Introduction to Panel 6 Appliances, product policy and ICT

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Introduction

Panel 6 has a broad scope, addressing energy efficient appliances, ICT, smart grids and lighting, as well policy programs to promote the market penetration of highly energy efficient technologies. In this panel, aspects like international comparisons, market analysis, learning curves, international programs and rapidly expanding economies will be under investigation.

The topics for this panel are

- Cost of efficiency.
- Policies and measures.
- MEPS and labeling
- Testing, standards and promotion.
- Household electricity demand.
- ICT.
- Smart houses & smart grids.

Cost of efficiency

Not taking into account learning curves when analysing the potential of energy efficient products will lead to underestimations. Desroches et al. (6-190-13; "Trends in the cost of efficiency for appliances and consumer electronics") draws data from US to prove this thesis. Learning curves, historic and projections, for white goods, air conditioners, furnaces and televisions are presented. The estimated consumer benefits are larger by up to 60 % compared to standard impact modeling.

Learning curves are also a basic part in Van Buskirk (6-289-13; "Modelling the dynamics of appliance price-efficiency distributions"). He develops a novel set of model equations that can be used to describe the evolution of appliance efficiency distributions and price-efficiency correlations over time. Its empirical foundation and parametric simplicity is a key advantage, depending only on four key parameters and specification of a set of initial conditions. Among other findings, a top-of-market efficiency improvement rate of 3 %/year was found.

Which effect do energy efficiency standards have on prices and market shares of major household appliances? Spurlock et al. (6-187-13; "Energy efficiency and minimum standards: a market analysis of recent changes in appliance energy efficiency standards in the United States") discuss the drop in prices in relation to many factors. Additionally, market shares of purchased appliances have shifted towards greater and greater efficiency. In particular, the clothes washer market share distribution across efficiency levels has been characterized by a bimodal distribution, which has gradually shifted towards greater efficiency, particularly following the implementation of standards. There appears to be an overall downward pressure on prices just around the time of changes to the standard for clothes washers. The final conclusion is that simplistic assumptions of perfect competition are likely not justifiable for these appliance markets.

Policy and measures

Letschert et al. (6-191-13; "Energy efficiency appliance standards: Where do we stand, how far can we go and how do we get there? An analysis across several economies") estimates the foreseeable impacts of minimum energy performance standards (MEPS). The Bottom-Up Energy Analysis System (BUENAS) is used to estimate potential impacts and savings for a wide range of residential and industrial end uses and in the

11 participating major economies. The paper presents a comparison of three potential saving scenarios for MEPS, for the main end-uses in the residential sector and identifies a large, cost-effective, potential annual energy savings in SEAD economies. Setting more aggressive standard targets is possible if more policy instruments, such as financial incentives are made available.

What are the economical and technical possibilities to reduce electricity demand? Elsland et al. (6-069-13; "Is enough electricity being saved? Impact of energy efficiency policies addressing electrical household appliances in Germany until 2030") address this issue with a bottom-up simulation model. Rebound effects and learning curves can also be implemented in the analyses. Three explorative scenarios are analyzed. Ecodesign plays a central role in all of them. Results from the model shows that the current policies can lead to a reduction in electricity consumption of approximately 25.3 TWh by 2030 compared to the level of 2010, but an ambitious design of policy measures should be able to reduce the overall electricity consumption of certain appliances by up to 50 % by 2030.

What is an appropriate policy package? Barthel et al. (6-359-13; "Halving worldwide electricity demand for residential cold appliances through appropriate policy packages") argue why these packages are needed and present how they can be configured. Elements of measures to build specific policy packages for refrigerators are presented, and the refrigerator package from California demonstrates the successful implementation of a sector-specific package.

MEPS and labelling

Why do the ecodesign and labelling measures take so long time to implement? This is the issue Siderius (6-068-13; "Speeding up adopting ecodesign and energy labelling measures – analysis, challenges and solutions") is addressing. In principle the process is straightforward, but the technical complexity and political sensitivity create problems along the way. He analyses each step of the preparation of the process, makes an international comparison with Top Runner in Japan and the US DOE rulemaking process and suggests as a benchmark, a 3 year process from the start of the study phase to the final publication. (Apart from constraints in staffing at the European Commission, Member States and stakeholders, total process time is mainly challenged by the technical complexity and the contentiousness, including political sensitivity, of the products to be regulated.)

What is the effectiveness of the new EU labels? Waide et al. (6-124-13; "The new energy label: assessing consumer comprehension and effectiveness as a market transformation tool") have investigated the new label for freezers, washing machines, dishwashers and televisions. Consumer focus groups and questionnaires were conducted in ten cities across the EU and were complemented by in-depth interviews. Some interesting proposals for future labeling design are presented. The paper concludes that while the energy label is generally well understood, the motivational effect has weakened the market transformation impact because of the scale A+++ to D.

Lock and Tokur (6-081-13; "UNDP/GEF market transformation of energy efficient appliances: upgrading energy labelling and eco-design policies and programmes in Turkey – an accession country example") points out that the electricity consumption for households is increasing rapidly in Turkey. In order to accelerate the transposition, implementation and better enforcement of the EU energy labelling and eco-design regulations, the government launched a market transformation programme towards more energy efficient household appliances which has been a success so far and has established a market surveillance programme to check compliance of products with energy labelling for the first time in Turkey.

The Chinese total residential electricity consumption has increased more than 10 % per year since 2007. Hu et al. (6-186-13; "Market analysis for China energy efficient products") analyses the current market status of efficient products, calculate potential energy savings and provide policy recommendations in this paper. 48 MEPS have been established. In addition to these market transformation policies, several rebate programs are available to promote energy efficient products in China.

Attali et al. (6-301-13; "Can Europe continue deciding on product policies (MEPS, labels, etc.) without monitoring the market?") discuss the advantages of continuous market monitoring. The paper presents monitoring in other countries and gives several examples from Switzerland illustrating the benefits of market monitoring for policy decision. At EU level, a good example is the European database for cars.

The review of the Ecodesign directive in 2011 concluded that market surveillance was insufficient and ineffective. It was estimated that 10–20 % of products covered by implementing measures are non-compliant. Petersson and Nielsen (6-329-13; "Market Surveillance – the prerequisite for realising the large expected savings from the Ecodesign Directive") participate in the EU Ecopliant project created to help deliver the intended economic and environmental benefits of the Ecodesign directive by strengthening market surveillance and so increasing compliance. How do MSAs deal with product testing, effective methods for monitoring, verification and enforcement when experience and resources are limited?

Testing, standards and promotion

How to encourage the production and sale of super-efficient products? That is the task Ravi et al. (6-180-13; "Policy into Practice: The SEAD global efficiency medal") have embraced. SEAD, Super-efficient Equipment and Appliance Deployment, is a new player on the international energy efficiency arena. One activity is the Global Efficiency Medal competition. The first annual competition recognized the most energy-efficient flat panel televisions (TVs) in three different size categories and four regions around the world. This market transformation program is a good example of a successful policy mechanism to promote highly-efficient products through awards programs or other voluntary schemes.

Bennich et al. (6-491-13; "On the bright side of life: International efforts to accelerate market adoption of LEDs while avoiding the pitfalls of CFLs") present the IEA 4E Solid-State Lighting (SSL) Annex. The paper discusses how several governments are working together to accelerate processes to establish performance criteria and quality assurance methods. The introduction of LED lamps is facing important challenges: the technology is brand new, relatively expensive, test

methods and standards are not harmonized, and laboratories have little experience with LED testing. Overall, quality and performance criteria are not fully defined, and many consumers, importers, retailers and manufacturers don't understand the technology.

Judging from the declared On-mode power found on Topten China and Topten Europe, the most energy efficient TVs on the European market seem to be far more efficient than those on the Chinese market. Michel et al. (6-172-13; "Finding the most energy efficient TV in China and in Europe: not such an easy job …") attempt to find out if this is true. An international testing project was launched: three testing institutes each tested the most efficient 46-inch-TV from China and from Europe according to the Chinese and the European measurement procedures. The importance of harmonization of energy testing standard procedures and definitions of energy efficiency are stressed.

Household demand

Bosseboeuf et al. (6-120-13; "French higher domestic electricity consumption for captive uses compared to Germany: assessment of explanatory factors") tries to understand why French households consume on average 600 kWh/household more than German households regarding electricity consumption for captive uses (i.e. excluding thermal uses). Quantitative factors such as large domestic appliances and a larger penetration of very efficient appliances in Germany partly explain the higher consumption in France. The lower price of electricity in France certainly plays a role, but other factors need to be considered such as miscellaneous historical, structural and demographic factors. Concerning policy and Instruments factors, the situation is similar between the two countries, but Germany has implemented public awareness programmes for longer that France, and with more continuity. Furthermore, German consumers give more attention to environmental issues and German households also benefit from numerous DSM programmes implemented locally by Länders, cities, and more than a thousand electricity providers, some of which belonging to local authorities who have often been proactive in DSM programmes for decades.

Evans (6-499-13; "Easy-to-adopt lessons for organisers of large scale energy consumption studies in households") demystifies the complexity of household studies and demonstrates a successful management structure. The results have already been published therefore the main theme here is to identify the key features of the design and management processes that enabled this huge and complex research programme to be completed as specified, on time and on budget.

ICT

In Western Europe consumption of data centers is estimated to almost double between 2007 and 2020. Patrão et al. (6-363-13; "Energy efficient IT-technology for data centers and server rooms: case studies, procurement guidelines and educational experience from the PrimeEnergyIT European project") acknowledge that saving possibilities are well known, but identify a potential for improvement for small and medium datacenters. The project collected several best practice examples, developed public procurement guidelines and training materials. About 500 IT experts were trained in workshops all over the participating countries. This paper presents two of the most successful best practice examples collected within the project.

Proske and Stobbe (6-408-13; "Comparative inventory model of conventional end-user devices and thin clients") analyze, from a system perspective, alternative ICT configurations. They even include the telecommunication part. PC, thin clients and notebooks are compared both for offices and home environment.

According to IEA, ICT stands for 5 % t of total final global electricity consumption and is projected to increase three-fold by 2030. Rozite et al. (6-152-13; "Is smart efficient?") present quantifications of current and projected ICT-related energy consumption and options for policy design. Solutions to make these technologies more efficient exist, but are not implemented due to lack of market demand and concerns on the impact these solutions may have on quality of service. The challenge for policy intervention is technical complexity the design of networks and appliances, while at the same time keeping the end user in mind.

Viegand (6-317-13; "Server room guide helps energy managers reduce server consumption") describes saving opportunities and a market analysis among IT managers. This is followed by a presentation of the contents of the latest version of the Danish server room guide.

Smart houses & smart grids

Smart homes have been strongly driven by technology push and have not been based on a clear understanding of user-centric benefits according to Hargreaves and Wilson (6-241-13; "Who uses smart home technologies? Representations of users by the smart home industry"). The paper presents the results of a content analysis of industry-produced smart home marketing materials. The content analysis was based on a coding template derived from a systematic review of the academic literature on smart homes and their users.

Moura et al. (6-277-13; "Monitoring and control platform for energy efficiency in smart buildings") present a novel energy monitoring and control system. The system reduces electricity consumption by increasing the energy consumption awareness of the users, by acting automatically on the demand side, and by coordinating electricity consumption with the in-building and neighbourhood positive-energy generation facilities.

Norwegian regulations have charged somewhat unwilling network companies to achieve full penetration of smart meters within 2017. Throndsen (6-333-13; "Constructing the Norwegian smart grids: To fix what is not broken?") explores such a challenge using the empirical material composed mainly of participatory observation and interviews at a medium-sized network company as they have been struggling to define, develop and implement smart metering.

The evolution of power systems towards smart grids will expectedly foster the implementation of dynamic tariffs and provide the technological basis for a broader dissemination of local generation and electricity storage. Soares et al. (6-067-13; "An agent-based modelling approach for domestic load simulation") argue that a more proactive attitude from typical domestic end-users is needed, namely determining the best demand

response strategies when using, storing or selling electricity back to the grid in face of dynamic variables such as electricity prices, weather conditions, comfort requirements, and local generation availability.

How can utilities create customer value from the Smart Grid? Puckett et al. (6-463-13; "Smart grid appliances case study: anatomy of a demonstration pilot") reports on a demonstration project in 30 dwellings. Two utilities and GE are involved.

Can electronic devices be self-supporting? McMahon (6-458-13; "Zero energy devices (ZED): Stopping the increasing demand of electronics for grid-based electricity") gives several examples of these fascinating devices. The combination of technological advances in energy efficiency for electronic devices, coupled with advances in harvesting ambient energy, has the potential to achieve zero energy devices (ZEDs), self-powered and utilizing less than one watt each.