

## **Introduction: Session 3: Energy, Conservation and Recycling I**

Controlled environments use energy (up to 4 kilowatts per square metre per hour), in the provision of light, cooling, heating, dehumidification and humidification. This represents a cost to the user of controlled environments from 20% to 100% of any bill that a user may finally receive. Policy on charging may vary considerably from institution to institution, but energy consumption represents a major element of costs associated with using controlled environments. Choices in purchasing and using controlled environments may be influenced by the costs of energy as well as its availability. Even where controlled environments are built to achieve a particular set of environmental goals, energy usage will be important, if not from its costs, but because supply might be limited.

This session focussed on how choices made in designing and building controlled environment facilities influence final energy usage as well as the impact on the environment. Papers by Sander Pot on lighting and Reg Quiring on temperature control discuss how choices affect energy consumption as well as discussing how future developments may influence the design and purchase of new controlled environment facilities. Cooling, using a variety of refrigeration systems is essential to most controlled environments. A paper by Fritz Steimle discussing refrigeration highlights the benefits and disadvantages of different refrigerants, in terms of energy consumption, efficiency, cost, future availability, safety and their environmental friendliness. Energy availability, as well as costs, is important and a paper by Quentin Mabbutt discusses the use of a microturbine system to provide electricity and heat, on a scale that is usable by most controlled environment facilities.