

UK CONTROLLED ENVIRONMENT USERS' GROUP

MINUTES OF THE 2006 ANNUAL GENERAL MEETING

The annual general meeting of the Controlled Environment Users' Group was held on Tuesday the 12th of September at Kingswood Hall, Royal Holloway, University of London, Egham.

The UK CEUG Chairman, L.D. Incoll opened the meeting at 20.15 h.

Present: S. Andrews, C. Armstrong, L. Benjamin, R. Darby, C. Denston, J. Franklin, C. Fryars, E. Fryars, P. Gill, M. Gilroy, F. Gilzean, L. Hansen, M. Hibbert, M. Holdsworth, G. Holmes-Henderson, G. Holroyd, L. Incoll (in the chair), M. Lappage, B. Meredith, S. Millan, A. Morgan, R. Natt, I. Pearman, G. Pitkin, M. Pratt, R. Quiring, D. Clark, B. Roberson, K. Sawford, A. Sim, A. Skelcey, D. Skelton, M. Stenning, G. Taylor, C. Tilley, B. Trotter, G. Waimann, D. Wildman.

Apologies: Mick Fuller

1. L. Incoll, UK CEUG Chairman and chairman of the meeting welcomed members, overseas members and new members to the Annual General Meeting of the UK CEUG. He reminded the meeting that this is the fifth anniversary of '9/11', which happened during the middle of our first international meeting at Norwich, a traumatic experience.
2. **Minutes of the previous meeting at University of Plymouth, Plymouth on the 5th September 2005.**

The minutes of the previous meeting, which had been distributed to members earlier in the year, were approved as a true record of the proceedings (proposed M. Stenning, Sussex University; seconded R. Natt, CSL, York). The minutes were approved unanimously with one abstention.

3. **Matters Arising.**

There were no other matters arising that did not appear on the agenda.

4. **Chairman's Report (L.D. Incoll, University of Leeds)**

The chairman was pleased to report again that the last twelve months have seen much activity. The meeting at Plymouth and the Eden Project in September 2007 on "The Eden Project – The Challenges of Controlling a Large Scale CE" was a great success. For the second successive year we had a meeting of a longer duration than usual, this time to allow good time for the tours at the Eden Project. It was a great success with a capacity attendance of 51 delegates (a waiting list had to be employed as it was oversubscribed as a limit had been set by the Eden Project), a stimulating set of lectures, visits to the Watering Lane Nursery facility and the three Eden Project biomes, a memorable dinner in the National Marine Museum in Plymouth and, for some delegates, an interesting post-conference visit to a commercial glasshouse (peppers) business in Somerset.

Communications

a. 'UK-CEUG' JISCMail List

There has been a 4-fold increase in activity in the last year with informative messages from the Executive (27) and messages from members (70) either asking seeking help by asking questions that in some cases have generated significant discussion. There has unfortunately been misuse of the list where members wishing to reply to the sender, reply to the list, thereby sending a personal messages to all 160+ members of the list. There are various options for preventing this -

- Set the list to 'reply to sender'. The Executive Committee does not consider this to be desirable. The configuration has to be set to 'reply to list' to enable it to function as a discussion forum.
- Preface every message with a warning that the list replies to the list not the sender. This has been implemented.
- Moderate all messages i.e. inspect all messages before forwarding them to the list for distribution. This would impose considerable extra work on the list owners i.e. me and Secretary Julian Franklin.
- Set the option of repeatedly offending members to 'review'. All messages sent by such members would be moderated. One member has been identified as a repeated offender.

b. Website

He was pleased to report that the charity successfully applied to UKERNA for a domain name that is more readily identified with the group viz. <http://www.ceug.ac.uk/> than its previous URL. The Executive Committee have considered the possibility of acquiring either of the URLs containing <.ceug.org.uk> or <ceug.co.uk> but decided not to as they require annual payments in contrast to the one-off payment to UKERNA.

The chairman regretted that pressure of other tasks has prevented him from being a conscientious webmaster and the web site is in need of significant updating in some items.

Membership

There has been a satisfying net increase in membership this year which conceals an impressive number of new members offset by a number of resignations, at least one of which was provoked by the misuse of the JISCMail mailing list reported earlier. For the first time we have members joining from the horticultural glasshouse industry. The need for continuing recruitment is evident.

Since September 2005

Category	Number
New members	15
Members resigned	8
Net change	+7
Current total	167
No E-mail contact – <uk-ceug> JISCmail group (no e-mail address or unsubscribed)	5
Attending the 2006 meeting (not all are members)	48
<i>Overseas recruitment:</i>	
Germany – joined	1
France – joined	0
Spain – joined	0

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Publications

a. Recruitment leaflets

Following a proposal of our Spanish member, M. Giménez-Moolhuijzen that we produce a recruitment leaflet in Spanish for distribution at the 2005 glasshouse meeting in Almería, new recruitment leaflets have been produced in English, Spanish (translation by Miguel), French (translation by J. Boccon-Gibod) and German (translation by E. Fryars). The chairman was grateful to all those who helped make this a reality by helping by checking translations and proof reading, to a colleague of mine in Aberdeenshire, A. Sibbald, who converted the Word documents to 'publisher' format ready for printing, and to G. Holroyd for organising the printing. The leaflets (*in colour, 2-sided, one A4, folded twice to fit a B4 envelope*), on display at this meeting, will be available to manufacturer members for them to distribute to their existing and potential customers and to ordinary members as well. Some leaflets, in each language, were picked up at the glasshouse meeting but no-one joined.

b. CE Guidelines for tissue culture facilities

The chairmanship of the international sub-committee on 'CE Guidelines for tissue culture facilities' passed from G. Holroyd to S. Millam early this year. Steve has 'kick started' the sub-committee's activity and a first draft of the guidelines has just been circulated to the International Committee on CE Guidelines' mailing list. The target of the sub-committee is to have a draft ready for discussion at NCR-101's 2007 annual meeting next spring and by our group by September 2007 so that the guidelines are ready for release at the 2008 International Conference on CEs in Florida.

Future Meetings

Next year we visit the Department of Biological Sciences at the University of Wales in Aberystwyth and IGER, BBSRC, where R. Darby and M. Humphreys respectively will be hosts. The topic of the scientific programme, "Cutting the costs: Towards energy efficient controlled environments", is one that has become increasingly important to managers, manufacturers and users of CEs especially with rocketing power prices and new EU regulations on the disposal of end-of-life equipment by manufacturers.

Our North American colleagues have decided that their planned international meeting will be in spring 2008 and at present it is planned to take place at the Kennedy Space Centre in Florida. The Executive Committee has decided to offer travel bursaries to members who plan to take an active part in the conference by presenting spoken or poster papers. The Finance Sub-committee is leading a campaign to raise funds to support the bursaries. The competition will open later this month and close at the end of the year so that decisions on successful applicants can be made in good time (February 2007) for them to obtain matching funds from other sources. The plans are for the bursaries to be approximately equivalent to the cost of budget travel to Florida.

We have some firm offers from members to host future meetings. A workshop on "Water" is being organised at Dundee in 2008. The Executive Committee has pencilled in for the group to host the fourth international meeting in 2012.

Discussion: M. Stenning (Sussex University) asked how many bursaries were likely to be offered. The chairman responded that the Finance Sub-committee is investigating various charities and sponsors and it depends on how much funding is raised i.e. if £3,000 were raised and the offer was £300 then 10 delegates could go. Currently approx. 20 would like to go. In order to be considered, candidates would need to demonstrate that they have supported this group. If delegates are going in Easter 2008, they need a year to apply to their own organisations to match the sum that we award them. NCR-101 has definitely decided to hold the meeting in 2008 so the chairman is trying to persuade the North American committee to decide what their topics are going to be. Although they have a committee, no indication of topics has been received. He suggested that Quality Assurance should be a topic at the meeting. R. Quiring (Conviron) indicated that there was a wide variety of attitudes to QA in North America, as demonstrated by the time taken to generate their minimum reporting requirements, and therefore this would be a useful topic for the meeting. Speaking about the problems of the Kennedy Space Center about financing the meeting, he indicated that due to the changing programmes and priorities, many of the people who were effectively sub-contracted to Nassau were effectively in "holding" mode and unsure of their own status. The location itself was not in jeopardy, but funding was as yet uncertain. L. Incoll (Leeds) noted that the North Americans had also agreed with our proposal that there be an interval of four years between meetings. He felt that the Australian meeting in 2004 had been too soon, being three years after the first international meeting. This next meeting in 2008 and our planned one in 2012 give enough time for new activities and new fields to develop sufficiently to justify another meeting. R. Quiring confirmed the good will and growing enthusiasm of NCR-101 for international co-operation.

L. Incoll (Leeds) will distribute the information about the bursaries as soon as possible after this meeting. There will be a closing date in December, the Executive Committee will meet in January and the decisions will be announced in February. The number of bursaries will depend on funds raised, so if you wish to go to Florida, the Executive Committee needs your suggestions for people that can be approached for sponsorship. There is an excellent trade display tomorrow – 8 sponsors – that will bring in an income of £2,000; the same should happen next year at Aberystwyth, but suggestions are needed of whom to invite next year. We would be looking for approximately 10 exhibitors. He asked delegates to please treat tomorrow's trade show seriously because it is the sponsorship of these companies that keeps us going.

C. Fryars (CLF) reminded the group that two years ago he had suggested that manufacturers should be charged a membership subscription and wondered had this idea been developed? The chairman noted that the Finance Sub-committee had taken the suggestion on board. G. Taylor (Weiss-Gallenkamp) as Chairman of the Finance Sub-committee responded by setting out the pros and cons of charging manufacturers, especially citing our principle of having manufacturer members as equal partners in the Group, not because they might be sources of funds, and pointing out the risk of double charging when the same manufacturers are also amongst those who we approach for sponsorship through mailings and display stands. It was agreed that Garry would review the matter with manufacturer-members.

The Chairman's report was approved unanimously (proposed G. Taylor, Weiss-Gallenkamp; seconded P. Gill, SCRI)

5. Secretary's Report (J. Franklin, Rothamsted Research)

The secretary reported that during the last year, the Executive Committee had met twice at Rothamsted. Although much of the business of the Committee is conducted via email messages, the Charity Commission requires the Executive Committee to meet at least twice a year. These all day meetings focus on details of the annual meeting, the planning of future meetings as well as progressing the business of the group. At our last meeting in June, apart from finalising details for this meeting we were firming up the details of next year's meeting in Aberystwyth, as well as planning the 2008 workshop in Dundee.

The group is grateful to Rothamsted Research for provision of its facilities for the meetings; it is probably the most cost effective place to meet, being readily accessible to most Committee members.

As Secretary, I would like to thank Lynton for all the work he does as Chairman of the group. This includes most of the 'secretarial' work for which I am grateful.

The report was approved unanimously (proposed I. Pearman, Rothamsted Research; seconded C. Fryars, CLF).

6. **Treasurer's Report for the financial year 2005/2006 (P. Gill, SCRI)**

The Treasurer presented his report for the financial year 1st August 2005 to 31st July 2006 (Annexe A). The current balance is £905.66 higher than this time last year, but this is mainly due to the income/expenditure balances of this year's Silwood Park conference (£3,470.62 - £2,323.72 = £1,036.90). This account has been managed by the Treasurer, rather than the local organiser.

One-off items of expenditure this year have been the printing of flyers (£650.80), computer software (£94.00) and G. Pitkin's travel costs to the Almería Glasshouse Conference (£222.03). The Scottish Crop Research Institute funded Graham's registration and accommodation (£512) at this conference.

The cost of the running the Executive Committee meetings has increased to £1,002.16 from £815.62 last year (23%) (Annexe B). This is as a result of membership changes and higher travel costs generally. The summer meeting is more expensive, reflecting the increased cost of travel at this time of the year.

The final balance sheet for last year's conference at the University of Plymouth and the Eden Project (Annexe C) shows a turnover approaching £12,000 with a small surplus of £352.23 (3%).

The report was approved unanimously (proposed M. Stenning, Sussex University; seconded D. Wildman, Imperial College).

7. **Report on the annual meeting at the Eden Project & the University of Plymouth, 4th – 7th September 2005 (M. Fuller, University of Plymouth & J. Franklin, Rothamsted Research)**

The 2005 annual meeting was hosted by the University of Plymouth and involved two full-day visits to the Eden Project.

Conference organisation went well and thanks were due to D. Horne and her team for the organisation, mailings and conference documentation.

Accommodation was in the main acceptable although one or two people experienced problems with noisy extractor fans and some had problems with water pressure and inoperable showers.

The logistics of the meeting i.e. to and froing on minibuses went well and we extended a thank you to the two other minibus drivers, S. Lane and P. Russell.

The talks and tours organised and run by the Eden Project teams managed by S. (Sue) Minter and A. (Tony) Kendle were excellent and well executed and kept everyone's interest for their full duration. Thanks to Eden staff were made on the day, at the conference dinner and again verbally by M. Fuller to Sue and Tony. M. Fuller also donated a half case of Seale-Hayne wine to Sue and Tony to say thanks.

The conference dinner was held at the National Marine Aquarium on the Barbican in Plymouth and was preceded by a tour of the Aquarium. Everyone agreed it was an impressive location for the dinner and the food and wine were good too. Not all delegates stayed for the conference dinner, despite it being included in the conference price, which meant that we had a number of vacant places at the dinner; the NMA over-catered and we had to pay. S. Minter attended but A. Kendle declined the invitation.

7. Election of the Executive Committee

Nominations for the re-election of two members and for the two vacant positions had been received, seconded and agreed by the nominees. They were:

Position	Person	Proposed	Seconded
Member	G. Taylor (Weiss-Gallenkamp)	M. Fuller	A. Morgan
Member	G. Pitkin (SCRI)	A. Thain	P. Gill
Member	M. Pratt (Leicester University)	G. Taylor	J. Saddington

All candidates were duly elected. One committee position remains vacant.

9. Future Meetings

a) *2007 Annual Meeting on "Cutting costs: towards environmentally friendly controlled environments", Aberystwyth (R. Darby, University of Wales & M. Humphreys, IGER)*

R. Darby reported good progress on the preparation for the meeting. A variety of matters have been settled, with theme, topics and some speakers decided. More work is needed on the trade exhibition to get companies there who are relevant to the theme of the meeting. It is hoped that members will be happy with the accommodation that the University is offering. He will be meeting the head of UWA accommodation services in October.

L. Incoll (Leeds) noted that the Executive Committee had decided to restrict the topics of talks to 'sustainability', 'sustainable building design and the use of sustainable materials in construction', 'advances in energy efficient lighting systems', 'advances in energy efficient cooling systems', 'novel glass/plastic house designs', 'energy efficient concepts in glass/plastic houses' under the new title of 'Cutting costs: towards environmentally friendly controlled environments'. R. Darby, M. Fuller and J. Franklin (programme sub-committee) need ideas for speakers in some of these areas. Do you know anyone that is an expert on e.g. 'how do we cut costs?', 'how do we get environmentally friendly controlled environments?', 'what sort of materials should we be using in the future would make "environmentally friendly CEs"', 'will materials be non-polluting on disposal?'. So the most help from members is needed to secure good speakers and good trade stands. A full trade exhibition (ideas to A. Morgan, Warwick, please) will contribute significantly to the fund raising for our 2008 travel bursaries.

In order to cope with the comparative remoteness of Aberystwyth from a travel point of view, the meeting will start at 9 am with two nights stay instead of one, the meeting

finishing after breakfast on the second morning. This will facilitate a visit to the Centre for Alternative Technology (CAT) near Macynlleth, on the way home after the meeting. CAT is accessible by road or rail.

J. Franklin (Rothamsted Research) added that there are many interesting CE facilities to visit at the University, including controlled environments for marine biology, and at IGER which has new rooms.

b) 2008 Workshop on "Water and its measurement in controlled environments", Dundee, (P. Gill & G. Pitkin, SCRI, Dundee)

P. Gill reported that it is eleven years since a meeting was held at Dundee. Preliminary plans are that the workshop should start on Sunday 7th September. It will be in the same format as the workshop at Leicester i.e. it starting on Sunday evening and finishing at Wednesday lunch time. Wednesday morning will be a 'wash up' session. This is a huge subject so we have ignored plant water relations and will be looking only at atmospheric and soil water. Encouragement and enthusiasm from local staff is assured since the new Director at Dundee, P. Gregory, is a soil scientist (ex-Reading University). The accommodation at Dundee West Park will be brand new in 2007 with all bedrooms en-suite. Breakfasts, morning lectures and lunches will be there, and for the afternoon practical sessions delegates will be bussed out to the SCRI. Some initial discussions with potential manufacturers to be involved in the practical sessions have taken place. However, we do need ideas for good speakers, so if you know of anyone, please do let us know. Hopefully by January 2007 we will be much further forward with the organisation of the programme and the budgeting.

The business meeting will be held on the Monday evening. On the Tuesday evening we are planning to visit Scott's 'Discovery' which was built at Dundee. The evening meal will be in the museum area following a reception and drinks on the ship.

c) International meeting at the Kennedy Space Center, NASA, Florida, in North America in Spring 2008

This meeting was dealt with in the Chairman's report – see item 4 above.

d) Post-2008 meetings

L. Incoll (Leeds) outlined the plans for the future (see table on the next page) - nothing is settled yet about meetings post-2008. New sites have been offered and there suitability has to be assessed by the Executive Committee before they become fixtures e.g. Universities of Sheffield and Sussex. The University of Cambridge has just agreed to the idea of being host for an international conference in 2012. Their new buildings and facilities will be in place by then.

We need sites to volunteer for meetings – please consider this.

Date	Venue	Comments
2007	University of Aberystwyth / IGER	Wales, (will be 13 years since last visit to IGER); New for University of Wales Theme: "Sustainable CEs"
2008	Easter, Kennedy Space Center, Florida	<i>International Controlled Environment Conference. Theme: "?"</i>
2008	SCRI, Dundee - September	Workshop. Theme: "Water and its measurement in CEs" (will be 11 years since last visit)
2009	University of Sheffield	New site
2010	Rothamsted Research	(will be 12 years since last visit)
2011	York University / CSL or University of Sussex	(will be 12 years since last visit) New site
2012	September (second week), University of Cambridge	<i>International Controlled Environment Conference. Theme: "?"</i>
2013	John Innes Centre, Norwich	(will be 12 years since last visit)
2014	Syngenta, Jealott's Hill	(will be 12 years since last visit)
2015	University of Lancaster	(will be 12 years since last visit)

10. Light sensor calibration package (D. Wildman, Imperial College and J. Franklin, Rothamsted Research)

D.Wildman reported that last November all members were asked to participate in an email survey to canvass opinion about the purchase of a suite of light sensors by the CEUG. This suite of sensors would be hired out to members either for direct use, or for use as a comparison with locally-held instruments.

Members of 41 organisations responded, and the results indicated that there would be enough interest in hiring the package to justify the cost of purchase and maintenance of the equipment.

It was therefore decided that we should purchase the sensors. However, it was wise to wait until other things were in place.

- a) Production of a simplified user's manual for the sensor suite.
- b) Manufacture of levelling stands to hold the "hired" sensors and the local unit under test co-planar and in close proximity.
- c) Provision for checking the performance of the hired sensors against a centrally-held "Master" sensor between hire events, in other words a "local cal check" rig to ensure they have not drifted between hirings.

- d) Establishing a procedure for hiring the units. This is expected to be from a website, on a password-protected area. Hirers could book the sensors for a two-week period on a “first come, first served” basis. The hirer would be responsible for insuring the equipment while it is in their care, and returning it at the end of the hire period.

In the June Executive committee meeting he announced that, due to personal circumstances, he felt he would be seeking employment in fields other than controlled environments within the foreseeable future, and therefore he could no longer undertake responsibility for this project. J. Franklin (Rothamsted) had responded that he could undertake management of the instrument package. It was agreed that D. Wildman would provide drawings etc. for the necessary ancillary equipment (stands and cal rig) for manufacture at Rothamsted.

D. Wildman was pleased to announce that in the last few days his colleague C. Denham has produced for us a pair of levelling stands (which they are giving to the group) based on his sketches. He would like to record his gratitude to Chris for this.

He had been in discussion with B. Trotter (Skye Instruments) who will supply the sensors, and we will confer with a view to producing the local cal check rig before the end of the year.

There has been a lot of delay in this project, due (to an extent) to his concentration on organising the present conference to the detriment of other matters. Since there has been a recent announcement that the Ecotron is likely to be shut down in a few months time, he hoped members would concur with his decision.

J. Franklin added that the one large element is the transport costs. If the instrument package is based at Rothamsted (and the group still has to agree to that) then there is a potential for saving some costs in transport because there is a large throughput of visitors to and from the site, from quite a lot of different universities, who could take the package with them. The insurance risk is not to be understated and the position on insurance still needs to be resolved.

D. Wildman's proposal that he stand down and the project be taken up by J. Franklin was approved by the meeting (proposed, M. Stenning, Sussex University; seconded, G. Holroyd, Lancaster University).

L. Incoll (Leeds) thanked D. Wildman for his work and expressed sadness on behalf of the meeting for his impending redundancy and wished him well in the future.

11. Open discussion of the following CE topics

Maintenance, servicing, spares

M. Stenning (Sussex) asked if people monitor light conditions in CEs. J. Franklin (Rothamsted) responded that this year they put photodiode sensors (£5 each complete) in all of their cabinets, both insectary and plant growth cabinets. The benefit, over just two weeks, has already been noted. M. Stenning observed that in winter they extended photoperiod from 4 am to 7.30 am with artificial lighting in glasshouses but no-one

was around to check that the lights had come on. R. Darby (Aberystwyth) mentioned that they had a Pico Technology photodiode system which can tell you when lights are on or off. M. Stenning however also wanted to measure the quantity of light so that he would know when to change the lamps. R. Darby replied that in general the system was used for measuring photoperiod, with sometimes surprising results, but was only a rough guide to sensing a drop in light with time. I. Pearman (Rothamsted) stated that the fact that lights switched on inadvertently during a 'dark period' can have a major effect on plant development was not recognised by some research staff and careless staff were often the cause of such events because they think that they can enter a room and switch on lights at any time. J. Franklin (Rothamsted) told the meeting that they have a swipe card system, so they can track who has entered the buildings. M. Stenning felt that it is something that the group should focus on in order to increase the quality of research.

Lighting

I. Pearman (Rothamsted) said he has a 48-W LED floodlight system on loan from SavEnergi (<http://www.savenergi.com/>). The spectral distribution was very good but the intensity was not. At £1,000 for the system he thought that it were not cost effective, although it gave around $150 \mu\text{mol m}^{-2} \text{s}^{-1}$ at 20 cm it gave good light output per unit wattage. R. Quiring (Conviron) felt that, as a chamber manufacturer, providing photons this way for general plant growth to plants in the chamber is not cost effective, except for specific wavelength-based research, because conventional lighting is getting better all the time. There followed some general discussion about experiences with types of lighting. I. Pearman (Rothamsted) commented that he was able to get adequate light output from some fluorescent tubes that had seen 23 000 hours service, by initially under-running them. The subject of induction lighting was raised. I. Pearman and R. Quiring agreed that while they were the most efficient lamps and they last 60,000 hours, they were expensive so it was difficult to justify preferring them to conventional fluorescent lighting, though they were especially useful if access was difficult.

G. Holmes-Henderson (Syngenta) raised a question about the capacitors in the old Phillips lamps that can heat up (if running at under 80% capacity) and melt the lamp casing. In some recorded cases the lamp casing has actually burnt which then caused considerable damage to the shade or thermal screens or, in the worst case, the greenhouse structure itself. J. Franklin (Rothamsted) reported that notification has been received from Phillips about these capacitors, although in one case the resin-coated winding of the ballast windings had overheated. The risks, particularly in relation to insurance were discussed. R. Quiring (Conviron) illustrated an instance in North America where the capacitors are potted into the ballast housing, in some cases the capacitor failed. The Power Factor Correction was lost though the lamp still worked, but the difference in light could be easily seen with the naked eye.

Instrumentation, sensors, monitoring

M. Hibbert (Rotronic) wished to raise a number of points about atmospheric water vapour content:

1. Firstly on the expression of atmospheric water vapour content as vapour pressure deficit (vpd) rather than as relative humidity. Instruments are now available to do that in a programmable module.

G. Taylor (Weiss-Gallenkamp) observed that most people say to him "v.p. what", however if it is available we will fit it. I. Pearman (Rothamsted) said it is a measurement that only the 'old school' plant physiologists would understand. L. Incoll (Leeds) bemoaned the fact that people are not trained properly to fully understand the basic drivers of plant performance. He hoped that would change as people are required to translate their genetically modified work into performance of real plants, they will have to understand what the driver is. The driver for evapotranspiration is not r.h. but vpd. It tells us how dry the air is, how much capacity there is for it to hold more water vapour. We should not forget vpd because users did not understand it.

Mike Hibbert (Rotronic) said we must keep looking at its use. L. Incoll (Leeds) hoped that it would be possible to demonstrate this at the workshop with people being able to do measurements and do the calculations. B. Trotter (Skye) reported that she has compiled a really simple explanation about light measurements in booklet form and often e-mails it to commercial growers with no technical background. A similar non-technical booklet could be used to help educate users about vpd.

2. M. Hibbert (Rotronic) observed that four to five years ago there was a step change in the accuracy of humidity sensors, the digital signal technology which effectively brought accuracy of sensors from around $2\frac{1}{2}$ -3% down to $\pm 1\frac{1}{2}$ %. Now standard sensors are available that give $\pm 1\%$ stated accuracy. Also the digital signal technology is enabling much simpler networks to be set up: for example two-wire twisted pair, and wireless types. Networked monitoring systems can now be simply 'plug & play' and can link to an Ethernet system or to a PC and be very small.

3. M. Hibbert (Rotronic) reported that improvements have been made in calibration technology for RH sensors. Traditional methods involved waiting for salt solutions to equilibrate at an ambient temperature (providing a known r.h.), but systems are now available that involve a miniature environmental chamber where temperature and RH can be dynamically controlled, using miniature atomisers or saturators. This means that multiple RH sensors can be calibrated much more quickly (3 to 5 sensors per hour), and at the temperatures at which they are intended to operate (rather than a laboratory ambient). This latter point is important if calibration to FDA standards is required.

L. Incoll (Leeds) stated that this is quite important for our workshop; we were proposing to invite ADC and LICOR, who make humidity generators, which produce gas streams at a particular humidity. M. Hibbert also mentioned names of other manufacturers of these systems who should be invited.

Heating, reclamation and energy management

J. Franklin (Rothamsted) said that one of the strategies we have taken in terms of energy management is to switch off our lights at 4.30 pm because peak rate electricity time runs from 4.30 to 6.30 in the evening. He asked "Does anyone else do it and any problems incurred?" Different practices were related. One institution runs a generator for those two hours. The costs of electricity were discussed and ways to try to avoid

the peak periods. S. Andrews (John Innes) said the JIC was experiencing a similar problem and tried to use electricity during the cheap 7 hour period. J. Franklin commented that Rothamsted's contract was negotiated for the whole BBSRC and it should be the same for John Innes, in December, January and February it is about 4p per kWh for those two hours. S. Andrews noted that John Innes negotiate their contract separately from the main BBSRC contract. Rothamsted run their Combined Heat and Power system (CHP) for the peak rate hours. It is cheaper to have the whole thing on and 'dump' the heat in summer because it saves energy.

G. Taylor (Weiss-Gallenkamp) raised the question – do we want to save energy or money? This was discussed with a variety of alternatives but preferably save both energy and money.

R. Quiring (Conviron) related instances where local energy prices were such that it was cheaper to run chiller plant “full bore” at night and use eutectic storage, drawing on this at daytime. He also spoke of using ground-source heat pumps

It was suggested to J. Franklin that he install wind turbines to which he responded that local authorities would flatly refuse permission.

L. Incoll (Leeds) observed that this discussion is the very reason why everyone should come to Aberystwyth next year.

Fabric, glazing, reflective materials

J. Franklin (Rothamsted) reported that he is having difficulty in obtaining double polycarbonate glazing, only treble polycarbonate glazing was widely available. The light transmission of the treble polycarbonate is 77%, and of the double, 81%. He asked anyone hearing of a supplier to let him know.

Plant growth problems, pests, diseases

G. Pitkin (SCRI) reported that they tried using green waste compost to dilute peat-based compost with some success and wondered if anyone else has any experiences to share. R. Natt (CSL) reported that a lot more composted green waste material is now used by commercial potting compost manufactures. They are limiting this to about 20% of the mixture and while these are producing some good results care should be taken not to add too much. While these composting companies are producing to ISO standards not every batch of green compost waste is uniform, as there is seasonal variation of source material and some uniformity of plants can be lost. He felt that there is a possible future for it but care must be taken, CSL use this type of material for soil improvement on outdoor plots but not for potting. Although he has grown plants in this type of material, he would not use this material for young seedlings and sensitive plants

M. Stenning (Sussex) mentioned coconut husks (coir). It was suggested that coir binds added fertilizer and won't release it. It was felt that one would need to be very careful when using more than 20% in a mixture.

J. Franklin (Rothamsted) reported that tests had been done for WRAP (Waste and Resources Action Programme) on a variety of composted wastes. It was pretty poor

material containing wood chips and building debris but plants will still grow in it. His suppliers have not offered compost containing green waste. There is a BSI standard (PAS 100:2005 Specification for composted materials) which is good, but broad with respect to allowed microbiological content and nutrient status.

Growing media

M. Stenning (Sussex) had a question about disposal of waste compost and waste soil. How do people dispose of it? J. Franklin (Rothamsted) reported that his sub-section goes for disposal to deep land fill. Plant material and soil is autoclaved before disposal. He suggested that Martyn speak to local PHI office which may give you permission to put it on your own land. Radioactive material from Rothamsted has to be diluted before disposal and autoclaved material is used to dilute it. G. Holmes-Henderson (Syngenta) paid Grundons to take it away at £21 /tonne. R. Natt (CSL York) put clean compost on land and the contaminated wastes are autoclaved and sent for incineration.

12. Any other matters not included in the agenda items (including the Executive Officers' reports).

1. G. Pitkin (SCRI) reported on the International Symposium on Greenhouse Cooling that he had attended earlier this year in Almería. He heard papers on:

- Natural ventilation.
- Mechanical ventilation and new methods of greenhouse cooling.
- Air movements and climate uniformity in ventilated greenhouses.
- Evaporative cooling and shading techniques.
- Plant response to ventilation cooling.
- Insect exclusion techniques.

It was a very interesting symposium. He would compile a PowerPoint presentation and make it available on the CEUG's web site. There was a request for the presentation to be shown at the workshop next year. He advised members to visit a web site <http://www.coolingsympalmeria06.com/> to view in more detail what he saw. One of the papers and demonstrations was on temperature and humidity control in a Watergy greenhouse, a research greenhouse at the Cajamar Experimental Station near Almería, which runs on a closed ecosystem research principle. The Watergy concept is to provide passive strategies, using the effect of buoyancy for air movement and techniques of day and night or seasonal temperature balancing for heating and cooling, to avoid the need for ventilators and heat pumps that usually require large amounts of primary energy. A leaflet is available for inspection from him via <g.pitkin@scri.ac.uk>. The person who presented the paper has been invited to present the same paper at Aberystwyth next year. He thanked the CEUG for funding the travel costs and also SCRI who paid an even greater sum of money for his registration and accommodation fees.

G. Pitkin had also taken the minimum guidelines poster and multi-lingual recruitment leaflets to the meeting and 40 English, 20 Spanish, 4 French and 4 German leaflets were taken. He was disappointed that the exercise had not resulted in one new member.

2. The chairman wished recorded, on behalf of the group, his thanks to D. Wildman and Gill, his wife, and also to A. Goulding for taking the minutes. It has been an extremely successful meeting so far. He felt that Dennis should be very pleased to see the results of his work. To get this large attendance was enough in itself but we also had the prospect of a good tour of facilities and trade display tomorrow. He expressed his sadness at the prospect of losing Dennis from the group as his contribution had been significant.

The meeting closed at 23.10 h.

Recorder: A. Goulding
17/09/2006

Annexe A

UK Controlled Environment Users' Group
Accounts for the financial year 1st August 2005 to 31st July 2006

Royal Bank of Scotland account, Dundee (10081698)

Balance b/f at 1 st August 2005	£7,568.61	
INCOME		
2004 Light Workshop (1 stand)	£362.50	
2005 Eden/Plymouth conference (2 stands)	£543.75	
2006 Silwood Park conference (5 stands)	£1,230.00	
2006 Silwood Park conference (delegates)	£2,130.62	
Mailing sponsorship	£1,340.00	
Guidelines leaflets	£10.00	
Bank interest	£66.91	
		£5,683.78
EXPENDITURE		
2005 Eden/Plymouth conference	£371.12	
2006 Silwood Park conference	£2,323.72	
2007 Aberystwyth conference	£87.60	
Almeria conference travel	£222.03	
Executive committee meeting expenses (2005)	£57.35	
Executive committee meeting expenses (2006)	£886.96	
Fliers printing (Azimuth)	£650.80	
Computer software	£94.00	
Leeds University office services (stationery, etc.)	£84.54	
		£4,778.12
Balance c/f at 31st July 2006	£8,474.27	

P. Gill & G. Pitkin
20th August 2006

Annexe B

UK Controlled Environment Users' Group
Accounts for the financial year 1st August 2005 to 31st July 2006

Cost of Executive Committee meetings

Meeting held at Rothamsted Research on 12th January 2006		
Travel	£274.11	
Accommodation	£177.50	
		£451.61
Meeting held at Rothamsted Research on 2nd June 2006		
Travel	£390.55	
Accommodation	£160.00	
		£550.55
Total		£1,002.16

P. Gill & G. Pitkin
20th August 2006

Annexe C

UK Controlled Environment Users' Group
Final financial statement for the Eden Project/ University of Plymouth
meeting
4th-7th September 2005

INCOME	
Fees and accommodation payments	£11,870.90
EXPENDITURE	
Convenor's visit	£304.85
Organisers' travel	£70.40
Postage for initial mailshot	£45.43
Conference packs	£122.20
Stationery & printing, (badges, delegate lists, etc)	£120.00
University accommodation/residence charge	£3,066.00
University room hire	£120.00
University catering (evening meals & breakfasts)	£2,729.10
Mini-bus hire	£324.30
Fuel for mini-buses	£143.37
Eden Project lunch and refreshments	£810.20
Lunch cash payment at Eden Project	£200.00
Conference dinner (National Marine Aquarium)	£2,412.82
Payment to Minutes Secretary at AGM	£50.00
Administrative charges for SC Unit	£1,000.00
	£11,518.67
Balance	£352.23

P. Gill & G. Pitkin
20th August 2006