynote
10:25	0:30	Quiet Revolution Ltd.	**Energy Forecasting for Distributed Generation in Local Energy Neighbourhoods**	Dr. T. Bertényi	Project Paper
10:55	0:30		Coffee		
11:25	0:30	Austrian Institute of Technology	**Building Simulation and Control**	**Dr. G. Zucker**	Invited Paper
11:55	0:30	ennovatis GmbH	**Smart Energy Management**	**Prof. Dr. F. Schmidt**	Project Paper
12:25	1:20		Lunch / Coffee		
13:45	0:45	Next Energy	**Electric Energy Storage in Smart Buildings**	**Dr.-Ing. B. Lenz**	Keynote
14:30	0:30	Ardaco, s.a.	**Security Considerations for SmartCoDe Network**	J. Hájek	Project Paper
15:00	0:30		Coffee		
15:30	0:30	Vienna University of Technology	**An Architecture for Energy Management in Smart Appliances**	Prof. Dr. C. Grimm	Project Paper
16:00	0:30	Infineon Technologies Austria AG	SmartCoDe - On the Way to a Miniaturised Wireless Sensor Node for Monitoring and Control of Appliances	T. Herndl	Project Paper
16:30	0:10	Closing Words		Dr. C. Hansen	
16:40	0:00	End			

Figure 2.1.1: ECWS 2010 Agenda

The Agenda can also be accessed via:

https://www.fp7-smartcode.eu/events/ecw2010. Abstracts of the talks are directly linked to the titles as well as biographies of some of the speakers.

Rating of the workshop by the 39 registered participants has been extremely positive. An analysis of the participant feedback form is provided in the next chapter. The full workshop proceeding is provided as an additional pdf appendix due to the size of the document.

2.1.1 Analysis of Participant Satisfaction / Workshop Quality

All participants of the SmartCoDe Expert Cooperation Workshop have been asked to fill out a participant survey. Over 70% of the participants took part in the survey.

The analysis below is grouped into:

- Invited Speaker Performance
- Project Speaker Performance
- Overall Workshop Performance

2.1.1.1 Invited Speaker Performance

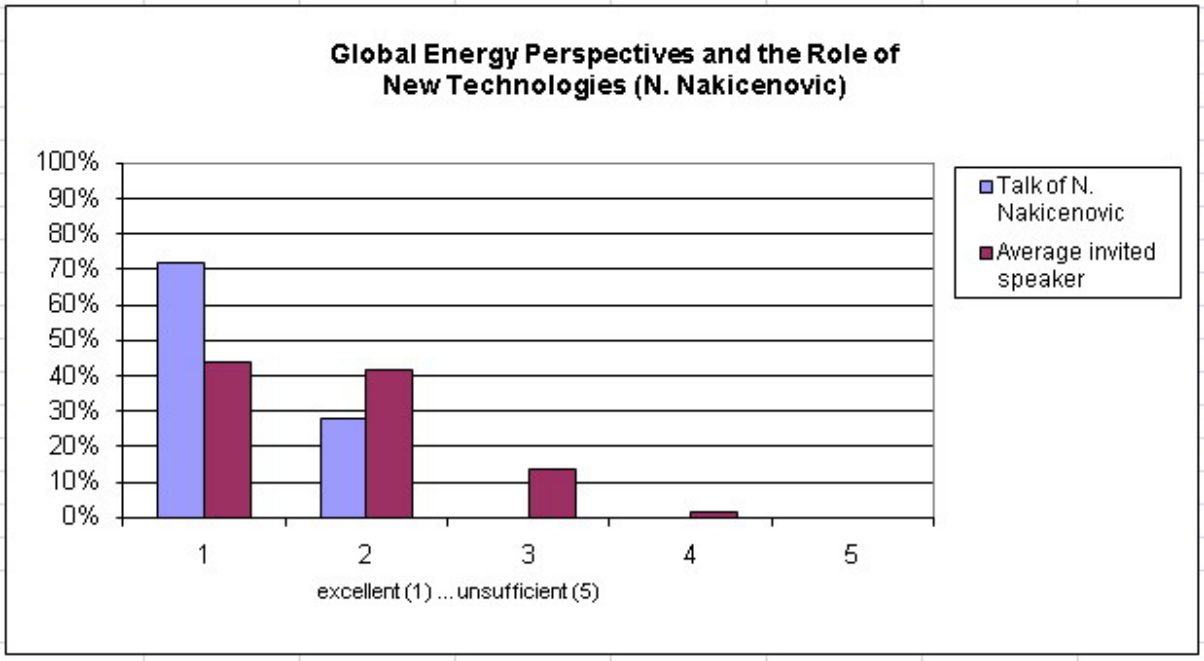

Figure 2.1.2: Prof. Dr. N. Nakicenovic

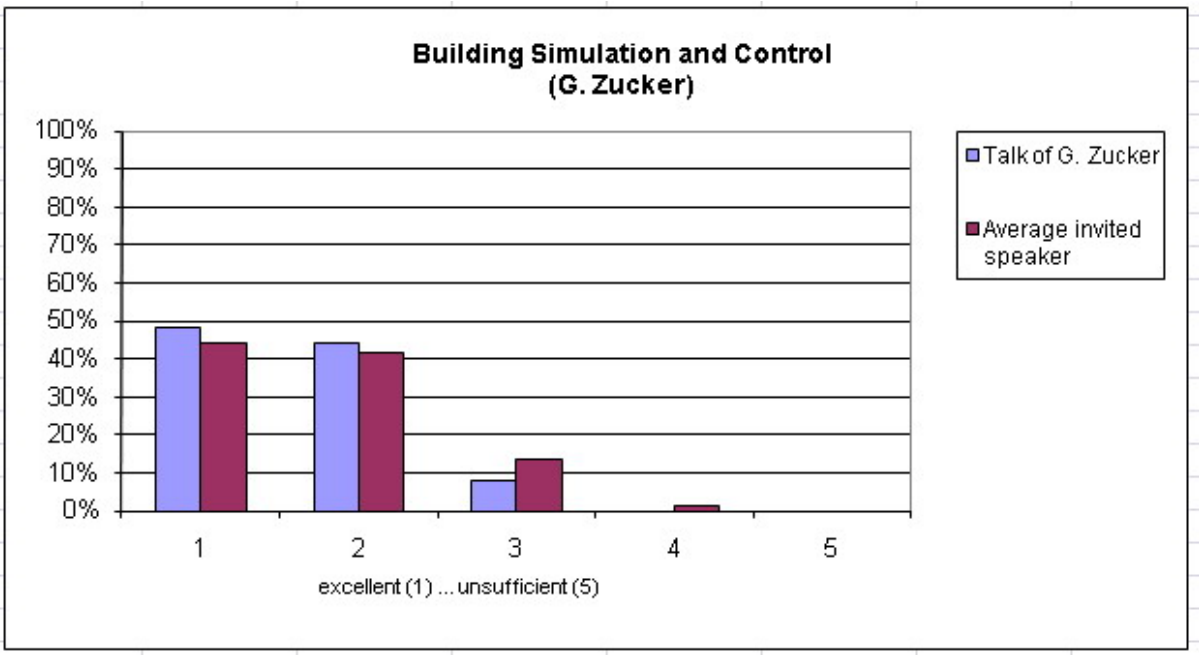

Figure 2.1.3: Dr. Zucker

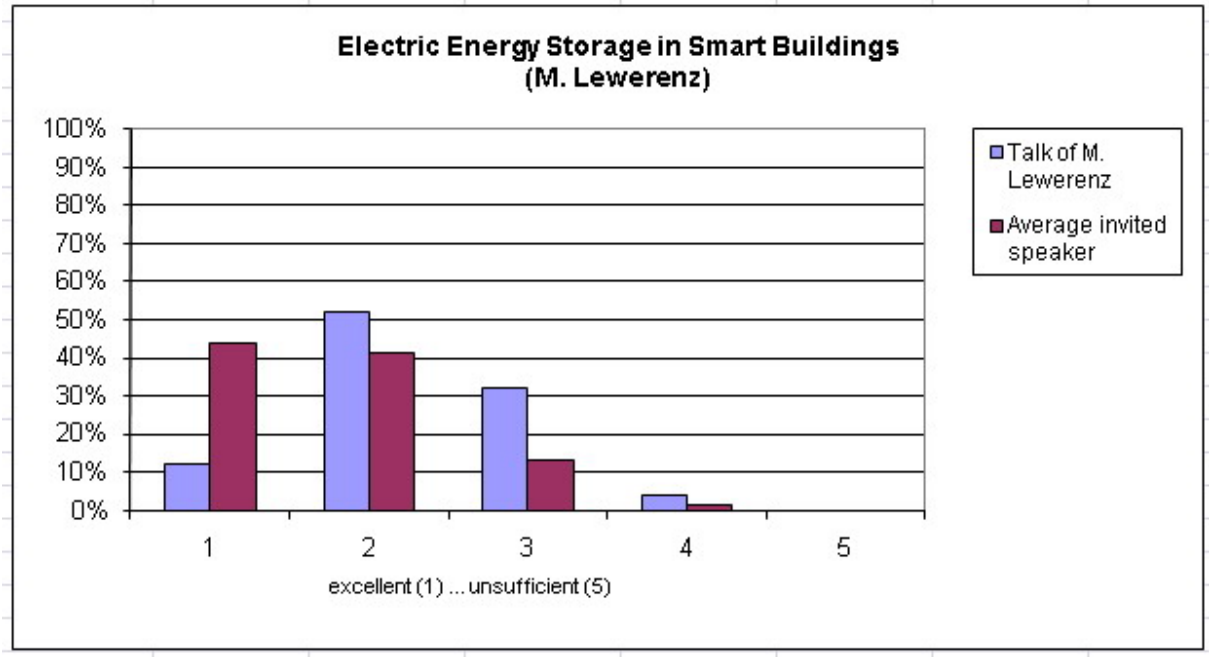

Figure 2.1.4: M. Lewerenz

2.1.1.2 Project Speaker Performance

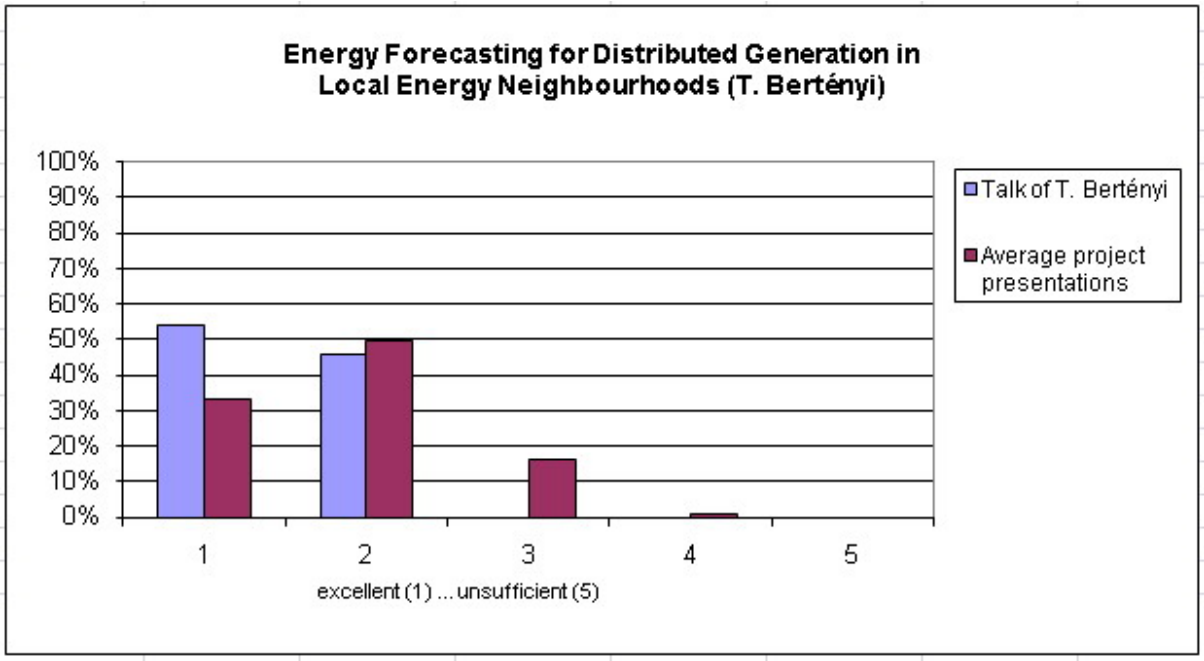

Figure 2.1.5: Dr. T. Bertenyi

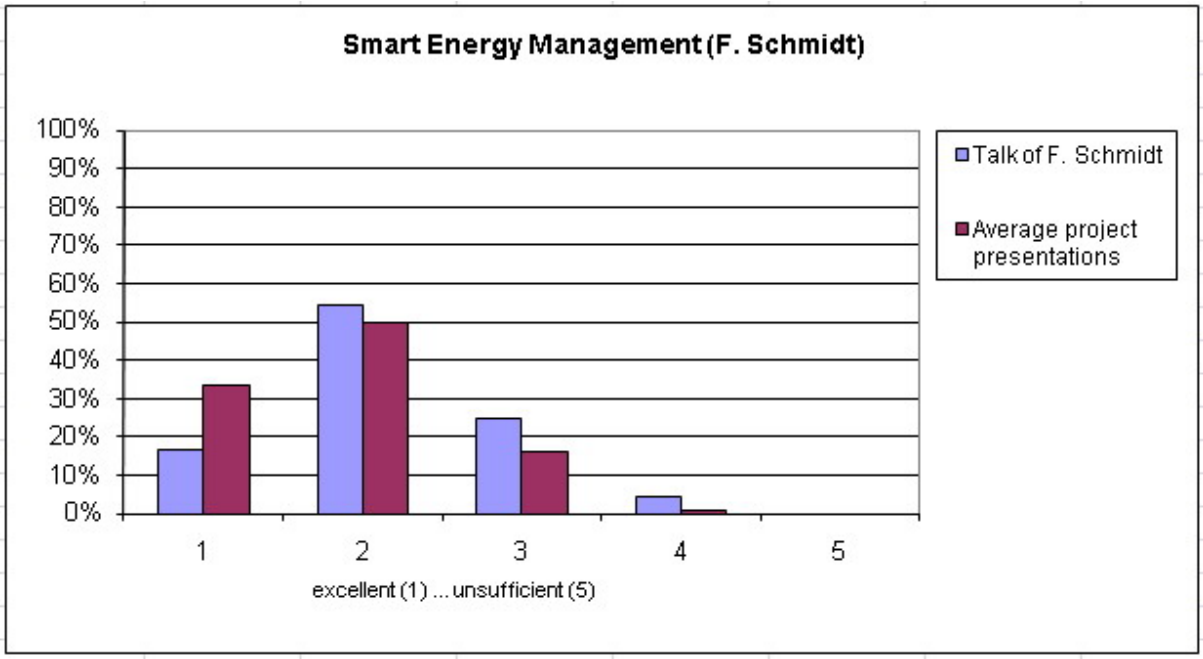

Figure 2.1.6: Prof. Dr. F. Schmidt

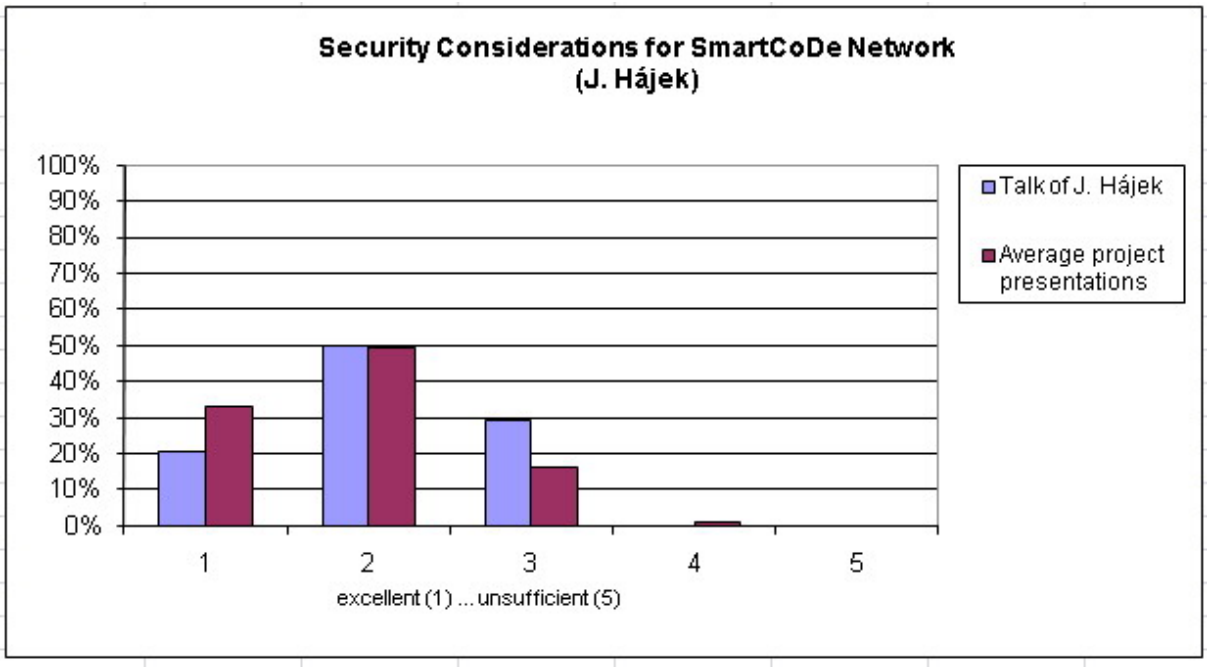

Figure 2.1.7: J. Hajek

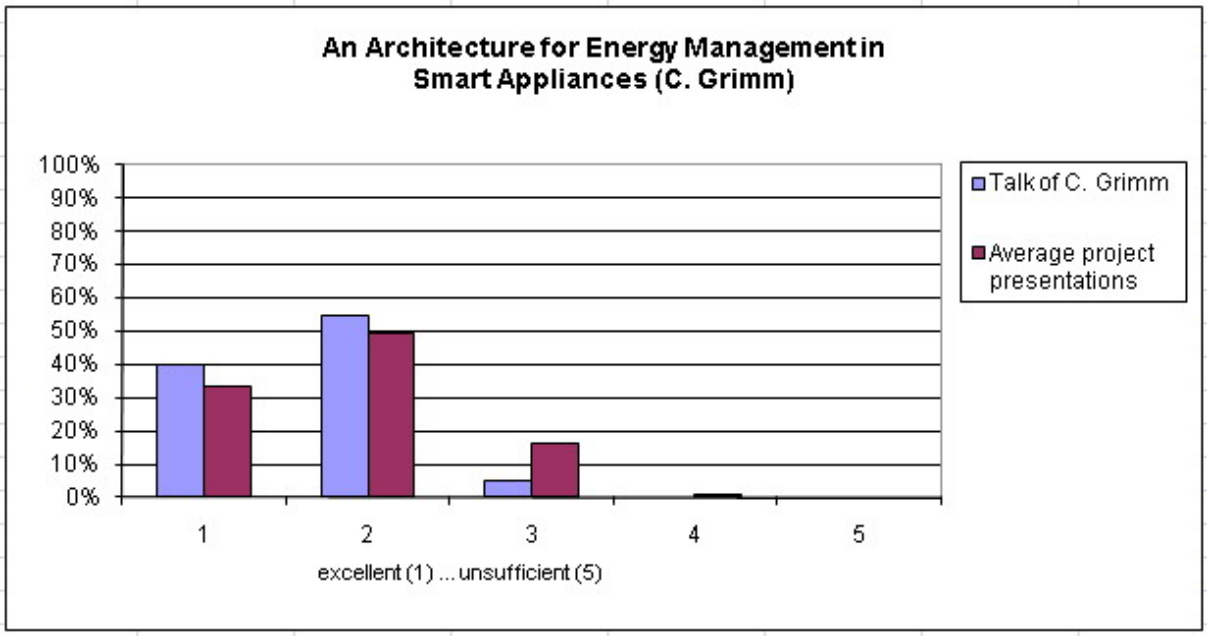

Figure 2.1.8: Prof. Dr. C. Grimm

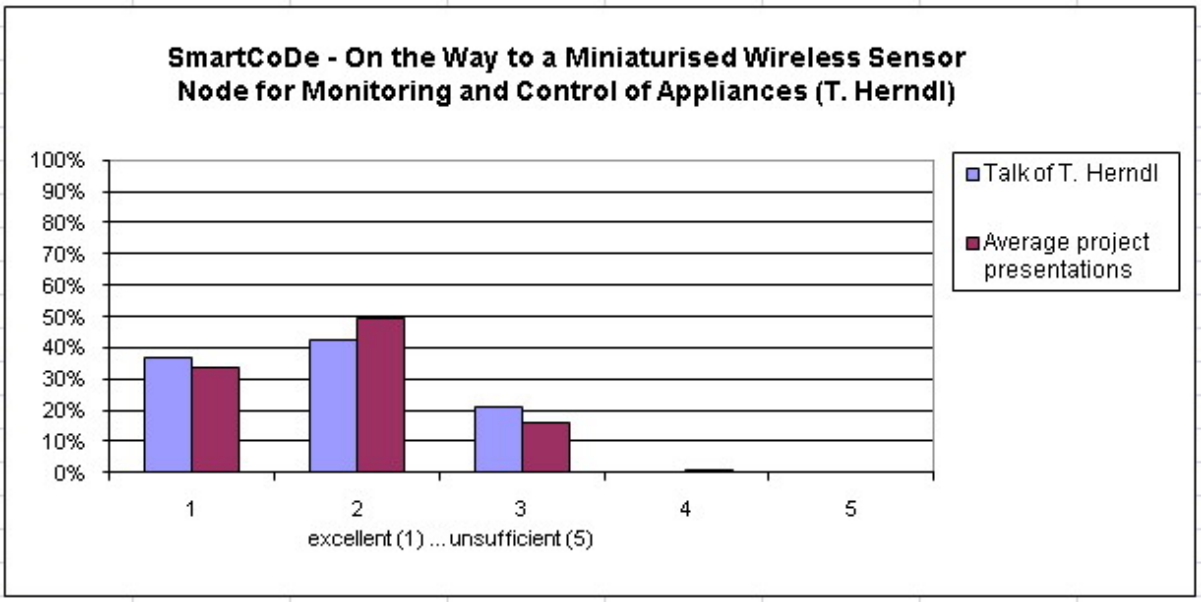

Figure 2.1.9: T. Herndl

2.1.1.3 Overall Workshop Performance

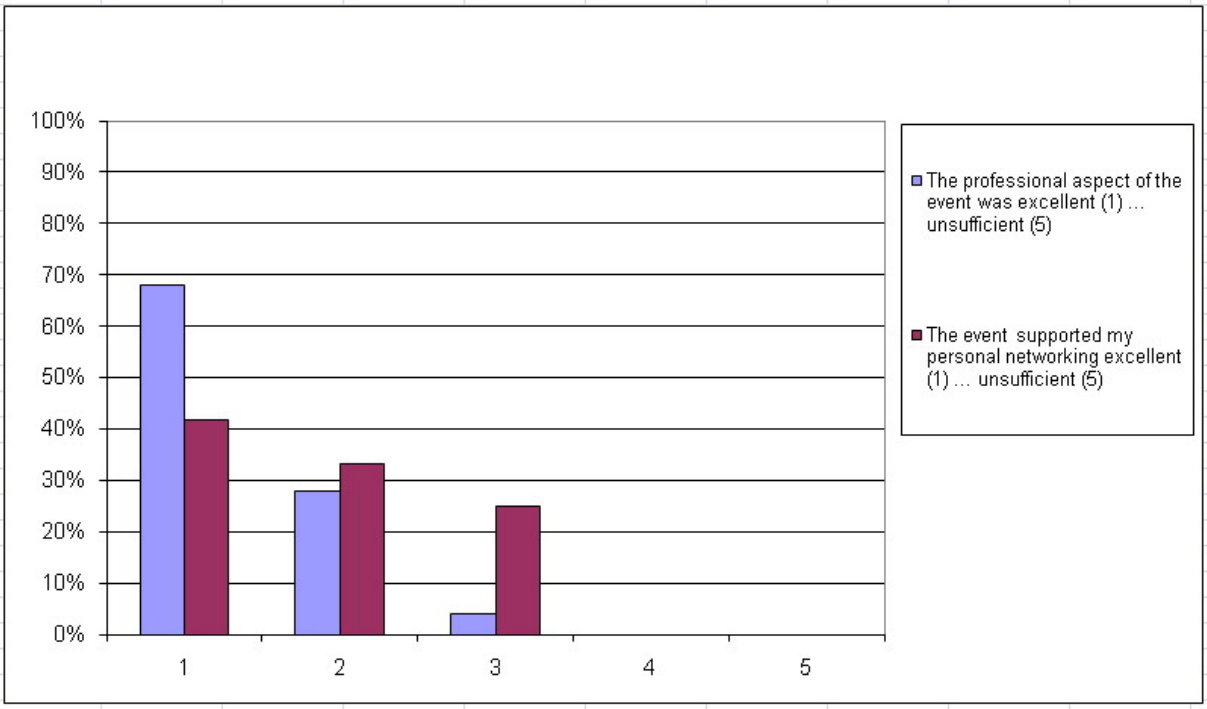

Figure 2.1.10: Professionality / Networking1

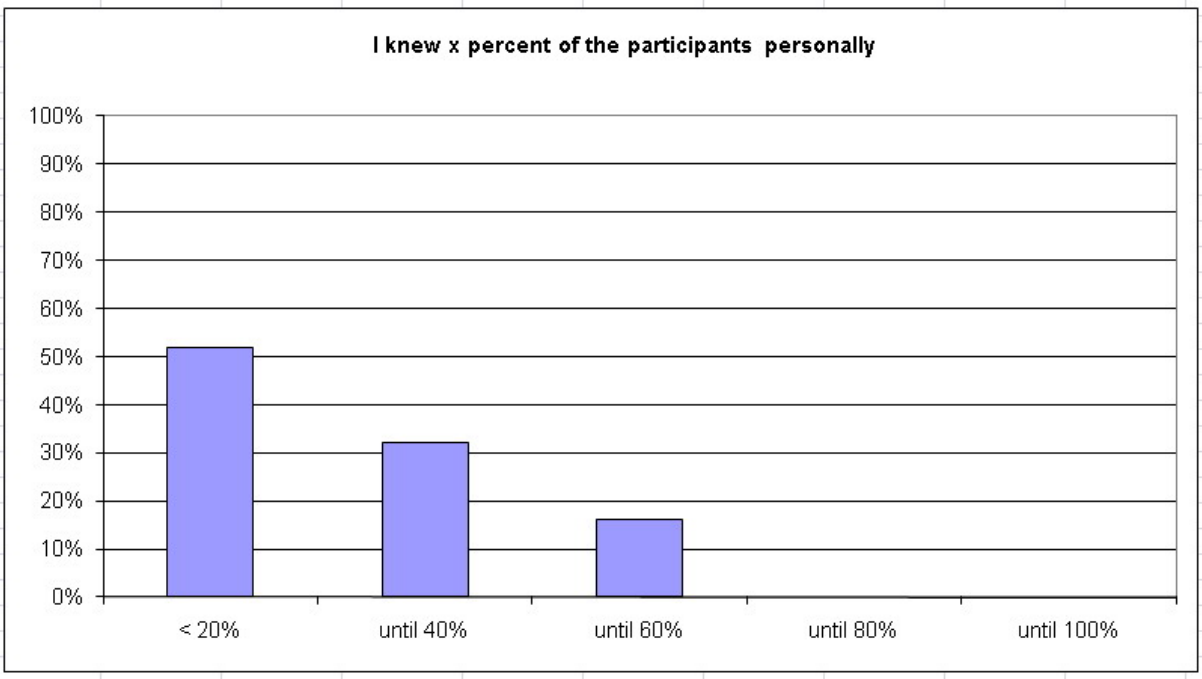

Figure 2.1.11: Networking2

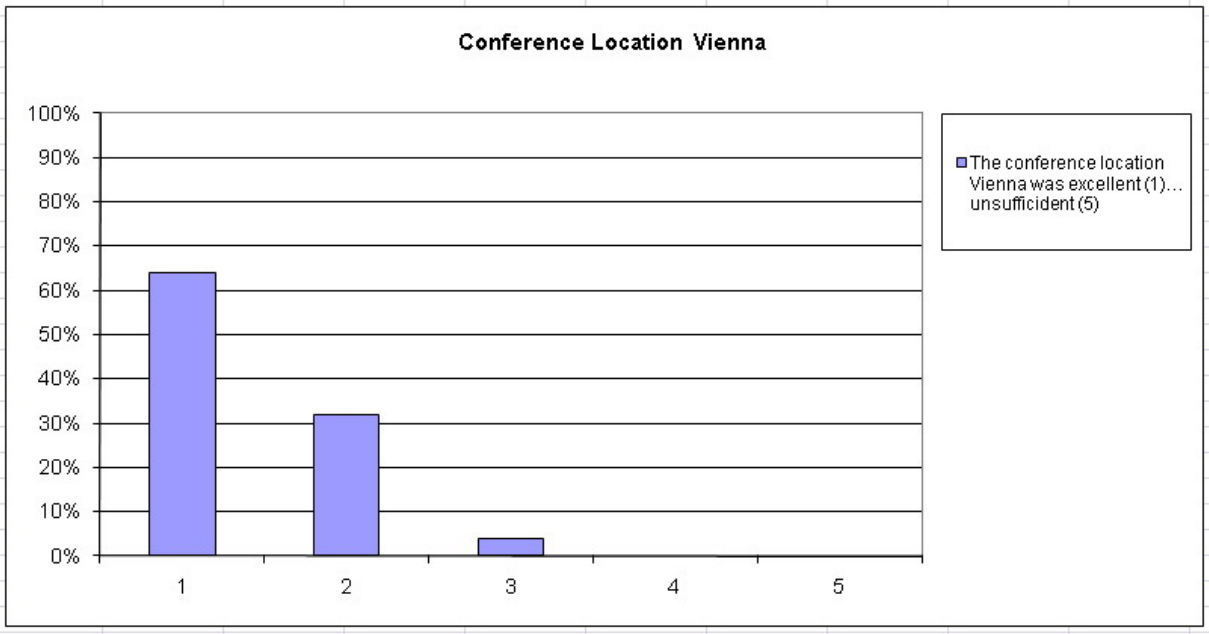

Figure 2.1.12: Location

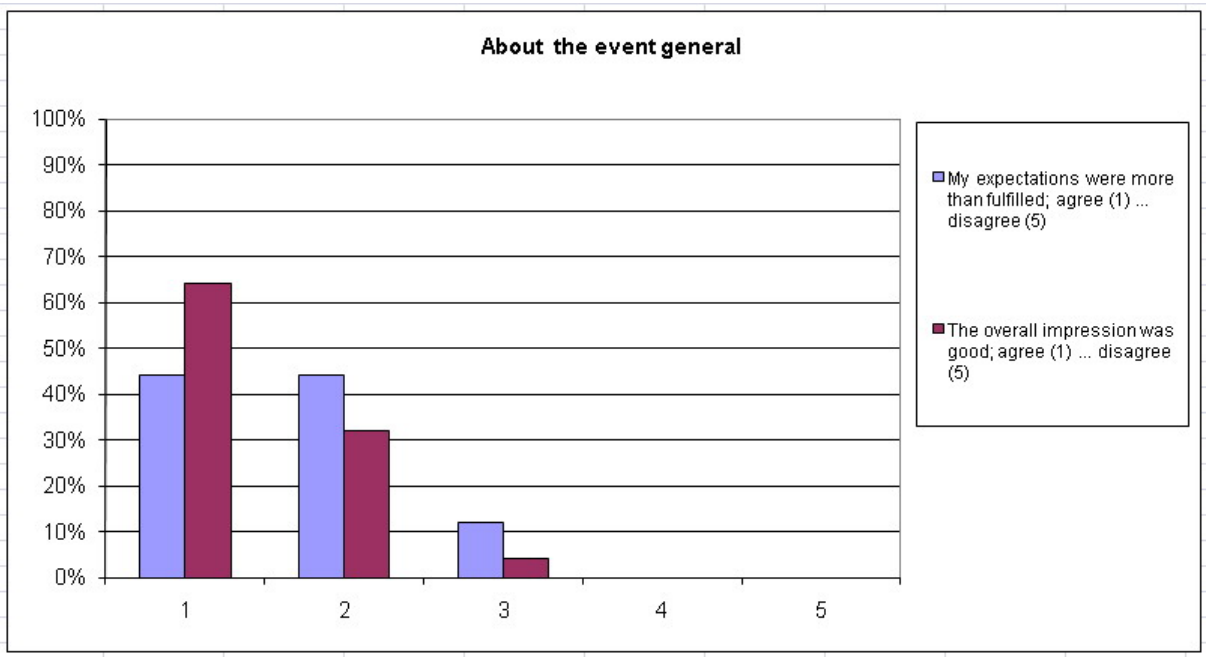

Figure 2.1.13: Expectations / Overall Impression

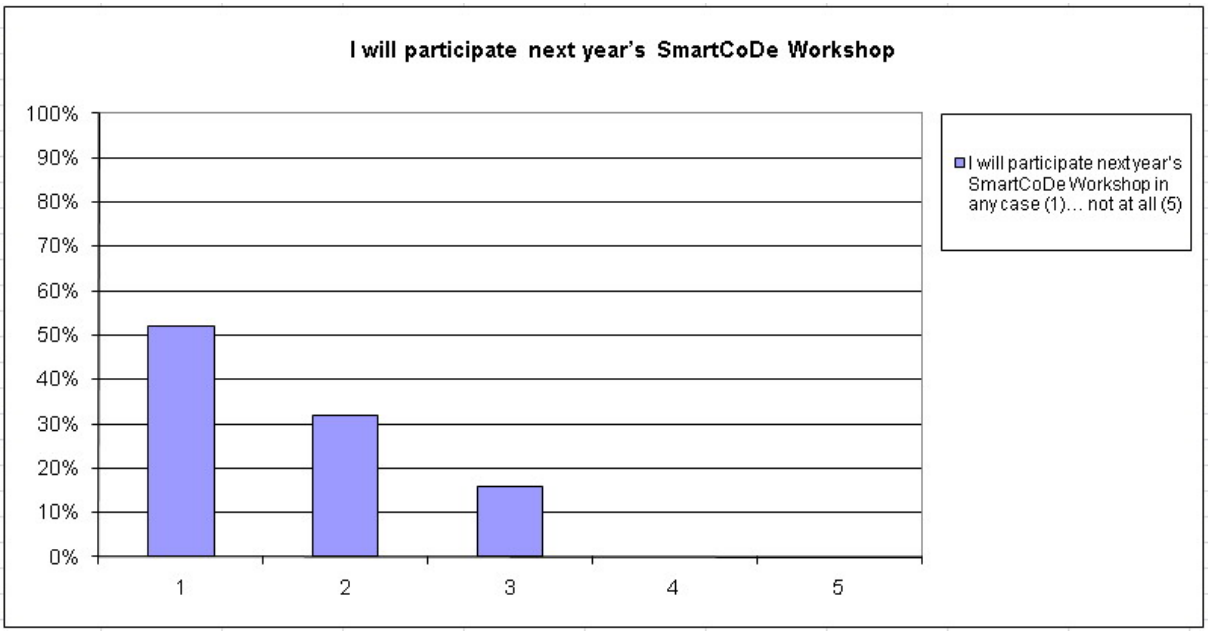

Figure 2.1.14: Participation in Next Year's Event

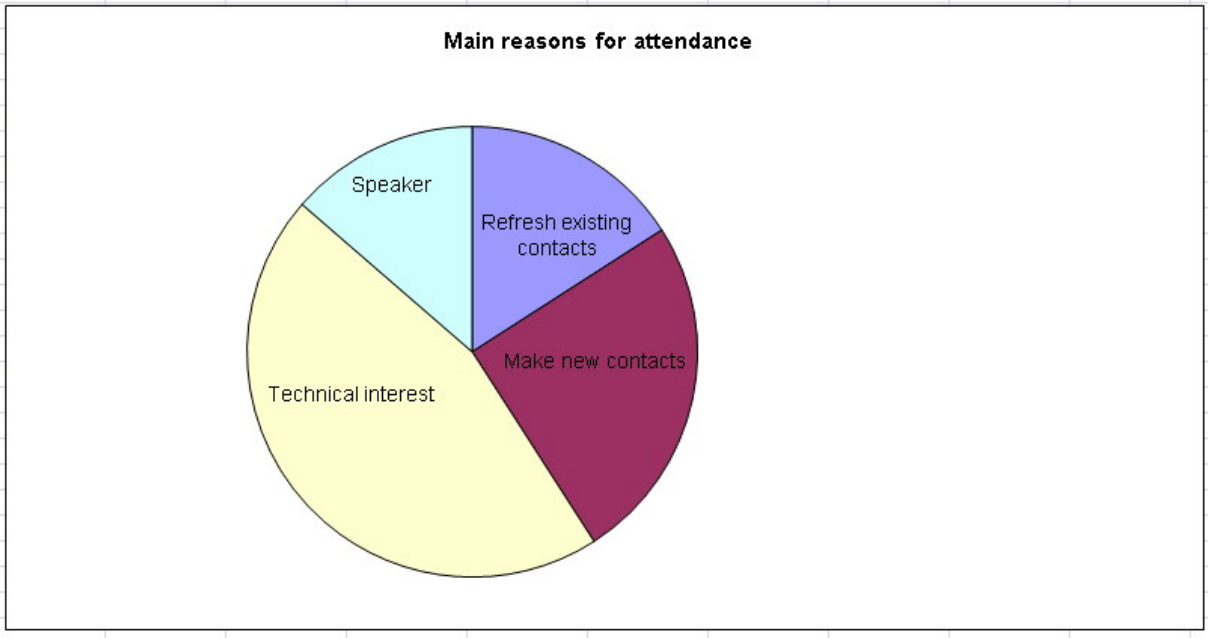

Figure 2.1.15:Reasons for Attendance

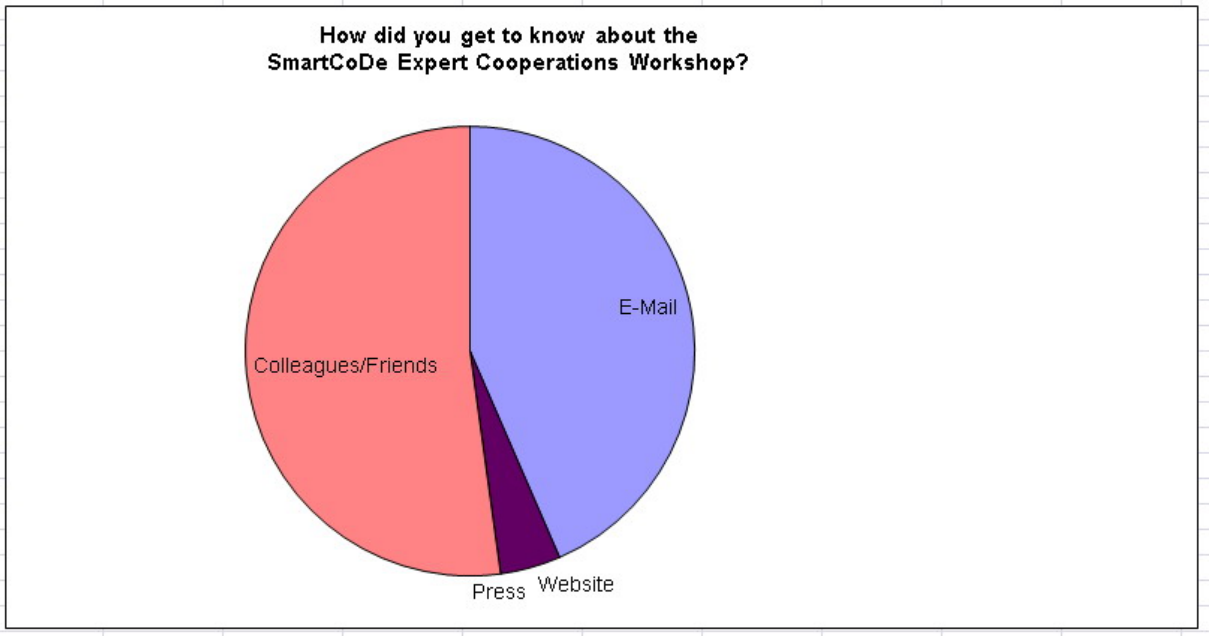

Figure 2.1.16: Workshop Information Broadcasting

Figure 2.1.17: Workshop impressions

Figure 2.1.18: Workshop impressions

2.1.2 Summary and Lessons-Learned

During his well received key-note Prof. Nebojsa Nakicenovic pointed out that the new energy systems not only require innovation on a technical level but also require market, regulatory and behavioural changes. This as well as the analysis figures provided in chapter 3.2 has been taken as encouragement for ECN to further foster the interdisciplinary knowledge exchange during the SmartCoDe Workshops to come.

ECN plans to further push the concept of enhancing the list of project partner speakers with invited papers from adjacent areas of research. In 2010 these areas have been climate change, energy storage, and building energy aspects other than electrical ones. ECN is currently working to get commitments from external speakers for the 2011 Expert Cooperation Workshop. Negotiations are currently under way with keynote speakers for 2011 from the following areas:

- Energy provider
- Energy net operator
- Renewable energy investment

Participant feedback also showed, that especially the breaks between presentations have been used for extensive interdisciplinary discussion and “networking”. Participants repeatedly asked for breaks that are not to short. We will include in the concept for 2011 that participants will have enough time for networking during breaks.

Further, in 2011 first hardware prototypes (as shown at the review meeting in Brussels) and demonstrator output will be available. How we will present this to the public is not yet defined, but demonstrator and prototypes will be one of the topics presented there.

Last but not least we have to mention press attention: after the 2010 conference we issued a press release as well as a mass-mailing workshop review to several thousand experts from

research and industry. As a follow up to the latter the publisher Springer US contacted us and we finally signed a contract for a book about the SmartCoDe topic.

We will stick to that concept of press release and mass mailing and we will try to get press attention also prior to the workshop so that we might succeed to invite at least one press representative to join us at the conference and to present it in one way or another to the public.

2.2 ECWS 2011

The SmartCode Expert Cooperation Workshop 2011, the second of three workshops throughout the life-time of the project, has been held in Vienna on Oct. 12, 2011.

One of the main goals of the workshops is to connect the project's research to the adjacent research communities. This second workshop therefore had three invited papers, two with relevant interconnection with the topic of *Smart Grids* (Energy Management, Energy Forecasting) and one from another EU-FP7, addressing building management optimisation. The full program can be seen in figure 2.2.1.

Agenda

Start	Duration		Titel	Speaker	
8:30	1:00		Registration / Coffee		
9:30	0:10	edacentrum GmbH	Welcome	P. Neumann / Dr. C. Pröfrock	
9:40	0:45	The University of Edinburgh	**Energy Management in Households and Built Environments: Assessment of PV and Wind Micro-generation Technologies**	**Dr. S. Djokic**	Invited Paper
10:25	0:30	Quiet Revolution Ltd.	Wind Energy Forecasting for Distributed Generation	Dr. T. Bertényi	Project Paper
10:55	0:30		Coffee Break		
11:25	0:30	Saarland University	**Short-term solar energy forecasting for network stability**	**Prof Dr. H. Hermanns**	Invited Paper
11:55	0:30	Vienna University of Technology	**Categorizing Energy using Products (EuPs) for partially decentralised Energy Management**	**M. Damm**	Project Paper
12:25	1:20		Lunch		
13:45	0:30	Tridonic AG	The SmartCoDe Node Functional Prototype	E. Holleis	Project Paper
14:15	0:30	Solintel	**Sounds for Energy-Efficient Buildings**	A. Barona	Invited Paper
14:45	0:30		Coffee Break		
15:15	0:45	University of Novi Sad	**The SmartCoDe Demonstrator - a testbed to evaluate energy management**	**Prof. Dr. V. Malbasa**	Project Paper
16:00	0:30	Infineon Technologies Austria AG	SmartCoDe - System-in-Package Considerations	T. Herndl	Project Paper
16:30	0:10	Closing Words		Dr. C. Pröfrock	
16:40		End			

Figure 2.2.1: ECWS 2011 Agenda

The agenda as well as a pdf of the full workshop proceedings are available via:

https://www.fp7-smartcode.eu/events/ecw2011.

Rating of the workshop by the 33 registered participants has been extremely positive. An analysis of the participant feedback form is provided in the next chapter. The full workshop proceeding is provided as an additional pdf appendix due to the size of the document.

2.2.1 Analysis of Participant Satisfaction / Workshop Quality

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2.2.1.1 Invited Speaker Performance

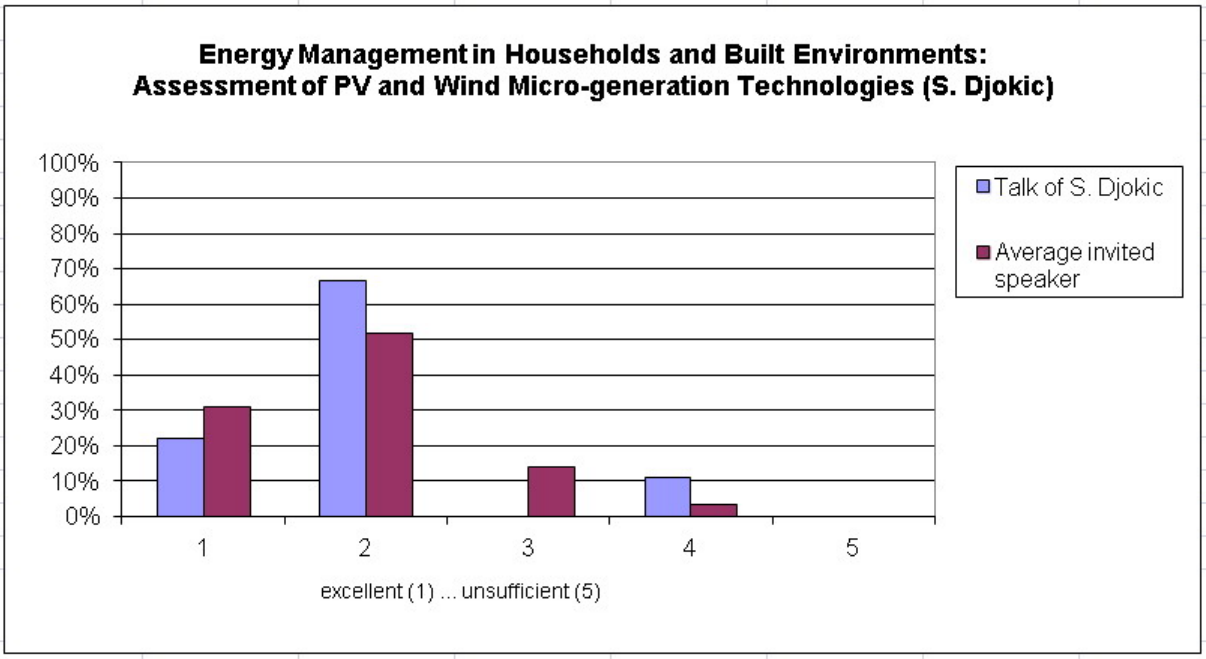

Figure 2.2.2: Dr. S. Djokic

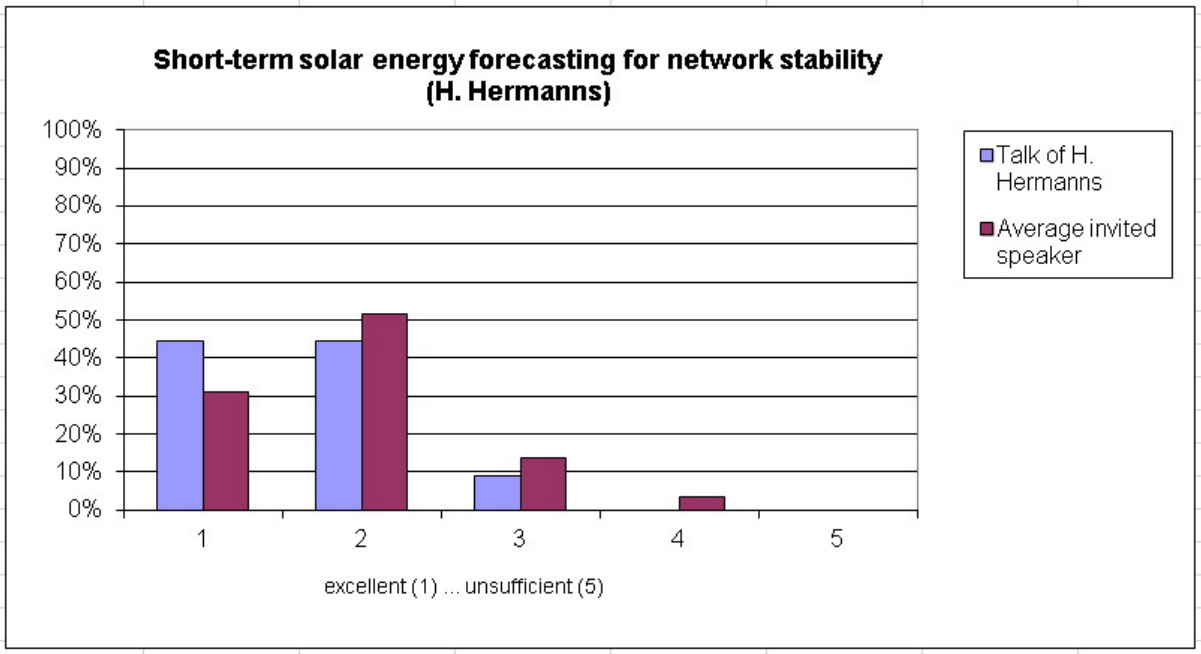

Figure 2.2.3: Prof. Dr. Hermanns

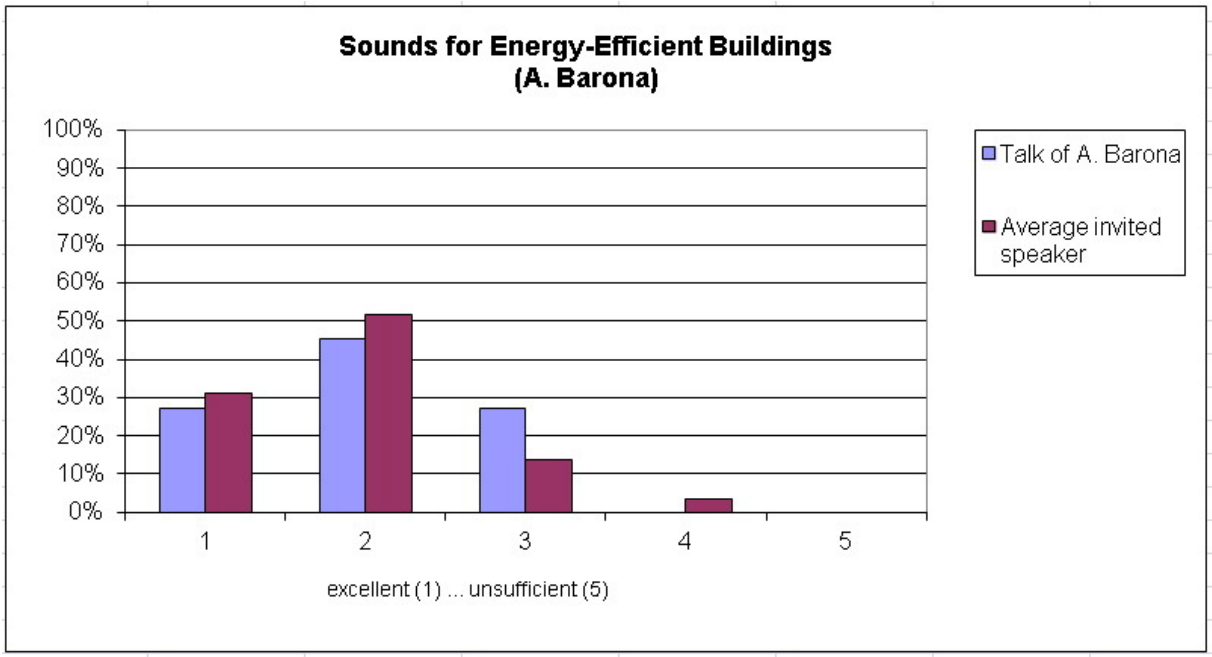

Figure 2.2.4: A. Barona

2.2.1.2 Project Speaker Performance

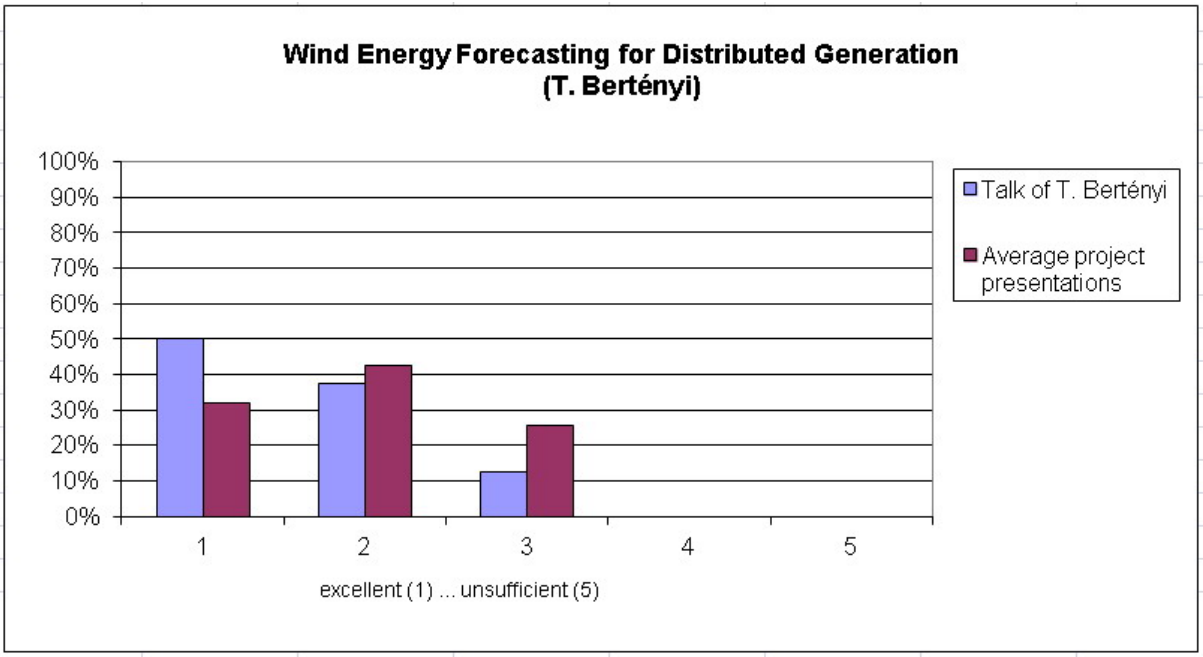

Figure 2.2.5: Dr. T. Bertenyi

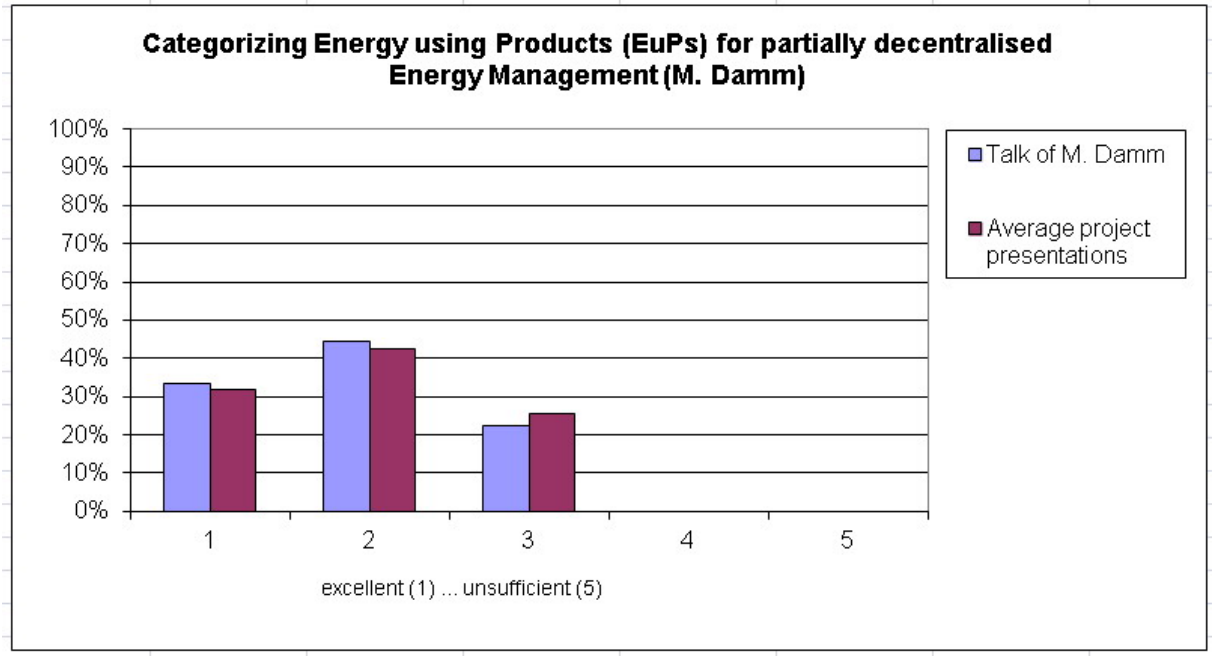

Figure 2.2.6: M. Damm

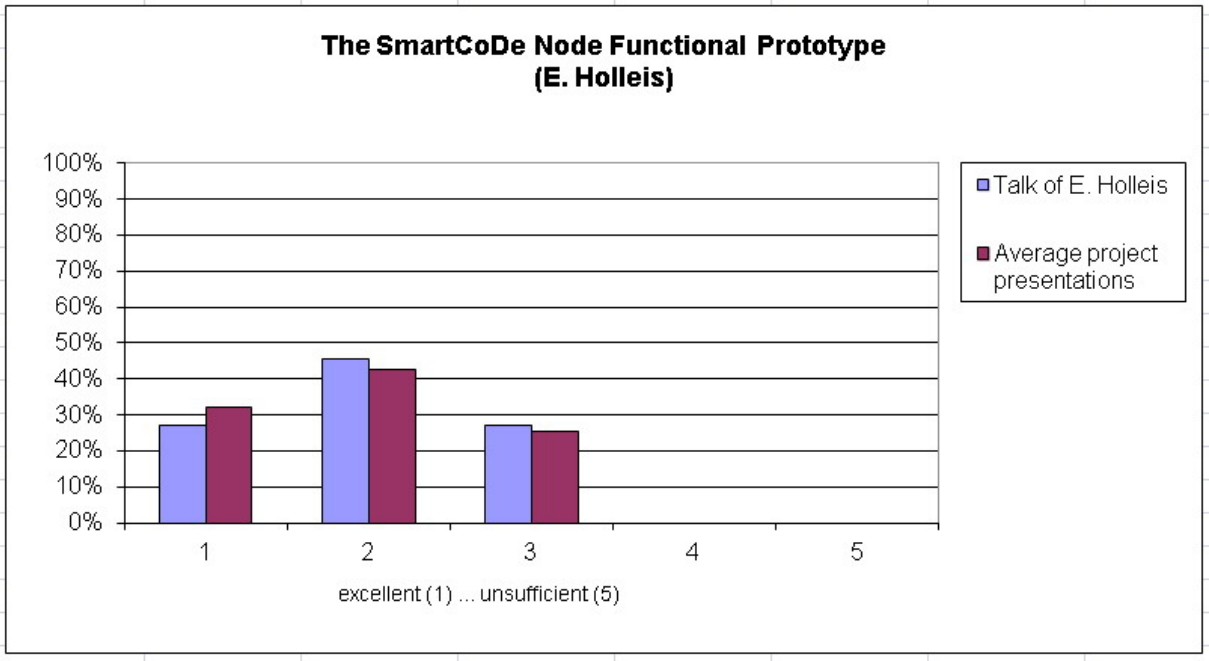

Figure 2.2.7: E. Holleis

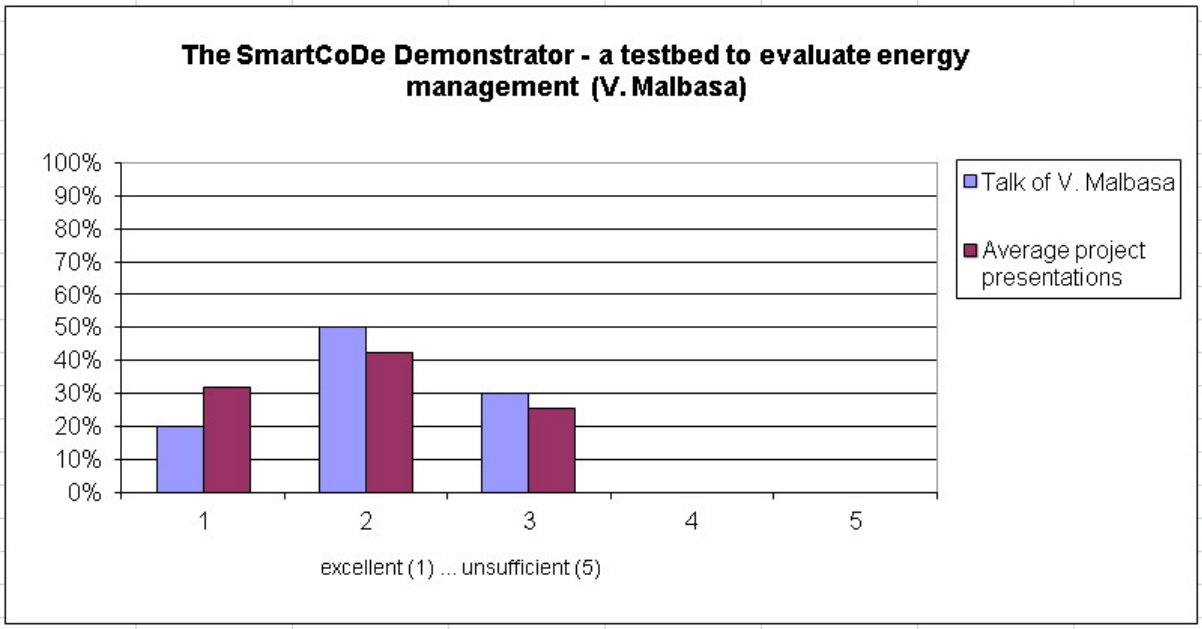

Figure 2.2.8: Prof. Dr. V. Malbasa

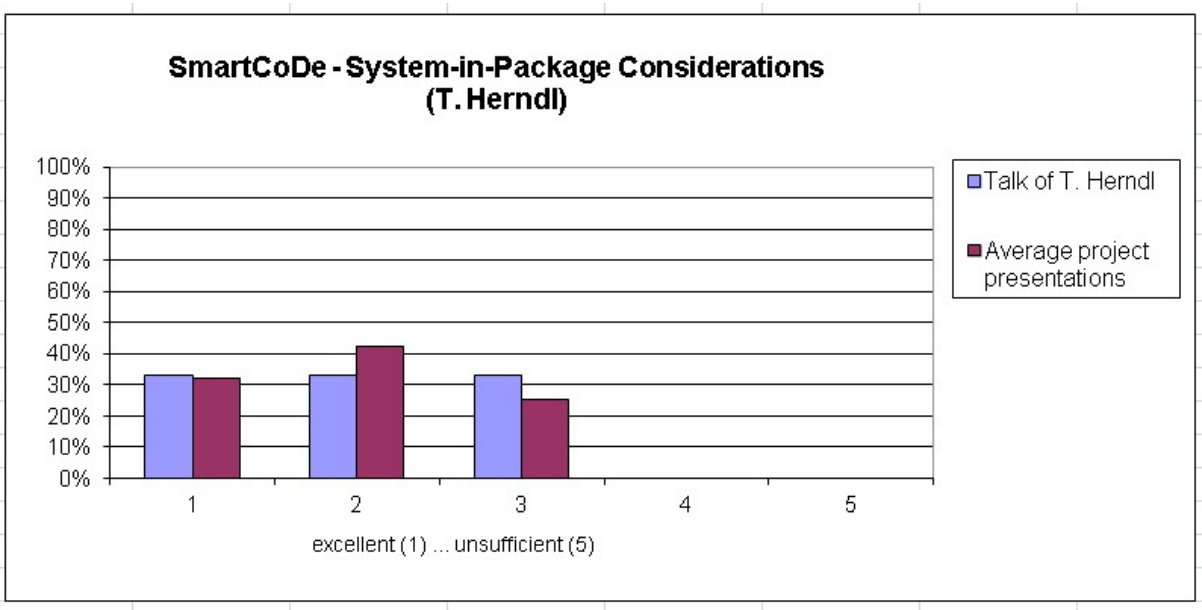

Figure 2.2.9: T. Herndl

2.2.1.3 Overall Workshop Performance

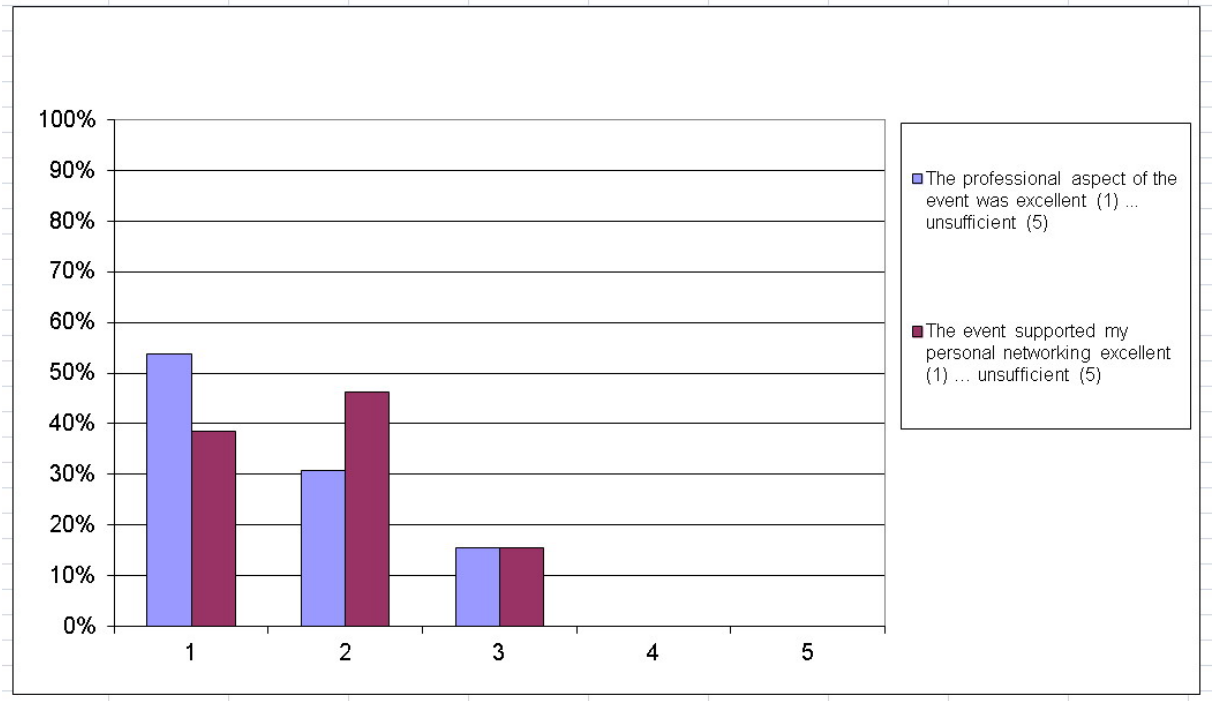

Figure 2.2.10: Professionality / Networking1

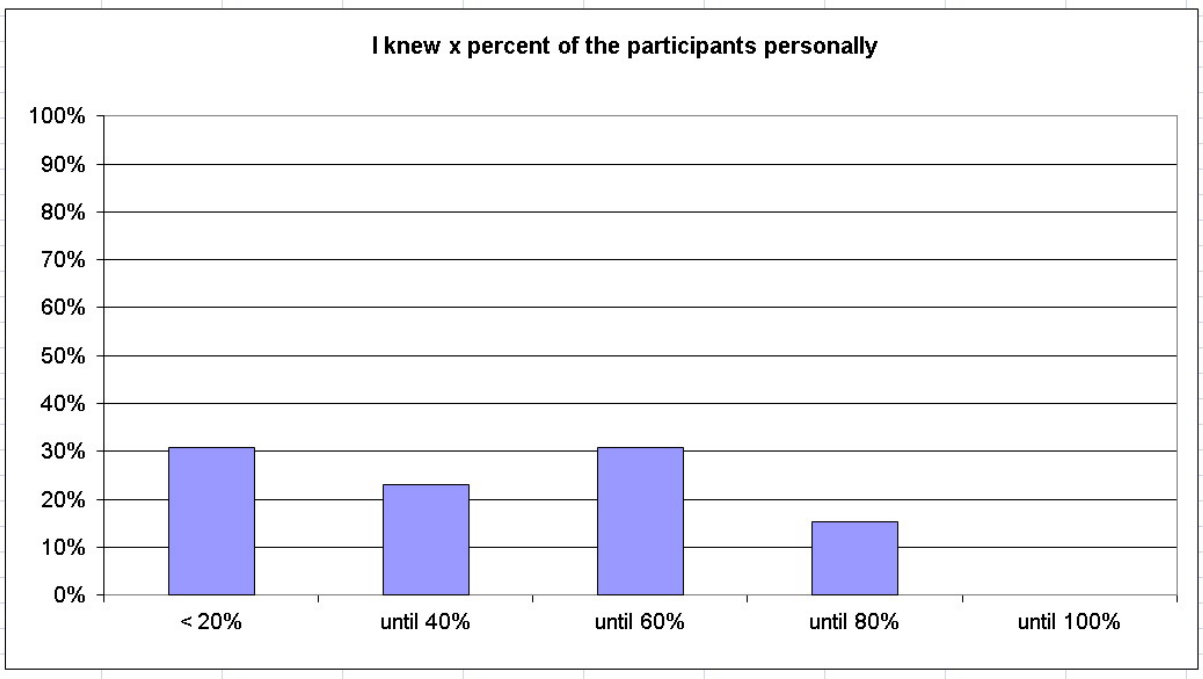

Figure 2.2.11: Networking2

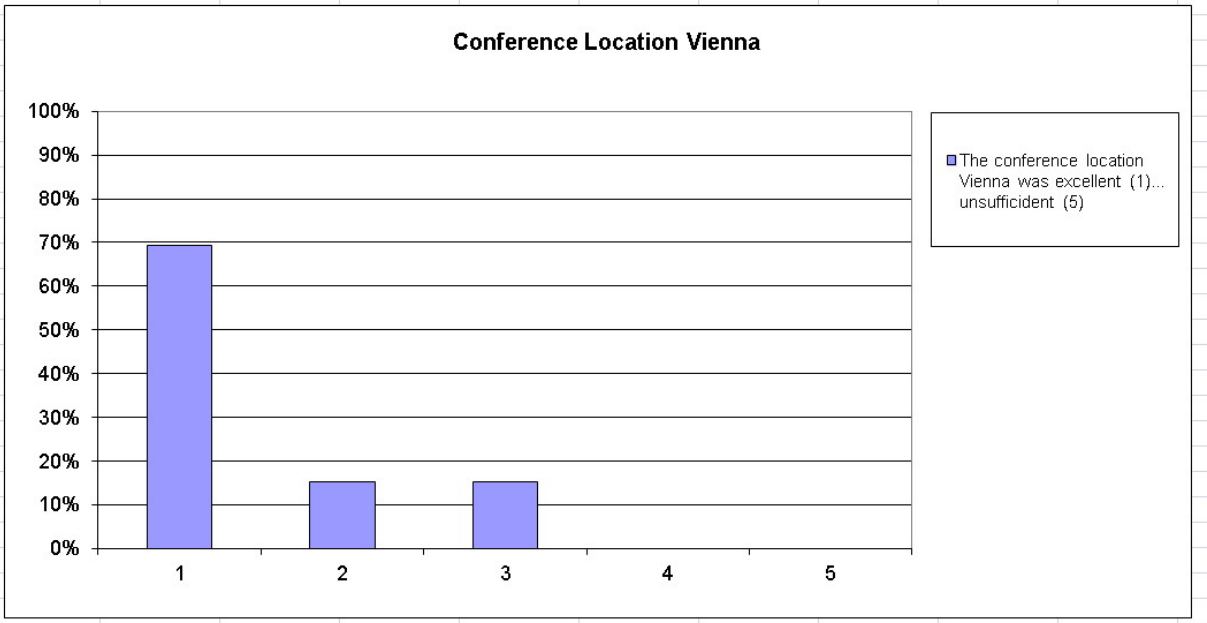

Figure 2.2.12: Location

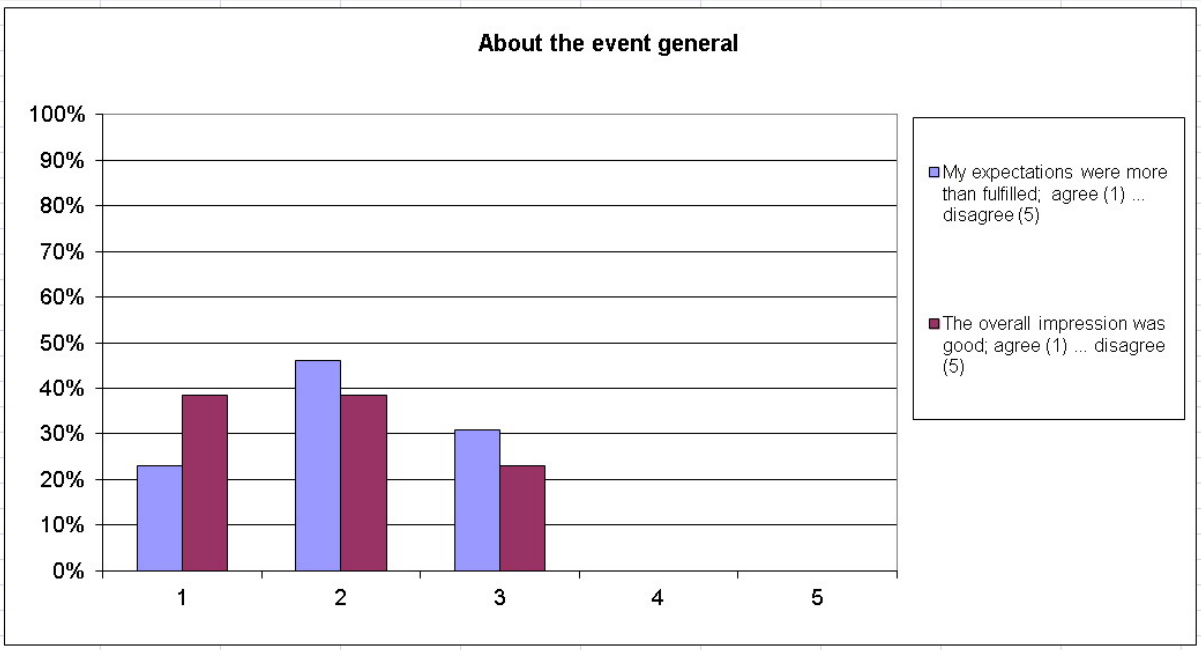

Figure 2.2.13: Expectations / Overall Impression

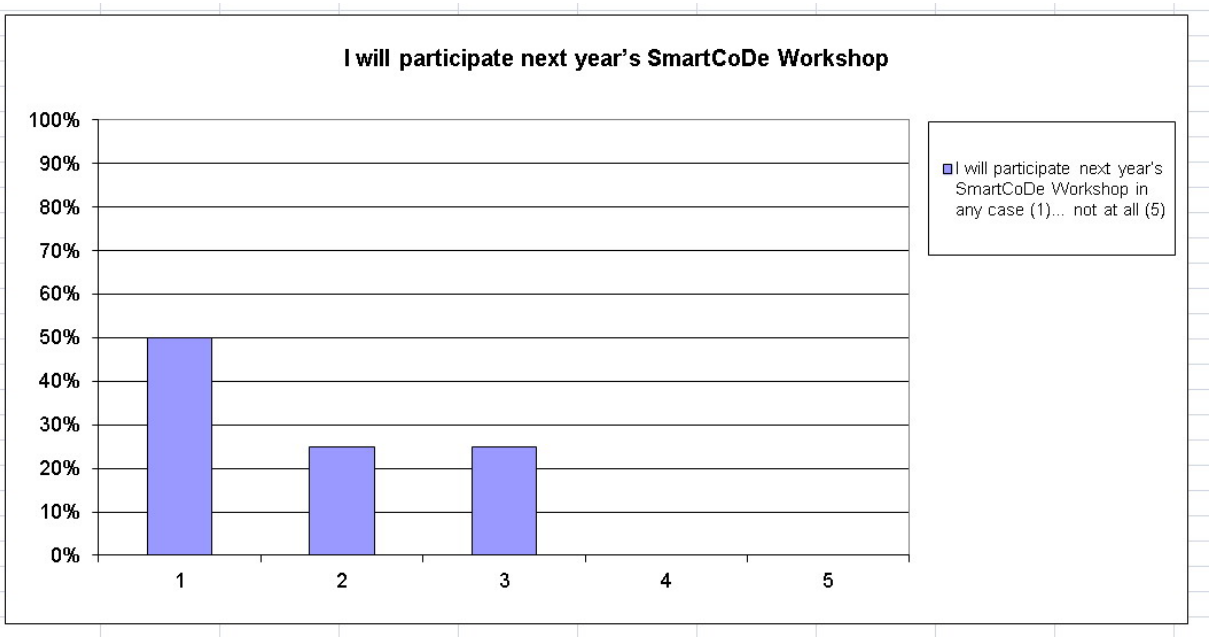

Figure 2.2.14: Participation in Next Year's Event

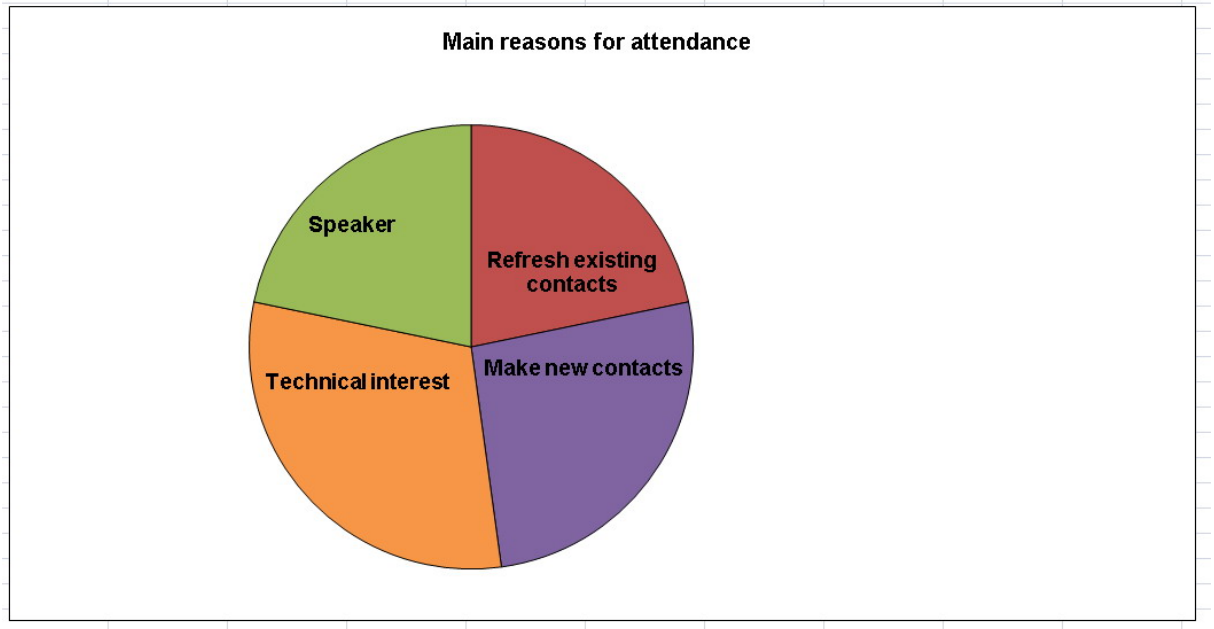

Figure 2.2.15:Reasons for Attendance

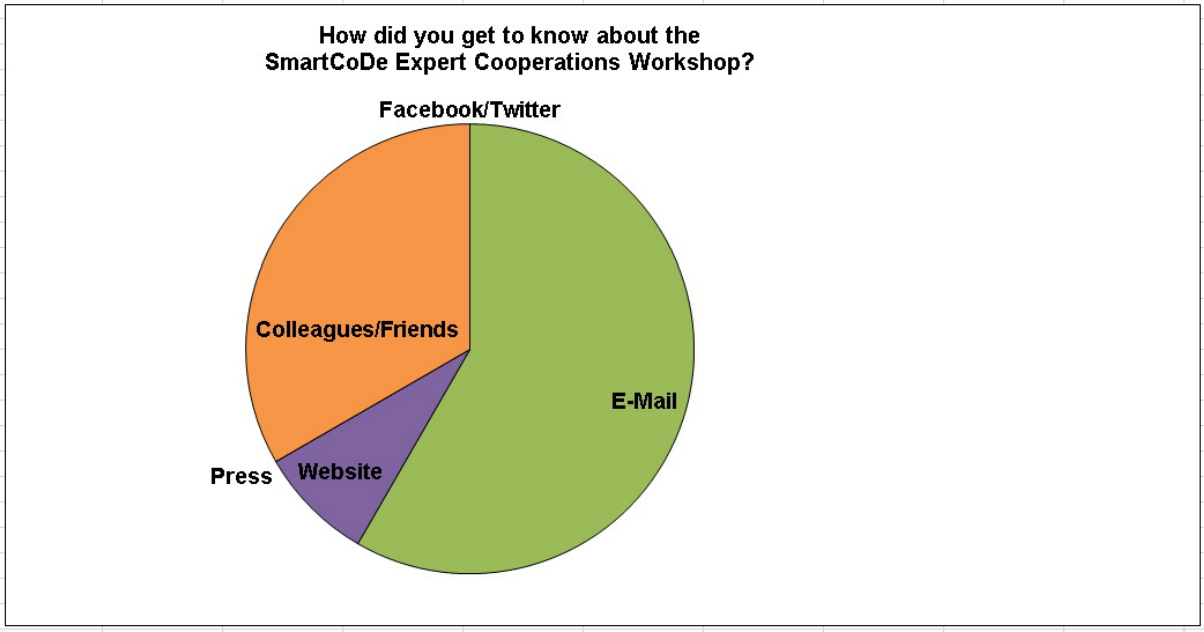

Figure 2.2.16: Workshop Information Broadcasting

Figure 2.2.17: Workshop impressions

Figure 2.2.18: Workshop impressions

2.2.2 Summary and Lessons-Learned

Most interesting outcome of the 2011 workshop was that the two different research areas energy efficiency (EE) and ambient assisted living (AAL) have a lot in common. Using sound to detect the presence or people in a room could easily be used for energy efficient reasons, but also for ambient assisted living, since a specific sound could be evaluated to detect situations of emergency. This could also be the case with the absence of sound when previously having detected a person in a room. Further classical energy management features like energy monitoring (e.g. use of water) could be a sign of unusual behaviour (if, for example, it is detected at 3 a.m.).

The combination of energy efficiency and ambient assisted living scopes could be a promising step in the direction of affordable AAL solutions. AAL system integration into houses is still very expensive and therefore only affordable for well off persons. EE solution today are already available on a contracting basis, i.e. the equipment and the integration into a house is paid with the energy cost savings of the future. Establishing an energy management system in a house at no additional cost which could then be upgraded with additional sensors and features at little cost would make such features available to a large community.

A lowlight of the workshop was on the other hand that although significant efforts have been spent to increase the number of ECWS attendees the project did not succeed. Reasons have been discussed internally but also at the EC review meeting in Brussels in April 2012.

Since a lot workshops and conferences are available that focus at the energy topic during the year it is difficult to raise the attention to a (small) European project workshop. It therefore has been agreed that instead of organizing another workshop on its own in 2012 the SmartCoDe project should attempt to cooperate with other energy events.

2.3 Cooperation with the "Sustainable Energy in Buildings and Urban Areas" Symposium (SEBUA-2012)

2.3.1 SEBUA Targets and Audience

The main target of the "Sustainable Energy in Buildings and Urban Areas Symposium" (SEBUA) is to foster interdisciplinary cooperation among the various scientific communities that are working and researching in the area of sustainability of energy. Among the audience from Algeria, Austria, Czech Republic, Egypt, France, Gambia, Germany, Greece, Italy, Latvia, Turkey, Romania, South Korea, Spain and the United Kingdom were engineers and researcher from the areas of architecture, building automation and control, biomass, civil engineering, dependable systems and software, electrical engineering, energy efficient buildings and indoor climate, energy conservation, energy management, environment and economy, informatics and telematics, materials research, mechanical engineering, microelectronics and chip development, cyber-physical systems, smart grids, solid fuels and application, thermal engineering and fluid mechanics, and others.

The main topics of the symposium were:

- Sustainable energy technologies
- Sustainable energy sources for buildings
- Energy efficient architecture
- Energy efficiency design tools
- Energy efficient building models
- Smart grids for smart neighbourhoods (energy generation and distribution)
- Building/neighbourhood energy management systems (energy consumption)
- Building monitoring and control intelligent systems (intelligent BEMS)
- Energy efficiency policies and legal frameworks with international impact

Although with approx. 40 attendees this event was relatively small in number, the scientific area spanned was very large. This indeed was the basis for very valuable interdisciplinary discussions.

2.3.2 SmartCoDe Special Session Program

The SmartCoDe project organized a special project day for "Energy Efficiency in Buildings" at (SEBUA), October 14-20 2012 in Kusadasi, Ismir, Turkey. In this context the special SmartCoDe session on October 18 which was chaired by SmartCoDe coordinator Peter Neumann was complemented by the SEBUA keynote speech and project paper of Prof. Dr. Grimm from SmartCoDe Associated Partner *University of Kaiserslautern* one day earlier on October 17.

Link: http://www.ichmt.org/sebua-12/content/view/68/38

2.3.3 SmartCoDe Keynote Prof. Dr. Grimm (Oct. 17, 2012)

Keynote / Paper Title:

"*Smart Energy Buildings and Neighbourhoods: Which Infrastructures, Which Platforms?*"

Authors:

Christoph Grimm*, Stefan Mahlknecht**, Markus Damm**, Franz Lukasch**

*Technical University Kaiserslautern, Germany

**Vienna University of Technology, Austria

Abstract

"*Management of electrical energy in buildings and environments enables a more efficient use of renewable energy sources that are located in its neighbourhood. For this purpose, IT infrastructure is required that networks appliances and that controls power consumption. The IT infrastructure is expected to be inexpensive, to consume low power, and to provide high security while being easy to deploy. Currently, no hardware/software platform fulfils these requirements. In this paper we give an overview of technologies and platforms to approach these goals. In particular, we summarise outcomes of the SmartCoDe Project.*"

This paper has further been proposed by the SEBUA scientific committee to be published in the by Begell House (*http://www.begellhouse.com*). Begell House publishes the journal "*International Journal of Energy for a Clean Environment*", IJECE. The principle aim of the journal is to describe, compare, and evaluate innovative technologies that will maximize the efficiency of energy production and utilization while minimizing the production of undesirable emissions into our atmosphere, our earth, and our water supply. IJECE deals with interconnected themes covering the reduction of local and global environment degrading emissions while increasing the production of high quality energy. It is an ISI reviewed journal.

Figure 2.3.1: Prof. Dr. Grimm's keynote

2.3.4 SmartCoDe Keynote Prof. Dr. Holger Hermanns (Oct. 18, 2012)

Keynote:

"*Power grid stability despite renewable instability*"

Author:

Holger Hermanns

Abstract

"*This keynote reports on formal behavioural models of power grids with a substantial share of photovoltaic microgeneration. Simulation studies show that the behaviour of the thus far installed hundreds of thousands of controllers on German rooftops might alltogether induce severe frequency oscillations. This phenomenon is indeed recognized by the German Federal Network Agency responsible for overseeing the national power grids, and new regulations are currently being put in place to counter this phenomenon.*

We study the current proposal, and compare it with a set of alternative approaches that take up and combine ideas from communication protocol design, such as additive-increase/multiplicative decrease known from TCP, and exponential backoff used in CSMA variations. We classify these alternatives with respect to their availability and goodput."

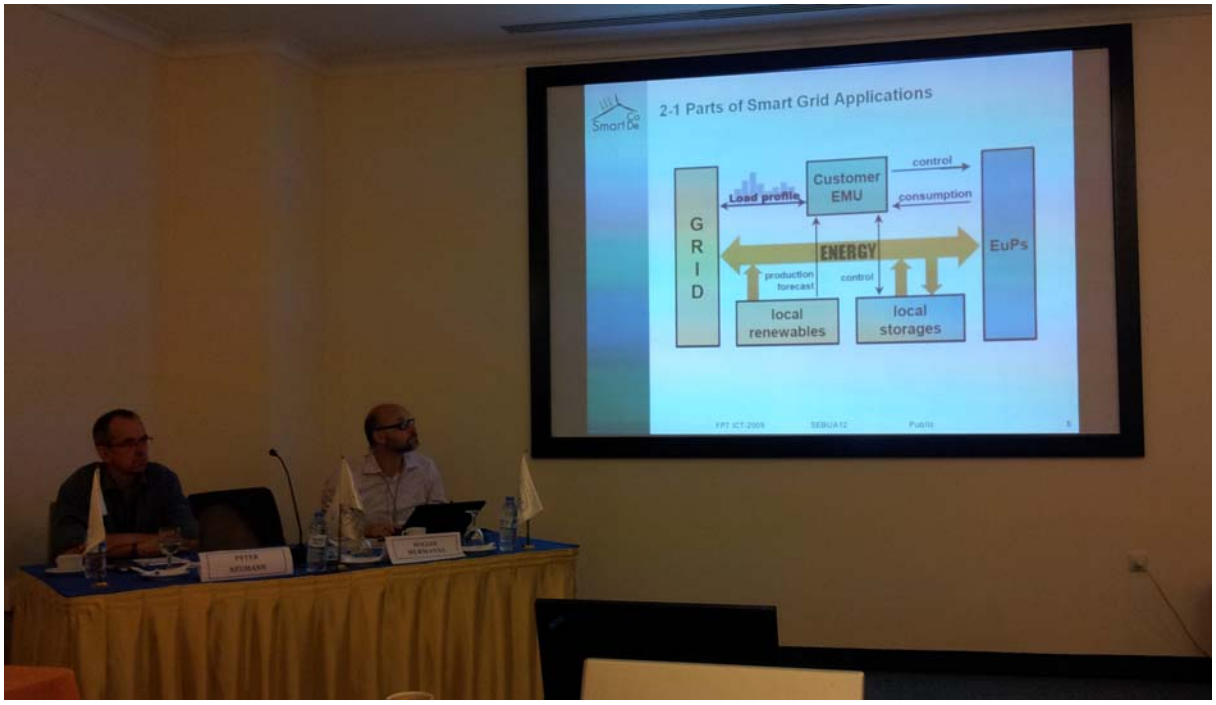

Figure 2.3.2: SmartCoDe session chair P. Neumann and keynote speaker Prof. Dr. H. Hermanns

2.3.5 SmartCoDe presentation Roland Kopetzky (Oct. 18, 2012)

Presentation Title

"*From theory to practise: real world demonstrators for smart grid applications*"

Author:

Roland Kopetzky, CEO ennovatis GmbH

Abstract

"*A smart grid is an electrical grid that uses information and communications technology to gather and act on information, such as information about the behaviors of suppliers and consumers, in an automated fashion to improve the efficiency, reliability, economics, and sustainability of the production and distribution of electricity. In order to evaluate new*

methods and to prove the efficiency of different algorithms it is necessary to set up a demonstration site that allows the integration of local energy providers (LEP) and energy-using products (EuP) under real world conditions. The presentation will show with a specific focus on energy management optimization strategies and the verification of the optimized results, how this goal was addressed at the demonstration sites at Almersberg and Buchberg in Austria."

2.3.6 SmartCoDe presentation Thomas Herndl (Oct. 18, 2012)

Presentation Title

"*Highly Integrated Microelectronic Devices for Energy Management*"

Author:

Thomas Herndl, Principle Engineer, Infineon Technologies Austria AG

Abstract

"*This presentation concentrates on hardware integration issues for a SmartCoDe wireless node, which is supposed to provide functionality for wireless communication and power metering & control of appliances with the aim to enable the application of demand side management and smart metering in private and small commercial buildings and neighbourhoods. In order to address a new and potentially huge market in homes, business- and public buildings and offices these services must come for very little additional costs. Due to the number of hardware modules that need to be installed, one significant cost item of the total system costs (aside of maintenance-, operational- and service costs) are the hardware purchase and installation costs. Nowadays purchasable modules are bulky and expensive. While minimization of installation costs is addressed by providing a wireless communication interface, which even allows for retrofit without structural changes, for a successful future roll-out scenario one must additionally strive for cutting the hardware purchase costs down to an affordable level for everyone. For that reason highly integrated circuits and effective heterogeneous assembly-, packaging- and manufacturing technologies are discussed.*"

2.3.7 Summary and Lessons-Learned

In the original SmartCoDe concept (see also Description of Work, DoW)) it has been planned to organize three yearly SmartCoDe Cooperation Workshops between 2010 and 2012. Despite press releases and mass mailing actions however the number of attendees has been relatively low in the years 2010 and 2011. For this reason, the project reviewer suggested to the coordinator during the SmartCoDe review in Brussels in April 2012 to cooperate in this context with other energy efficiency events. Although there was only little the time to initiate a cooperation (approx. 5 month,- for event planning and organizing it usually requires a year up front, sometimes more), the project succeeded to cooperate with SEBUA.

The interesting thing about SEBUA is that this symposium aims for interdisciplinary cooperation. The complexity of the challenges ahead (and the required solutions) demand for a cooperated approach,- dealing with the issues on a one-by-one basis where each research community works in its own ivory tower is not sufficient.

As described above SEBUA attendees came from very different areas of research. They also came from different European regions which is important because depending on the geographic region the primary energy use-case (e.g. heating in the north, cooling in the south) can be very different. But also the region-specific energy generation and storage options are very different.

The basic conclusion from the SEBUA symposium is that energy concepts have to be developed on a dedicated basis. There is no concept that is adaptable for all other regions. Independently from the geographic aspects (regions with lots of wind, geothermal options etc.) also country-specific characteristics have to be taken into account.

One example for country-specific aspects is the huge infrastructure for natural gas in Germany (pipes as well as storage), although most of the gas is imported from other countries. Germany has underground gas chambers with a capacity that may serve the whole country for approximately 6 month. From this it becomes obvious, that a potential future (country-specific) solution is the use of surplus wind energy from the North Sea for Methane generation that can be fed into the gas infrastructure and optionally power gas power plants.

The above example is an approach that could be called a large-scale one since there is a lot of financial and technical investment is involved. What however also became clear at SEBUA is that large-scale options must be complemented with small-scale concepts. Small-scale concepts, as the SmartCoDe one for example, do not need a large financial investment. Also the technical challenges could be reduced significantly. Small smart energy cluster could be rolled out one-by-one, they could even be financed by cooperatives of citizen, keeping the creation of value local. When more and more of these clusters become available, the effect on the overall grid will continuously grow. Coordinating several cluster via information and communication technology (ICT) will even enhance the benefit and could be considered as the next step in the direction of a virtual power plant (VPP). Important to understand in this context is that an actual concept for such a small cluster can (and should) be set up depending on the local requirements.