

Introduction to Panel 7:

Making industries more energy efficient

Panel leader: **Juha Honkatukia**
Finnish Government Institute for Economic Research (VATT)
Finland

Panel leader: **Ronald Wegman**
SenterNovem
The Netherlands

Introduction

Many options exist for cutting the high cost of industry: improving energy efficiency, reliability and productivity and working with government to influence policy and programs.

The panel on Energy Efficiency in Industry will offer opportunities to learn about a wide variety of cutting-edge energy technologies, measures, programs and strategies that cut energy costs, improve energy reliability, reduce energy price volatility, and enhance industrial productivity.

Papers on the following topics in particular were sought:

- Role of the government and programs in industrial energy efficiency
- EU and national programs in industrial energy efficiency
- Voluntary approaches, energy audits, benchmarking
- Energy policy – what works?
- Industrial energy efficiency and sustainable issues
- Improving productivity
- Sector case studies
- EE & climate change management policies
- Management practices in industrial energy efficiency
- Enabling methodologies for energy management
- Measurement of industrial energy efficiency

The response was very good. The papers accepted for panel 7 cover nearly 100 % of the above topics. The following outlines the contribution of the accepted 19 papers and 4 posters.

Role of the government and programs in industrial energy efficiency

In 7,048 Johansson et al summarise the current experiments in Sweden on how industry reacts and adapts to the mix of policy instruments which directly or indirectly affect energy costs and the prospects for energy efficiency improvements. In the absence of a level playing field (e.g. global emissions trading or border adjustment taxes to compensate) they propose that regulatory and supportive policy instruments should be used much more extensively and actively than today.

EU and national programs in industrial energy efficiency

In 7,057 van Beeck addresses the transfer of the Dutch Long Term Agreements (LTA) approach to other countries, based on experiences in Bulgaria and Romania. The Dutch voluntary agreement scheme has proven to be a flexible cost-effective instrument that can be used complementary to the EU-emission trading scheme to better exploit the full energy efficiency potential in industry. The paper describes the key factors which determine the success of the LTAs and discuss an approach (including indicators) for successful transfer of Dutch LTA knowledge to a different economic, legal and socio-cultural context. The results of the first project in Bulgaria are given.

In 7,118 Beukema and Dirks describe the results of the EU project Interaction. Interaction stands for International Transport and Energy Reduction Action. Recent experiences in different countries show that a sectoral approach to energy use reduction in freight transport is very successful. Actual practice has shown that on average reduction potentials of 15 % exist.

In the project 6 countries with 90 companies will be involved. The project will be concluded in December 2008. The results of case studies e.g. from the metallurgic industry in the Netherlands show that a sectoral approach as used in Interaction can be truly effective, in stimulating cost and energy reduction in freight transport.

Voluntary approaches, energy audits, benchmarking

In 7,209 Ottosson and Petersson present the first results from the Swedish LTA program for energy efficiency in industry together with the lessons learned from the use of this mechanism. The program runs for five years. During the first two years an energy audit is done to identify measures to improve the energy efficiency. The company also implements a standardised energy management system (EMS) together with routines for purchasing, planning and renovating. During the following three years the identified efficiency measures should be realised. The main conclusion is that the tax exemption does not seem to be big enough incentive companies to join the program. About 10 % of the companies involved have chosen to be a participant.

In 7,370 Huenes Wajer et al describe the results of the EU supported project Bess. Sixty SMEs from 11 European countries of the food and drink industries tested a package of interactive instruments for energy management and energy efficiency improvement. A number of pilot companies show a profit increase of 3 up to 10 %. The package includes a user-friendly and web based E-learning scheme for implementing energy management as well as a benchmarking model for company specific comparison of energy indicators. It also has several practical tools. SMEs have the possibility to benchmark anonymously their energy situation. A follow up project to expand the number of participants of various sectors is currently being developed.

Energy policy – what works?

In 7,037 Praetorius and Schumacher discuss carbon capture and storage (CCS) versus energy efficiency for the case of Germany. They give a survey of the current state of the art of CCS deployment and activities and use a general equilibrium model to analyze the impact of introducing CCS to the German electricity system. They conclude that given an appropriate legal and policy framework, CCS and energy efficiency are complementary measures and should both form part of a broad mix of measures required for a successful CO₂ mitigation strategy.

In 7,109 Schleich et al analyse and evaluate 25 National Allocation Plans (NAPs), which were submitted to the European Commission for phase 2 (2008-2012). Evaluations were made on macro and micro levels. The findings provide guidance for the future design of the EU Emission Trading Scheme (EU ETS) for CO₂-emissions from energy and industry installations.

In 7,104 Khan and Nordqvist make a comparative analysis of the implementation of five public policy instruments directed to the industry sector, which have in common the aim to promote increased energy efficiency. The empirical material from five European countries comes from ex-post evaluations of the policy instruments carried out in the EU-project Active Implementation of the European Directive on Energy Efficiency

AID-EE. They discuss and compare key factors. Important factors are stakeholder involvement in design and implementation, flexibility in the implementation phase and the integration of policy instruments

In 7,328 Ürge-Vorsatz et al describe why green investment schemes GISs should focus in energy efficiency, especially on investment in buildings in the former communist countries in Central and Eastern Europe (CEE). However much of this potential, especially in the building sector is difficult to unlock due to a broad range of barriers. The paper reviews the potential components of GISs, evaluates them from their perspective on their potential leverage on energy efficiency investments, and suggests alternative architectures than can optimise their benefits of GISs Green investment schemes have a significant potential to unlock the high efficiency potentials in the CEE region Europe, and could make a significant difference in improving energy efficiency in certain areas. It is crucial that the GIS architecture is optimised to leverage energy efficiency opportunities from the start of the planning process to the monitoring and verification scheme.

Industrial energy efficiency and sustainable issues/Improving productivity

In 7,014 Yang assesses the cost effectiveness of improving the energy efficiency of China's medium and large induction motor systems by using intelligent motor controllers. In China electricity consumption by electric motors account for about 60 % of total electricity consumption. Using intelligent motor controllers in China is financial viable within a payback period of less than 2 years and the CO₂ reduction could be over 570 million tons between 2007 and 2020.

In 7,059 Abou Khalil et al introduce a 4-step method for energy optimization and product quality improvement in manufacturing processes of small and medium sized enterprises (SMEs). The methodology uses available techniques and analysis methods and adds a molecular analysis at the product level in order to determine the best available techniques (BATs). The fourth step consists in the comparison of the different energy ratios. Based on these ratios and the knowledge of the actual process energy savings are evaluated, technical solutions for energy efficiency improvement are proposed and a first economic analysis is carried out.

In 7,194 Kulterer and Weberstorfer describe the results of the Motor Challenge Program (MCP), a voluntary program of the European Commission. In this program industrial companies receive assistance in improving the energy efficiency of their motor driven systems. MCP was integrated in the Austrian national energy efficiency program which has the first focus on pumps, fans and compressed air systems. The results of case studies are given. In Austria the economic saving potential is about 500 MWh.

In 7,295 Gudbjerg and Andersen show the results from research projects and practically experiences with coating of pumps and ventilators in Denmark. Potential savings are in the area of electric consumption and maintenance costs and the extension of lifetime. For pumps an increase in energy efficiency was reached up to 20 %.

Sector case studies

In 7,021 Djemaa et al apply a model for the long range analysis of energy/technology choices in the industrial sector. The modelling tool is the TIMES model, which is family of the MARKAL model. It is an economic linear programming model generator for local, national or multi regional energy systems, which provides a technology-rich basis for estimating energy dynamics over a long term, multi period time. The results for the industrial sectors paper and steel manufacturing are given. Their work indicates that still a significant potential for energy savings and carbon dioxide reductions in both industries exists.

In 7,303 Coito and Allen postulate that industry uses large amount of energy, there appear to be numerous cost-effective energy efficiency improvements that customers are not implementing. Program planners need to better understand opportunities and barriers in the industrial sector to better design efficiency programs geared toward this sector. They presents the results of a case study analysis of one California's largest energy-consuming segments, the cement industry. Energy efficiency practices and decision making are compared across facilities within the industry. Customers' energy efficiency decision making attributes are analysed relative to facility energy efficiency and to identify barriers to increased uptake of energy efficiency measures. They suggest possible ways for utility-funded programs to affect these large industrial customers.

EE & climate change management policies

In 7,165 Schumacher and Sands use the Second Generation Model (SGM), an economy-wide computable general equilibrium model that embodies energy and other greenhouse gas mitigation possibilities. The electrical power sector provides substantial opportunities for fuel switching and the deployment of advanced electricity generating technologies with and without CO₂ capture and storage. The methodology relies on engineering descriptions of electricity generating technologies and how their competitive positions varies with a carbon price or change in fuel price. The study is one step toward providing more realistic scenarios of greenhouse mitigation options in Germany.

Management practices in industrial energy efficiency

In 7,098 Brunner et al report about the ongoing process for Harmonisation of Standards in Energy Efficiency of Electric Motor Systems (SEEEM), Only 10 countries have so far enacted mandatory Minimum Energy Performance Standards for electric motors and very few have done so for entire motor systems like pumps, fans or compressors. They explain the strategy and report about the building of an international multi-stakeholder Community of Practice.

Enabling methodologies for energy management

In 7,318 Bement and Skumatz provide results from several commercial sector programs detailed information about non-energy benefits (NEBs) and focus on implications and uses of the information including and beyond the benefit-cost

implications. Their work indicates that selling programs and measures solely on efficiency or bill savings even to the bottom line orientated commercial sector may not be the most effective approach because it ignores information on benefits that participants value from these programs. These results have implications for developing and marketing and targeting recommendations for the program.

Measurement of industrial energy efficiency

In 7,099 Riou describes the results of a French group of experts from ADEME, AFNOR, Ministry of industry, professionals concerned and industry representatives which had the task to develop a reference frame for energy diagnosis in industry. This reference frame represents a consensus, causes much interest among various actors and presents several benefits both for the industrialist and the diagnostician. It is a description of an acknowledged method. The document is currently proposed to the European normative committee.

Posters

Panel 7 has 4 contributions for the poster sessions, in which specific activities are described.

In poster 7,035 Chindris et al describe the development of original software created in Borland C++ Builder visual environment for computation of power losses in unbalanced and harmonic polluted industrial electric networks. The electromagnetic phenomena in the industrial electric power networks have reached a level of complexity that their accurate knowledge has imposed the developing of complex software products including expert systems. The use of this software decreases timework and offers advantages like avoidance of mistakes and the possibility of importing or saving input data and results.

In poster 7,055 Gulbrandsen describes the development and use of a Master of Expert Program (MEE) in West-Balkan to improve energy efficiency, environmental impact and possibilities for using renewable energy sources in industry. The target groups of this training program were energy and environmental experts from the Balkan industry and public sectors. The results of this training program are given.

In poster 7,120 Padilla and Galio present the Bilan Carbone® method developed by ADEME (French Agency for Environment and Energy Management) to help companies launch a dynamic emissions reduction process. The general spirit of the Bilan Carbone® method is to provide the broadest possible panorama of emissions that are linked to processes used by a company or an organization. The paper points out that an assessment of 130 Bilan Carbone® operations (out of over 400) has shown that 75 % of the participating companies have implemented one or more actions as a result of the diagnosis.

In poster 7,236 Ghnimi et al describe Ohmic heating as a food processing operation in which heat is internally generated within foods by the passage of alternating electric current. The paper reports experiments on the effect of duty cycle changes in energy efficiency of the power supply. The voltage and current measurements at high frequency were performed. The results suggest that duty cycle reduce energy efficiency of the Ohmic heating process, which varied from 65 to 90 %. The energy of the power supply close to 90 % was obtained when

the duty cycle exceed 0.8. A predictive of the energy model of the energy efficiency of the power supply according to the duty cycle is given. The global energy efficiency of the system power supply and the Ohmic heater is 85 %. For the Ohmic unit it was 95 %. This high energy efficiency can be means of energy savings compared to traditional processes.