Introduction to Panel 4 Monitoring and evaluation for greater impact

Panel Leader: **Kirsten Dyhr-Mikkelsen**
EA Energy Analyses
Denmark
kdm@eaea.dk

Panel Leader: **Lovorko Marić**
Croatian Public Energy Institute
Croatia
lmaric@eihp.hr

Introduction

Limited resources necessitate prioritisation and the urgency for achieving our climate goals demand an overview of how far we have come. Panel 4 is dedicated to sharing best practices, tools and lessons learned on monitoring and evaluation of energy efficiency programmes and policies. It covers an encompassing and wide topical and geographical range of subject matter, divided into seven themes, from EE service market analysis, behavioural changes, and large-scale programme evaluation, to monitoring through indicators and energy statistics.

Energy efficiency service market

Energy efficiency services play a fundamental role for realising investment in energy efficiency. Rau et al. (4-110-19) discuss the challenges of tracking the energy efficiency service market development in the German public sector. For the past 5 years they have closely monitored the evolvement of German market for energy efficiency services. Each year, more than 6,000 telephone interviews with households, public institutions and private companies are carried out to learn more about the market demand while the supply side is explored via an online query among more than 10,000 listed energy efficiency service suppliers.

Janša et al. (4-104-19) present an analysis of the monitoring of the energy efficiency and renewable energy subsidy measures in the residential sector, instigated by the Slovenian Eco Fund. They call for caution in the interpretation of impact assessment and advice that attention should be paid to comprehensively understanding the subject specifics. The analyses performed present the elements of the future monitoring system for the Integrated National Energy and Climate Plan 2021–2030, where energy efficiency and climate actions play an import role.

Hünecke et al. (4-092-19) try to answer the question what role transaction costs play in energy efficiency improvements and how can they be reduced. Investments in energy efficiency improvements frequently do not take place although they seem cost-effective from a simple cost-benefit perspective. Perceived transaction costs are one important barrier. The paper presents approaches, results, and insights from a recently completed research project funded by the German Federal Agency for Energy Efficiency, exploring the transaction costs of various energy efficiency measures and the role of energy efficiency services to overcome the barriers.

Learning from experiences

The German Energy Efficiency Fund, a special budget of the Federal Ministry of Economic Affairs and Energy, finances more than twenty national programs to support energy efficiency in the residential, private and public sectors. These programs range from energy savings check-ups for households to large-scale financial support programmes for energy efficient technologies in industry. This heterogeneity makes evaluation and communication of results challenging. Voswinkel (4-336-19) suggests a way to "catch them all" and present the multi-program results in a harmonised way.

Rotmann & Ashby (4-118-19) share their lessons learned on justification of the ephemeral behavioural change programs in US and Canada. With this type of programs verifying and getting credit for achieved energy savings can be a challenge. In 2018, the US Department of Energy (DOE), together with the Consortium for Energy Efficiency (CEE) and its 80 US and Canadian utility members, joined a global behaviour change collaboration

through the International Energy Agency Demand Side Management Task 24 (IEA DSM Task 24) to share the learnings from project researchers and practitioners. They analyse international best practice on evaluating behavioural programs.

Amassing and analysing lessons learned by a multitude of evaluators, van den Oosterkamp et al. (4-090-19) boldly claim to "present everything you always wanted to know about evaluation but were afraid to ask". They have developed a toolbox to support stakeholders find an evaluation design that fit their needs. Its interactive user interface provides users with practical guidance tailored to 30 combinations of sector, policy instrument and method for evaluating energy savings. The toolbox is primarily focused on ex-post impact evaluation.

The toolbox to develop, implement and monitor advanced energy and climate goals and strategies, presented by Jakob et al. (4-369-19), aims to facilitate data handling and communication of progress so that cities and utilities make informed decisions. "Ad hoc" data collection, resulting in datasets that are often incomplete and incoherent, may be alleviated with this toolbox. The Carbon Resource Energy and Adaption Toolbox Europe (CREATE), a comprehensive modelling and data toolbox, permits GIS-based scenario analysis and can for example be used to investigate how and at which cost climate change mitigation goals can be reached.

Taking the temperature on behaviour

The progress in IT-technology and installation of smart meters provides new opportunities for collecting important information in a cost-effective manner. Satre-Meloy et al. (4-291-19) have investigated what makes households peak, through cluster analysis of household activities and electricity demand, combining a dataset of high-resolution electricity data, household socio-demographics, and occupant time-use data for a sample of 135 UK households. This combination of information allows validation of load profile clusters and exploration of activities driving demand and the response to interventions.

Understanding daily routines and our target group is the basis for effectively influencing behaviour. Van Lidth de Juede et al. (4-177-19) describe the "Waste Checker", an application launched by a Dutch energy supplier, generating automated household specific insights on where energy is wasted in a user's home in order to increase awareness of energy conservation potential and to detect inefficient energy usage.

Keeping in line with the focus on potential behavioural changes of households, but this time from a US perspective, Meier et al. (4-042-19) investigate what internet-connected thermostats in more than five million American homes can tell us about American heating and cooling habits. This dataset represents the most comprehensive public data on home temperature preferences for North America so far. The connected thermostats raise a survey research question: When should policymakers rely on a small sample of rigorously selected buildings instead of a huge, unrepresentative sample with detailed data?

Balancing simple versus detailed

Severinsen & Hyndman (4-320-19) demonstrate quantification of energy savings from energy conservation measures in buildings using machine learning, especially from small energy conservation measures – thus avoiding undermining project cost-efficiency by installation of sub-meters to measure impact. Using nine Norwegian grocery stores as case, they have developed a model that predicts building energy consumption on an hourly level. The model was then trained on energy data from the main meter before the energy conservation measures were implemented and used to predict energy consumption after the measures.

Cullen & Gonzalez Hernandez (4-161-19) describe a methodology to evaluate the combined energy and material efficiency of energy-intensive industrial processes. The methodology consists of four key components: i) the extraction and reconciliation of bottom-up process control data or statistical data to quantify energy and material flows; ii) the conversion of energy and material flows into a single metric, exergy; iii) the visualisation of system-level resource flows with Sankey diagrams; iv) the exploration of potential efficiency savings using integrated metrics for both energy and material resources and benchmarking results against other plants, historical performance and physical efficiency limits. Results from three cases reveal that savings from material efficiency can be as high as from energy efficiency.

Suomi (4-357-19) is asking: what is sufficient for monitoring and evaluation of a policy? The voluntary energy efficiency agreement scheme for industry is the largest energy efficiency policy in Finland. Since its launch in 1997, evaluators have been gathering data on the scheme and the monitoring system is in fact one of the success factors in the scheme, creating trust and credibility among all agreement parties and achieving long-term top-level commitment. Thus, a circle of positive development has been created. Other obligations such as reporting requirements towards EU has also benefitted. It remains, however, a challenge to fulfil different and changing reporting requirements without administrative strain. The way forward, according to Suomi, is to be pragmatic and to keep it simple.

Choosing the right indicators for the job

Benchmarking – not just your own efforts but also compared to that of others – can provide useful and valuable insights.

Toro et al. (4-374-19) bring in a fresh new perspective from South America. It provides an overview of the methodological framework used to calculate the first balance of Useful Energy for Colombia, quantify losses and estimate the energy efficiency gap. Obtaining relevant sectoral data (industrial heat and cold technologies, transport mode efficiencies, residential technology efficiencies for different altitude levels, etc.) and its related uncertainties, suited for international comparison, has not been an easy task.

Having evaluated the performance of the French housing stock using several indicators, Laurent et al. (4-105-19) discuss the pitfall of a single indicator to rule them all. Comparing French and UK indicators, the impact of the different indicators is analysed: Which indicators are suited for the audience (households, planners, politicians) and the actions that the evaluation should trigger whether improving housing performance, reducing energy consumption, carbon reduction, or reducing energy bills.

Moving along geographically, Mathew et al. (4-237-19) describe the development of the first State Energy Efficiency Index

(SEEI) for India to help drive EE policies and program implementation at the state and municipal level. The paper delineates the data collection approach followed for the first SEEI and how it can help track progress in managing energy footprint of each state and India. The paper also suggests a framework to streamline EE indicator data collection involving all state stakeholders with the State Designated Agencies.

Realini et al. (4-035-19) take a closer look at industrial energy efficiency indicators and the need for harmonization. They rely on 3,000 real cases across the EU, and have developed a methodology to harmonize data from energy efficiency projects from different sources and EU Member States. It comprises a detailed taxonomy and collection of good practice with regard to energy efficiency in the EU industry. The authors' ambition is to contribute to an effective implementation of policies and measures supporting industrial energy efficiency.

Evaluation of large-scale programs

Schumacher et al. (4-061-19) study the impact evaluation of the German National Climate Initiative on the occasion of its 10-year anniversary. The Initiative is a cornerstone of the German government's carbon reduction plans and the paper provides illustrative examples of the findings of the evaluation. Substantial differences between information-based and investment-based activities, and between the different information-based project approaches were found. Moreover, it describes success factors and lessons learned that might be helpful for the design and implementation of other policy programs.

Chunekar et al. (4-257-19) present a compelling study of the impacts of India's large-scale LED bulb program, named India's Unnat Jyoti by Affordable LEDs for All (UJALA), and draws lessons to increase the effectiveness of the existing program, and to aid the design of similar programs in India and abroad. UJALA is arguably the world's largest zero-subsidy LED bulb program for households with more than 300 million LED bulbs having been sold under the program since its launch in 2014. Since the program launch in 2014, production of LED lighting in India has gone up 50 times and retail price of an LED bulb has dropped to a third of its pre-programme cost.

Energy efficiency and deployment of renewable energy must go hand-in-hand if we are to reach our climate goals. McKenna et al. (4-114-19) take a closer look at the residential solar PV self-consumption. They investigate how PV can reduce residential electricity bills analysing a previously unused dataset of electricity readings from over 1,300 households with solar panels located across the UK, USA, Australia, Germany, the Netherlands, and Belgium. The results show that there is considerable variation in self-consumption between different households and that the factors affecting self-consumption are similar between the different countries analysed.

Joggling statistics

Wemyss & Blumer (4-039-19) are asking: How representative are you? They have compared environmental behaviour and attitudes of voluntarily recruited intervention participants. The data has been collected in a nation-wide annual survey of residential heating, electricity, and mobility behaviour in Switzerland. Not only is demographic information controlled for in the responses, but also sociological and psychological variables are considered. The paper compares the results of the intervention with respect to the socio-psychological characteristics of the participants and those of the entire Swiss population.

Dupret et al. (4-015-19) depict a way to accurately provide household consumption data based on the long-term electricity consumption measurement in 100 French households. The initiative comprises the establishment of a neutral platform, which will provide baseline data sets thus contributing to the assessment of demand side management policies. The paper presents the first results and describes in detail how a new way of producing statistics from real time field measurements is introduced.

Energy statistics are the foundation of energy studies and correct data can support reliable policies. Su (4-008-19) presents work to calibrate energy consumption statistics using another dataset, compiled for an entirely different purpose. Faced with clearly misleading energy consumption and energy intensity data for a subsector of the service sector, they chose to verify the validity of the data by combining tax information with a dataset on electricity consumption. It is proposed to carry out this work at regular intervals to ensure that future policies are based on sound data.

Panel 4 comes full circle – not just around the globe – but also around all aspects of evaluation: from evaluation design, data collection, validation of data, benchmarking progress, and arriving at sound policy decisions. It aims at having a detailed and thorough perspective on how to proceed in the future for the benefit of energy efficiency.