SESSION 22

ENERGY SAVINGS FROM BEHAVIOURAL INITIATIVES IN COMMERCIAL BUSINESSES AND BUILDINGS

Moderator: Iris M. Sulyma, BC Hydro

PAPERS:

Evaluating Personalised Energy Feedback Information for Behaviour Change in Commercial Buildings

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Dr. Katherine Irvine, De Montfort University, Leicester, UK
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An Evaluative Investigation into Employee Attitudes to Energy Management in the Food Retail Environment

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A Support Tool for Ranking Energy-Saving Activities in Office Buildings

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SESSION SUMMARY:

For commercial buildings several stakeholders are involved in the implementation of energy savings measures and policies. Thus far, the growing body of research has focused on issues between building owners and tenants. This session will focus on new and emerging behavioural initiatives targeting commercial building occupants, employees or workers. The first paper investigates the use and potential impacts of providing personalized energy feedback to building occupants. The second paper investigates staff motivation to identify improvements that will increase the adoption of energy measures and energy management policies in large chain, food retail settings. The third paper, an analytic hierarchy process, was used to help select energy saving measures for commercial offices, in which the cost and benefits of three stakeholder groups (i.e., building owners, tenants and occupants) are considered comprehensively

Dr. Coleman's paper focuses on the use of personalised energy feedback in a commercial setting as part of a wider research effort investigating the development and application of wireless behaviour information (Wi-be) systems. The Wi-be approach provides accurate, disaggregated feedback to building occupants so that individual energy users can assess the impact of their behaviour on energy consumption, disaggregated to specific end uses (e.g. individual appliances), locations (e.g., rooms) and people. The study is using a mixed methods design to collect qualitative and quantitative data with preliminary interviews being conducted to assess people's perceptions of Wi-be systems and energy use in buildings.

Results from initial interviews with commercial building occupants provide some support for the use of personalised feedback to building occupants in a commercial building. The results indicate that in

contrast to residential buildings, presenting feedback in terms of cost may be less appropriate in non-residential contexts as building occupants do not pay energy bills. The interview results also highlight the need to address control of communal energy end-uses (e.g., space and water heating) and the potentially counterproductive ethical issues associated with energy monitoring and tracking; including privacy, surveillance and the potential for misuse of data (e.g., to assess employee work performance).

Dr. Chistina's paper presents a qualitative evaluation designed to understand staff motivation around energy management at the shop floor level in a large food retail environment. The first phase of the study provided essential quantitative data to understand how effective the energy management policies were, while the second phase, reported here, was designed to identify the underlying issues effecting implementation. Whereas management research has looked at energy policy from a high level system viewpoint, the shop floor based qualitative evaluation provided a new perspective that was crucial to arriving at key findings and developing new approaches to increase the effectiveness of the energy management policies.

The first insight from the qualitative data is that energy is a non-primary goal in a multiple goal environment, making it vulnerable to goal conflict and consequently impaired performance. The hypothesis drawn from this insight is that multiple goal conflict will be reduced if the system is better aligned with existing organisational structures and routines. The second insight is that energy management goals are perceived as difficult to achieve at an operational level. The second hypothesis is that the perception of difficulty can be reduced by introducing easier proximal goals into the planned change.

The findings informed a change strategy for improving staff motivation towards store energy performance. First an approach to align closely with existing organisational structures to counter multiple goal conflict was adopted. Second a task strategy approach of using proximal goals to break down the complex distal goal was adopted. The last evaluation stage will involve validating the effectiveness of the changes using quantitative methods.

Dr. Ueno's paper focuses on a decision aiding tool, an analytic hierarchy process, used to help select energy saving measures for commercial offices, in which the cost and benefits of three stakeholder groups (i.e., building owners, tenants and occupants) are considered comprehensively. Measures related to occupant (worker's) activities were specifically targeted. A questionnaire was developed to determine the rate of adoption of various measures and the worker's perceptions regarding the adoption of energy savings measures. Then, support for the selection of energy saving measures was developed using the analytic hierarchy process and applying the tool to six model office buildings.

The percentage of occupant agreement to adopt a measure was generally higher than the actual adoption rate. In general, the higher the air-conditioning set temperature, the lower the comfort level of the occupant. However, there was a clear dependence of comfort level on the decision maker; the comfort level was significantly greater when office workers were left to choose the air-conditioning set temperature themselves. Otherwise, in offices where energy savings measures had been adopted, the percent of office workers' agreement with implementation of the measures was high regardless of the decision maker.

Based on modeled results for six buildings, the energy savings measures with high scores for total benefits included the installation of high-efficiency lighting and turning off lights, and control system for the heat sources (excluding buildings with unit-type air conditioners), and were thus primarily related to lighting for both workers and facilities. In contrast, the measures with low scores for total benefits tended to include those that decrease the thermal comfort of workers, such as turning off air conditioners and heaters for extra working hours and changing the preset temperature. Results using the rate of reduction in CO_2 emissions alone were different from the results based on total benefits.