Introduction to Panel 3
Energy use in industry: The road from policy to action

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Introduction

Two key aspects of energy use in industry fundamentally shape the development of industrial energy efficiency policies and measures: 1) the large potential for energy efficiency improvements in both small and large companies and 2) the great diversity of possible technical actions for improvement and barriers to their implementation. However, this diversity makes policymaking a challenge. It demands that those policies are appropriate, complementary, cost-effective and well coordinated and that they address the specific barriers for energy savings improvements. Such policies also ultimately need to enhance companies' motivation for making investments that improve energy efficiency, including identifying savings as a continuing process (in the light of the high saving potentials available, as presented in the some of the papers in this panel).

The papers selected in this panel address two main themes: calculating energy saving potentials and non-energy benefits from energy efficiency measures and policy programs or initiatives governments have implemented to encourage energy savings. Within these two themes, the papers take various and diverse approaches. Some study energy saving potentials linked to specific technologies that are present in all industry sectors (e.g. lighting) or are sector specific (e.g. food industry). Some address cross-sectoral mechanisms to continuously improve energy efficiency levels (e.g. EnMS in Ireland). Others address the barriers that hinder identification of the full energy saving potentials. Others still present international comparisons, or focus on national, regional or local initiatives (e.g. the energy efficiency networks in the EU or voluntary agreements in China). With such a wide range of issues included, it is not surprising that many high quality abstracts were received and we regret not being able to include more.

Our aim in presenting this panel is to compare and contrast some of the initiatives. In this overview, we highlight the papers included and discuss their relationships, intending to draw out some key issues and common lessons that could emerge from the panel to influence policy and practice in the near future, with a view to further drive industrial efficiency.

Calculating technical savings potentials and NEB

A number of specific papers provide case studies indicating that energy savings potentials remain significant. Tiedemann and Sulyma (3-057) from Canada present experiences with a voluntary industry program for energy efficiency, initiated 1975, and provide an evaluation of the program's efficiency. Savings related to the program range from 1,7 % for base consumption looking at facility lighting to 5,6 % for process and water heating. Webber et al. (3-526) from the UK report from a project where smart metering was used to help achieve energy efficiency in the SME sector. They found that detailed monitoring of energy consumption and feedback are an effective way of engaging SMEs in energy efficiency.

Taking a technology or process specific approach, Pehnt et al. (3-157) highlight the importance to focus on the industrial processes. In Germany, two-thirds of final energy consumption is used for process heat, and conversion of this waste heat for electricity generation and heat pumps is largely untapped. Hita et al. (3-332) from France show via the TIMES economic model the huge potential for heat recovery in the industry sector using the French food and drink industry as a case study. With the use of heat pumps based on new technology, up to 85 % of the heat can be recovered.

Fleiter et al. (3-200) find a cost effective saving potential of 14 % in the German energy intensive industries thanks to the use of new technologies, such as heat pumps. They explain that one of the main barriers to implement this new technology is the strict pay back time of investments in industries. Mericam-Bourdet et al. (3-288) from France also present the new "cold plasma" technology that can decompose the pollutants, and can lead to substantially high energy savings if used instead of pure ventilation.

A common experience of companies that become more energy efficient is that many other significant operational savings are also uncovered. Beyond energy-related cost savings, non-energy benefits (NEB) can be significant. Willoughby et al. (3-122) present a very interesting case study in China where non-energy benefits of investments considerably increase the value of energy efficiency projects. The paper makes reference to a US study that estimates that the value of the NEBs is 2,5 bigger than the energy saving itself. Yet, Van Reusel (3-092) also points that while energy efficiency is a valuable means for GHG mitigation, in some cases, it makes only poor sense as a measure for CO_2 reduction. The author makes a comparison between gas and electrical aluminium melting, the former being more energy efficient, but also more GHG intensive. The paper points out that there is a need for a more holistic approach.

Identifying energy savings through energy audits and EnMs

While significant energy savings are achievable in the industry sector, it is clear that industrial facilities are not always aware of their overall energy-efficiency improvement potential or specific technologies and measures that can be implemented. Conducting an energy audit or assessment is a key step for identifying these potentials, but many plants do not have the capacity to conduct an effective evaluation.

Price and Lu (3-049) describe a number of government programs that have been established around the world to encourage, facilitate, or mandate industrial facilities to undertake energy audits. The paper provides information on the establishment of these programs with the goal of providing guidance to policy makers and program designers.

Taking a country perspective, Gruber et al. (3-112) provide results from the evaluation of an energy audit programme for SMEs in Germany, which offers partial subsidies for the energy audits in SMEs. Success factors of the audit scheme include its low threshold access due to the high levels of funding, the support from the regional partners and their personal contacts to SMEs, and the generally high quality of the audits. Focusing on the county or municipal efforts, Dinkel and Hallström (3-113) present the results of a project led by a public-private consortium in a county of Sweden aiming to encourage SMEs to undertake energy audits and achieve energy efficiency. Fully implemented, the measures could result in annual energy savings varying from 10–30 % from the sector.

Implementation of Energy Management Systems (EnMS) also enable organizations to establish systems and processes necessary to achieve operational control and implement continual improvement of energy performance. EnMS will clearly play an important role in the coming years to encourage energy efficiency. An ISO standard is on its way and many countries have introduced national standards and support programs for the implementation of EnMS. Several papers present evaluations of EnMS programs, and it is clear from several of them that EnMS can help the industries to be more energy efficient.

Stenqvist et al. (3-412) from Sweden summarise the experiences with EnMS in the Swedish pulp and paper industry. The paper raises the question of why such an energy-intensive industry had not introduced EnMS prior to 2005 when it was introduced via the long-term voluntary agreements (PFE). It also discusses co-benefits of EnMS, beyond energy efficiency.

O'Sullivan (3-375) explores the concepts of Special Investigations developed in Ireland, which are pivotal to the continuous-improvement process, in that they challenge energy requirements and uncover deeper energy-efficiency opportunities. He also shows that EnMS itself must also be continuously improved.

Ozoliņa et al. (3-016) present research from Latvia in the area EnMS. The research indicates that systems such as EMS 16001, well known in other countries, need time to be implemented if the supporting policies that encourage its use are not present. Barriers such as lack of knowledge and the economic situation are indentified as barriers to EnMS implementation.

ESCOs, outreach and voluntary programs to encourage efficiency investments

International experience shows that implementation of EnMS and the undertaking of energy audits can drive action when linked to an energy savings agreement between industry and government. Networking initiatives, energy service companies (ESCOs) and incentive mechanisms also greatly accelerate the uptake of energy saving measures. Several papers report on success stories and the impact of government-led outreach or networking programs supported by energy audits and EnMS training. One paper points to the untapped potential of ESCOs.

Petersson et al. (3-501) presents results from an evaluation of Sweden's energy efficiency long-term agreement (PFE) and major success factors. The reported results were above all expectations – about three times more electricity than expected had been saved. Major success factors include the introduction of EnMS within companies, networking meetings among the participants and financial incentives for participation.

Koewener et al. (3-325) describe the benefits of Energy Efficiency Networks (EENs) implemented in both Germany and Switzerland. Experts provide information on new energy efficient solutions during networking meetings and the performance of each company is monitored on an annual basis. Results from 70 networks in Switzerland and more than 20 networks in Germany show that the participating companies can double their energy efficiency improvements. They represent an innovative approach for medium-sized companies being applicable in any industry with minor adaptations.

Mey (3-391) outlines the requirements that lead to effective EnMS but also explains that less strict requirements are needed for SMEs. The paper compares international experiences of programs that encourage EnMS implementation as well as international standards. Key findings are that financial support for EnMS and legal obligations should be embedded

in a good framework to ensure the quality of the management systems and certificates. But it should not lead to a situation where pro-forma certificates are generated just to get the fiscal or regulatory benefits. The need and level for monitoring of energy consumption is discussed with the view that one size does not fit all.

Crittenden and Lewis (3-502) describe the Australian Energy Efficiency Opportunities program designed to address the gap between the potential existence of cost-effective energy efficiency projects and the information required by managers to make investment decisions. Companies are required to publically report on the outcomes of assessments and business response on an annual basis, a key element of the EEO program. If all of these projects were to be adopted they would achieve a 2.9 % reduction in Australia's total energy end use.

Jiang and Price (3-040) provide information on voluntary agreements that have been signed between national-level government agencies and large enterprises. In exchange for participation, incentive policies are designed such as technical assistance. The paper also discusses the prospects for continued adoption of voluntary energy efficiency agreements under China's 12th Five Year Plan, making recommendations for improving the use of this policy mechanism in China.

Backlund and Thollander (3-081) focus on the role of energy service companies (ESCOs) as a potential means of overcoming barriers to energy efficiency in the SME sector. They highlight several assessments of the ESCO market in Sweden, which indicate that it is not fully developed, and conclude that a large part of the potential for energy services will not be implemented in industrial SMEs unless energy policies such as, e.g. subsidized energy audits and other market stimulation mechanisms are provided by the government.

The use of other policies to encourage efficiency investments

While the role of voluntary agreements, outreach initiatives, ESCOs and incentives as a driver for energy efficiency in the industry sector cannot be underestimated, other policies are also being developed. One paper discusses the innovative policy that is being developed in India.

Dhingra (3-494) describes the Perform Achieve and Trade (PAT) scheme, a new comprehensive policy scheduled for introduction in 2011. The PAT could provide an effective mix of regulation by setting mandatory energy intensity targets for energy savings combined with a flexible market mechanism – the trading of energy saving certificates ("white certificates") – to secure overall cost-effectiveness.

Some key findings

- Research presented in this panel identifies that there is a significant energy saving potential in the industrial sector and it will increase in the coming years as new technologies are developed.
- The absence of detailed baseline energy consumption data in many companies is a major barrier to identifying projects with the potential for savings and later for assessing the effectiveness of any investment recommended to improve performance. Energy audits are key to determining the level of energy savings (or GHG emission reductions) that a company can achieve.
- EnMS systems is also a way forward to reach this potential. Used in combination of other systems (e.g. LEAN), the efficiency of the EnMS programs increase.
- International experience shows that implementation of EnMS and the undertaking of energy audits can drive action when linked to an energy savings agreement between industry and government or energy efficiency targets.
- Improving energy efficiency in the industry sector enhances competitiveness and productivity, and provides a range of ancillary benefits. If the value of the non-energy benefits is included in the payback calculations an even higher potential can be reached as they multiply the value of the energy saving with a factor 2.5.