



*ibpsaNEWS is published periodically by the International Building Performance Simulation Association. The editors are Jeff Haberl, Dan Seth, Joe Clarke and Michael Witte and can be reached through the IBPSA Secretariat.*

## MESSAGE FROM THE PRESIDENT

There comes a time with any new technology when its translation from the research phase to the marketplace must be attempted. Often this translation, while not assured, is made easier by market expectation: the technology explosion within the personal computing industry is a prime example.

Some technologies, however, are much more difficult to translate, even when the cost-benefit is demonstrably commendable. One such technology is computer simulation as applied in support of design decision-making and operational management within the building industry.

Few would argue that buildings, and the issues related to their performance, are anything other than complex systems: so complex, perhaps, that their cost-performance cannot be optimized by the application of traditional methods. Equally irrefutable is the strategic importance of buildings in terms of energy efficiency, avoidable pollution and community sustainability. By offering designers the possibility to emulate future reality at the design stage, simulation provides a means to cope with complexity and thereby achieve the necessary trade-offs between cost, efficiency, environmental concerns and performance.

Unfortunately, even though the industry's need is palpable, the technology of building simulation is very slow in its diffusion. The most likely reason for this is that the technology is being targeted on a mature industry which has no real means to assess its impact or its worth.

In response to this problem, IBPSA was founded in 1987 to address the attitudinal, technical and integration issues which underpin the application of computers in a design context. Since then the organization has espoused a two-fold mission: to legitimize simulation as the means to appraise building performance; and to find ways to bridge the gap between research and practice.

Our previous Presidents, Ed Sowell and Dan Seth, along with others, too numerous to mention here, have contributed much to IBPSA's achievements to date: its international network of committed devotees, its three

successful international conferences, its regular (well almost) newsletter, its electronic bulletin board and its published strategy plan.

Now, in 1994, I believe that the time has come to build on these achievements by moving IBPSA closer to the profession through the establishment of an apposite product range and the development of an operational framework within which practitioners can more readily participate.

The best way to realise this aim, I believe, is to establish regional autonomy so that the work of IBPSA can be arranged to match local needs and take advantage of local funding opportunities. Already plans to establish an Australian regional group are advancing and the possibility of forming North American and European regional groups is being considered. The expectation is that these groups would be better placed to address issues such as information dissemination, the formation of users' clubs, application training and the like, and to form strategic alliances with the various national professional organizations such as ASHRAE, CIBSE and the RIBA. The "I" in IBPSA would then be enabled through the fostering of regional development, the establishment of effective inter-region communication channels and the continuation of events such as international conferences.

If you would like to contribute to this fascinating and challenging process of integrating simulation within the building design process, then please join us. You, like me, will find it rewarding to belong to an organization which embraces such aims and seeks to find the correct balance between current practice and future prospect.

Joe Clarke

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## 1994 MEMBERSHIP

IBPSA is pleased to welcome the following members who have either renewed their 1994 membership or joined IBPSA as new members. IBPSA will endeavour to keep members current with new developments.

Emilio Vicario .....	Italy
Alfonso Gomez .....	Spain
Dave Bloomfield .....	U.K.
Ingrid Rohmind .....	USA
Andrea Flago .....	Italy
William Carroll .....	USA
Jon Hand .....	Scotland
George Walton .....	USA
Yi Jiang .....	China

## NEXT IBPSA BOARD MEETING

The next IBPSA Board Meeting of both Board of Directors and General Membership will take place in Hotel Royal Plaza, 1905 Hotel Plaza Boulevard, Lake Buena Vista, on June 25 and 26, 1994. The meeting will convene at 2:00 p.m. and run until 7:00 p.m. on June 25 and on June 26 from 9:00 a.m. to 1:00 p.m.

### Agenda

1. Apologies
2. Minutes of last meeting
3. Matters arising not on the agenda
4. Brief stock taking:
  - 4.1. Mission statement, goals and functions
  - 4.2. Achievements to date
  - 4.3. Strategy Plan
5. Regional development initiative:
  - 5.1. Regional activities
  - 5.2. International affairs
  - 5.3. Development plan
6. Programme of events:
  - 6.1. Newsletter
  - 6.2. Bulletin board
  - 6.3. BS '96
  - 6.4. Research directory
  - 6.5. User's club

- 6.6. Software products
- 6.7. Information papers
- 6.8. 1994-5 programme

7. Corporate issues:
  - 7.1. New Board and member function
  - 7.2. Executive Secretary appointment
  - 7.3. Finance (Treasurer's statement); new funding opportunities
  - 7.4. Membership drive and profession links
  - 7.5. IBPSA image
  - 7.6. IBPSA awards
8. AOB
9. Date/place of next meeting

## IBPSA MINUTES OF JANUARY 1994 MEETING

### IBPSA Board of Directors and General Meeting

22 January 1994; Bayou I, Fairmount Hotel, New Orleans

### Minutes (Condensed Version)

**Present:** Dan Seth (Chairman), Jeff Haberl, Larry Degelman, John Mitchell, Per Sahlin, Roger Peletret, Ed Sowell, Jeff Spitler, Mike Witte, Chip Barnaby, Taghi Alereza, Gren Yuill, Radu Zmeureanu, Fariborz Haghighat, Alex Bring, Yuri Tabunschikov, Jean-Michael Nataf, Mariana Brodatch, Alex Spiridonov.

### Agenda

The Agenda was discussed and modified to accommodate those members who had previous commitments to present their items and leave. A motion was unanimously passed to accept the amended Agenda.

### Approval of the Denver Minutes

*Chip moved, seconded by Per, to accept the Denver Minutes. Motion passed. Minutes adopted.*

The Chairman reminded all members that this was the first IBPSA meeting where the BOD and General Meeting were combined into one. All

members were encouraged to participate, however, only Board Members' vote will be counted on matters requiring a counted vote.

## IBPSA Finances

Ed Sowell distributed copies of the IBPSA and P&L Statement and opened discussion on the status of the IBPSA finances. It was acknowledged that the balance sheet did not include earnings of some \$7,000 from BS'93 nor the sponsorship funding of some \$12,000 from EPRI and \$5,000 from CERL. With these adjustments the operating balance would be a healthy \$98,5000 provided sponsorship funding is received. A motion to honour \$2,600 in travel expenses from Carl Johnson of EPRI was passed.

*The financial statement was accepted based on a motion presented by Taghi and seconded by Roger. Motion carried.*

## BS'95

John Mitchell presented a proposal from the University of Wisconsin to host BS'95. John handed out an outline of the conference and details about its administration. The conference would be hosted by the Solar Energy Laboratory and held on August 14-16, 1995 at the college of engineering. It is estimated to attract some 200-250 delegates to the conference.

Two committees were established as follows:

- Organizing Committee: Carol Gardner, Terry Williamson, Ed Sowell and Rik Van de Perre;
- Scientific Committee: Per Sahlin, Roger Pelletret, Jeff Spitler and Jeff Haberl.

Some further discussions about conference planning, tours, student attendance, mailing lists of potential attendees, travel to meetings, conference fees, scheduling, and advertising were held. It was decided that the organizing committee will assist John to prepare final budgets and plans which will be presented at the next IBPSA meeting.

*A motion by Ed, seconded by Mike, to grant a budget of \$10,000 as seed money to start the conference planning, was carried.*

## Elections

Mike Witte reported that progress has been slower than anticipated as there were a few glitches to overcome. His committee has contacted most of the Board Members and inquired about their intentions to serve on the board. The most difficult task has been to find someone suitable and willing to serve the office of the President. Finally, Joe Clarke has accepted the nomination on the condition that the members accept proposal outlined in his letter to the Board. Joe's proposal to move IBPSA closer to the building profession by establishing regional autonomy and by restructuring the international BOD would make IBPSA more relevant and international to its members worldwide. Joe's proposal was thoroughly discussed and everyone present was given the opportunity to voice their views. It was suggested that a good debate be held at the next IBPSA meeting to decide on the ways and means to realize Joe's vision for the future of IBPSA.

*A motion by Mike, seconded by Ed, that the BOD support the spirit of Joe's proposal and that the BOD be willing to work with Joe on orchestrating IBPSA towards a new structure on a time-table that does not disrupt any existing functioning of the organization; and that Joe be nominated candidate for the President, was passed.*

*A further motion by Mike, seconded by Jeff Spitler, that IBPSA hold a letter ballot for elections and have the new BOD ready to act by June 1, 1994, was carried.*

## New Program Initiatives

Jeff Haberl reported that topics for discussion had been faxed to the working group which was established in Denver. However, no input has been received to date. Roger Pelletret, who had submitted a proposal to the President, proceeded to explain his suggestion for a new initiative. His proposal consisted of a glossary of building simulation terminology. After some discussion about the pros and cons of proceeding with the project as submitted, it was decided to empower both Roger and Per to prepare two work statements.

*A motion by Ed, seconded by Larry, that Roger, Per, et al prepare two work statements:*

- 1) *a glossary, and*
- 2) *a bibliography of simulation software to be ready by 4/1/94 for mail ballot to the BOD for a vote that would then go out for bids, was passed.*

Gren Yuill registered a concern, he felt that IBPSA was jumping into this too fast and that he did not fully support the initiative.

## BS'93 Conference Report

The Chairman tabled Terry Williamson's conference closing report and complimented Terry for a job well done. Clearly, the Conference has been both a financial and technical success. A copy of the report was submitted to the Secretary for distribution on request. Also, a copy of the report summarizing lessons learnt and experiences gained from both BS'91 and BS'93 was handed to the Secretary for future reference.

*A motion by Jeff Spittler, seconded by Per, to accept Terry's conference report, was carried.*

## Executive Secretary's Contract Report

The Chairman and Phillipe Geril met the night before the meeting to go over financial statement prepared by SCS. It was resolved that SCS will resubmit its closing statement based on the decisions reached in Denver, and include reconciliation of membership dues received by SCS. Therefore, the motion contained in SCS report was denied pending clarification of expenses and submission of revised final report.

## ASHRAE Response

The Chairman reported that ASHRAE has declined IBPSA's request to co-market BS publications at its Book Store at ASHRAE sponsored meetings and conferences. This was in response to IBPSA's request of 25 June 1993. Both the IBPSA and ASHRAE letters were entered into the records.

After some discussion, Larry Degelman volunteered to look into ASHRAE sponsorship of IBPSA conferences and co-marketing of BS publications.

## Electronic Bulletin Board

Sub-Committee (members) established to evaluate submissions respecting the Electronic Bulletin Board expressed general dissatisfaction with the way the selection of the winning entry was handled. It was felt that there was an apparent breakdown in lines of communication between Europe and North America that contributed to this particular situation. In the future those responsible for the coordination

must make every effort to obtain committee members' input before presenting recommendations to the Board. Despite hurt feelings, it was decided to proceed on a trial basis with the U.K. sponsored Mailbase system.

*A motion by Chip, seconded by Larry, to pay up to \$1,500 US (1,000 English Pounds) to Joe Clarke for a one year test of the bulletin board, was passed.*

*A further motion by Chip, seconded by Roger, that Dan write a letter to the IBPSA Executive Secretary directing him to provide sufficient primary materials on all future correspondences for the BOD to vote on an item and that such a vote must be "positive contact" vote and not a "no silent votes by no contact", was passed.*

## Half-Day Orlando Symposium

Mike Witte apologized for lack of progress on this initiative and invited input from all members for the make up and staging of this event in Orlando. After some discussion it was decided that both Chip Barnaby and Mike Witte will try to assemble something for Orlando with a go-no-go deadline by 1 April 1994. If a go, the material will be forwarded to Dan Seth for dissemination to all members.

## ETH Conference in Zurich, Switzerland, August 22-25, 1994

The Chairman reported that, from what he has received so far, the CISS conference is on track and progressing well. Conference Organizers have accepted approximately 200 papers and are optimistic that the conference will be a roaring success. Building Simulation portion of the conference has added significant impetus to the conference scope.

## Adelaide Ad-Hoc Meeting Recommendations

Per Sahlin suggested that the recommendations of the Adelaide meeting be forwarded to the Executive Secretary for action.

*A motion by Per, seconded by Chip, that a copy of the Adelaide Ad-Hoc meeting recommendations be forwarded to the Executive Secretary for action to produce guideline from it, was carried.*

## New Business

The Chairman recommended that an RFP go out to potential bidders and invite proposals to provide Executive Secretary services for the next term.

*A motion by Mike, seconded by Chip, that an RFP go out for bids for the new IBPSA Executive Secretary contract, was passed.*

*A further motion by Chip, seconded by Jeff Haberl, that a sub-committee including: Chip, Dan, Jeff Spitler, and Joe Clarke be formed to develop an RFP, review the responses to the RFP, and enter into a contract according to the following schedule: issue RFP by 3/15/94; collect by 4/15/94; evaluate by 5/15/94; was passed.*

Meeting adjourned at 10:00 p.m.

## GENERAL INFORMATION

### The Great Building Energy Predictor Shootout II: Measuring Retrofit Energy Savings

Based on the overwhelming response to the first Building Energy Predictor Shootout a second predictor shootout has been developed to again compare how well different empirical models fit building energy data from several new data sets and to compare how those models can be used to calculate retrofit energy savings. ASHRAE's TC 1.5 and TC 4.7 have authorized a Building Energy Predictor Shootout II: Measuring Retrofit Energy Savings with is the focus of this announcement. The results of this friendly competition will be published in an ASHRAE Symposium. All able bodied building energy analysts are encouraged to participate.

In order to facilitate this comparison before-after data and site description data from two carefully chosen buildings that have received retrofits as part of the Texas LoanSTAR program will be made available to the contestants and placed on the internet for public access. (Diskettes of the data can also be obtained by faxing or e-mailing your request to the contest organizers). Each contestant will be required to prepare a quantitative analysis of both buildings and submit the results of their analysis in the required format for comparison by the contest sponsors. The top consultants will then be asked to write an ASHRAE Symposium paper and make a

presentation. There will be no monetary prizes, only the recognition that goes with being one of the top contestants.

The competition does not require advanced registration. To enter FAX, or e-mail a note requesting instructions for anonymous FTP logging to the LoanSTAR server, or if you do not have access to the internet and would still like to enter, simply mail an unformatted MS-DOS compatible, 3½", 1.44 Mbyte, high density, double-sided diskette, (or 5¼" Mbyte, high density double-sided floppy disk), and a self-addressed, 9 x 12" envelope, with a \$2.90 U.S. priority mail stamp affixed to:

#### PREDICTOR SHOOTOUT II

Attention: Jeff Haberl, Energy Systems Laboratory  
Mechanical Engineering Department, Texas A&M  
University, College Station, TX, 77845-2123,  
Phone: (409) 845-6065, Fax: (409) 862-2762, E-mail:  
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Instructions about the competition, evaluation methods, and how to submit a return diskette with the analysis of the data will be included in a README.TXT file on the data diskette mailed to you. The contestants will also need to be complete an entry from about themselves, their methods, etc., and mail it back with their results.

### Regulations for the Energy Performance of New Buildings

By S.renes, Government Building Agency., Ministry of Housing, Physical Planning and Environment, The Netherlands.

Energy saving is no longer a matter of cost-effectiveness alone. The main target is to reduce the emission of CO<sub>2</sub>, NO<sub>x</sub> and SO<sub>2</sub> in order to cope with the greenhouse problem and the effects of acidification.

In the Netherlands the energy demand of buildings is about 36% of the total national energy consumption. Therefore, on explicit aim for the reduction of this demand is stated: 25% reduction in the year 2000 compared to the consumption level in 1989.

Besides instruments like financial support and promotion campaigns for energy saving measure, regulations for the energy performance of buildings will be used to reach the desired reduction in 1994 these regulations are supposed to come into force.

The guideline of the Government Building Agency IGBAI for the annual energy consumption in newly built offices is summarized to illustrate one of the possible constructions for energy performance regulations.

In general the Dutch policy on energy savings is based on the National Environmental Policy Plan [NMP, May 1989, its follow-up the NMP-plus (June 1991 and the Memorandum on energy conservation June 1990)].

On the subject of energy conservation, the Dutch Nation Environmental Policy Plan, the NMP, contains a specific task for GBA. The energy consumption the GBA's total building stock (about 5,000 buildings containing some 6.5 million square metres gross floor area) has to be reduced within ten years by 20%. This reduction should include not only energy for heating, but also for cooling, ventilation, air and water transportation, lighting and other electrical equipment.

For the existing building stock, a large energy-saving programme was started on 14 June 1991. This programme, called the "Energy Efficiency-programma Rijkshuisvesting (EER), will lead to a reduction of 17% in the year 2000 (total stock based). The programme is developed by the GBA in cooperation with the Ministry of Economic Affairs and Novem, the Netherlands Agency for Energy and the Environment. It contains a survey programme, in which every single building will be analyzed on energy saving measures. These measures might include technical measures (for instance more insulation or improvement of the Heating Ventilations and Air-Conditioning (HVAC) system) as well as measures for better energy management of the building.

In addition, the programme allows for the implementation of innovative solutions, encouraged by the expert knowledge of Novem.

After checking the return on the investment (payback time of up to 15 years) and the possibilities for fitting into existing programmes like maintenance, the measures will be taken.

Novem is supporting the GBA in the programme by checking the building stock, advising measures and introducing energy management.

The remaining 3% reduction (total stock based) will be achieved in the replacement of existing buildings by new energy efficient ones. For this purpose the GBA developed the guideline for the energy performance of new buildings, in particular offices. Through use of this standard, the "breed" of the GBA's building stock will continually improve the total energy efficiency.

Thus far the GBA has used prescriptive standards to guarantee energy efficient buildings. These standards contain minimal thermal resistance values (R-value) and the so called thermal insulation index I. Although the latter is a kind of a performance criterion, it doesn't lead to energy efficient buildings automatically. Passive Solar gain for instance, is not taken into account. Nor the impact of internal thermal loads (heat or lighting apparatus and persons). Research has shown that raising the current values ( $R = 1.5 \text{ m}^2 \text{K/W}$ , for the building facade and roof, or  $I = 12$ , GBA values until 1992) to  $R = 3 \text{ m}^2 \text{K/W}$  and  $I = 1.5$  is only useful for buildings with a low thermal load. In these cases, a reduction in energy use of about 20 to 25% is possible. Buildings with higher thermal loads need cooling compensation during summer to meet the comfort criteria. But, of course, the latter undoes the reduction in energy use which was brought in by raising the I value.

The more severe the energy criteria the more problems arise by interfering actions. This statement applies to every field which strives for high quality output. It's a main argument for integral designing and using performance criteria instead of prescriptive criteria.

The new GBA standard sets a limit to the annual energy consumption of a building (an office expressed in cubic metres of natural gas (or equivalent gas) per square metre of gross floor area per year:  $\text{m}^3 \text{ aeq/m}^2 \text{ bvo.a.}$ ). The way the building meets the limit is up to the designers; for instance by lowering the heat transfer rates, by installing solar collectors, total energy systems, heat pumps, aquifers, etc.

The standard contains a calculation method based on the model ISSO 21 (guidelines and tools for energy efficient signing of office buildings) and limits values for the energy consumption, depending on the kind of building. The calculation method is recorded on disk for IBM pc or compatible computers. In order to prevent radiant discomfort and moisture problems, minimum thermal resistance values are still required.



The standard is made for the design stage. It is not a test for the energy consumption of a building use. Nevertheless, evaluation of actual energy use in new buildings will take place. First of all, to monitor the progress of the energy saving programme. In addition, to check the validity of the calculation method.

The standard is developed by DGMR consulting engineers in charge of the GBA and with funds from Novem.

## PROJECT NEWS

### Energy Systems Laboratory at Texas A&M University

The Energy Systems Laboratory at Texas A&M University has several graphics packages available that provide useful viewing and browsing tools, including: MS Windows 3-D hourly surface plotting routines, multi-window time sequenced animation, JAS carplot matrix, and statistical box and whisker mean plots, and a general purpose empirical multi-linear, change-point linear and histogram modelling package. For more information, contact Jeff S. Haberl, (409) 845-6065, FAX (409) 862-2762, e-mail: jhaberl@loanstar.tamu.edu.

### Lawrence Berkeley Laboratory California

1. WINDOW 4.1 IS A DOS-based computer program that calculates the thermal and optical performance of window systems. WINDOW 4.1 uses analysis methods consistent with the National Fenestration Rating Council (NFRC). Version 4.1, a recent upgrade of the widely used 4.0 program, includes several changes to help increase user productivity. WINDOW 4.1 is developed by the Building Technologies Program at Lawrence Berkeley Laboratory (TEL: (510) 486-4040, FAX: (510) 486-4089, RLHAYNES@lbl.gov).
2. RESFEN 1.3 is a DOS-based computer program that calculates the heating and cooling energy performance and costs of residential fenestration systems. The algorithms are based on multiple regression expressions that were derived from a data base of DOE-2 building energy simulations. Users can vary geographic location, utility costs, infiltration, internal load levels, HVAC, wall and floor type, as well as

window size, U-value, and shading coefficient. Changes due to obstructions, overhangs, and interior shades can also be calculated. Available from the National Fenestration Rating Council at TEL: (301) 589-6372 or FAX: (301) 588-0854. Developed by Robert Sullivan, Building Technologies Program, Lawrence Berkeley Laboratory.

3. Energy Design Advisor (EDA) is a new building design tool for architects that supports the integrated consideration of multiple design solutions with respect to multiple design criteria. The initial version of EDA is linked to PowerDOE and incorporates a Schematic Design tool and a Case Studies Database. Future versions will support additional simulation capabilities as well as context-dependent design advice. EDA is being developed by the Building Technologies Program at Lawrence Berkeley Laboratory. (TEL: (510) 486-6854, FAX: (510) 486-4089, K. Papamichael@lbl.gov).
4. PowerDOE is a new version of the DOE-2 building energy simulation program with a graphical user interface running under Microsoft Windows. Interface features include menu-driven input, on-line help, graphical display of results, building component libraries, link to CAD packages and option to automatically generate a building description from type and vintage. PowerDOE is being developed by the Building Technologies Program at Lawrence Berkeley Laboratory (TEL: (510) 486-5711, FAX: (510) 486-4089) and Hirsch & Associated (TEL: (805) 532-1045, FAX: (805) 532-2401).

*IBPSA appreciates this contribution from Europe.*

## Conservation in End-Use Sectors

### Energy Conservation

#### Buildings

##### A. Project:

Development of a continuous absorption pipe with thermal solution pump CAP.

##### Objective:

The aim of this project is to develop and demonstrate technical feasibility of a continuous absorption ipi (CAP). This is a new concept for an absorption heat pump which due to its simplicity has the promise of cheap mass production and low cost.

**Brief Description of the Research Project:**

This absorption pipe concentrates the principle of absorption heat pumps in one tube which can be hermetically sealed. The solution pump is driven thermally so that electricity is not required. These heat pumps can use methane oil, coal, solar and waste heat, but methane will be the most currently used transfer from the CAP will be studied by LSOC. The University of Aachen will construct two CAPs with methano/LiBr as working media. A simulation model for CAP will also be developed by the University of Aachen.

**Principle Researchers:**

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**B. Project**

Research of solid-gas reacting media and of intercalation compounds used in suitable structures of reactors to improve the performances and spheres of use of chemical heat pumps, cooling machines and thermal transformers.

**Objective:**

Improve understanding of gas-solid couples, in particular for graphite reacting salt mixtures and graphic intercalation compounds. Develop a 1 kW AHP unit for air conditioning with a COP of 1,6 a 1 kW unit for heating which transforms heat from 80–100°C to 180°C and a solar refrigeration.

**Description of the Research Project:**

Until now solid gas absorption heat pumps did not find many applications due to a number of inherent disadvantages. A major problem is the low heat transfer between games of solid material and between these grains and the heat exchanger surface. This leads to large and expensive heat exchangers and a low heat power density. Recent R&D by CNRS and INP lead to an interesting concept which may solve this problem. Another obstacle is the fact that continuous operation is not possible: batch type operation of this AHP however has the advantage

the heat can be stored without extra cost. Solid gas AHP have the advantage that heat can be produced at much higher temperature levels (200°–300°C) than for conventional heat pumps (150°C); this could increase the field of heat pump applications, in particular in industrial processes.

Work on solid-gas couples will be concentrated on identifying and characterizing new couples in particular for low, medium and high temperature zones, which are presently not covered by known solid-gas couples (FPM, INPG and CNRS). Heat and mass transfer will be improved by mixing the reaction salt with an inert expoliated graphite binder (CNRS) and by intercalating graphite of the reactive molecule in the form of a graphite intercalation compound (INPG). Simulation models for coupled heat transfer of these two options will be established (CNRS). Three types of solid-gas AHP will be built to prove their technical feasibility.

An air-conditioning unit of 1 kW with a COP of 1.6 which consists of four reactors with three different types of salt and which has a system of internal heat recovery (CNRS).

A single stage heat transformer of 1 kW which transforms heat of 80–100°C into a smaller amount of heat at 180°C without any other heat input (FPM).

Modify an existing solar refrigeration unit where CaCl<sub>2</sub>/H<sub>3</sub> will be replaced by expanded graphite – reacting salt mixtures which are expected to give a much better performance.

**Principle Researchers:**

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**C. Project:**

Solid state variable transmission windows.

**Objective:**

Develop and demonstrate feasibility of electrochromic windows of  $30 \times 30 \text{ cm}^2$  with a transmission range of better than 50%, a switching time of 30 sec and a lifetime of 5,000 cycles.

**Brief Description of the Research Project:**

Variable transmission windows offer the possibility of regulating the transmission of visible and infrared solar mediation. This is achieved by coating the window with a stack of thin films.

The coatings consists of five transparent layers: two current conducting layers separated by the electrochromic electrode, electrolyte and storage layer. The operation of the multi-layer is analogous to a battery in that, with a small voltage, ions from the storage layer will pass through the electrolyte to be inserted into the electrochromic electrode. This will cause a change in the optical properties of the electrochromic layer. In this way, the window can be switched from transparent to nearly opaque in the visible region, and also from transparent to highly reflective in the near infrared. These mechanisms have very attractive implications in desiring energy efficient buildings in both warm and hot climates.

In this project different electrochromic materials and solid electrolyte layers will be investigated. In particular the behaviour of sputtered electrochromic metal oxide coatings undergoing "lithiation".

The transparent counter electrode will be developed by the University of Salford. The Li-ion conducting polymer electrolyte with an ion conductivity of around  $10 \text{ k}\Omega\text{cm}$ , will be developed and manufactured by ERL.

Thin film deposition techniques for the active electrochromic electrode, the storage layer as well as techniques for applying the ion conductive solid electrolyte will be developed (Pilkington, University Salford).

Finally, complete windows of  $30 \times 30 \text{ cm}^2$  will be manufactured where the layered solid state device is laminated between two sheets of glass.

**Principal Researchers:**

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**D. Project:**

The impact of new technology on the development of refrigeration equipment and/or heat pumps.

**Objective:**

Carry out a fundamental assessment of heat pumps and refrigeration systems to explore new technological options and solve problems (such as CFC) which could lead to a more extensive use of heat pump technology.

**Brief Description of the Research Project:**

Heat pumps have the potential of consuming 30-50% less energy than conventional heating systems and they can also be used for air conditioning and refrigeration.

Contrary to Europe, heat pumps are extensively used in the US and Japan. This is reflected in large number of heat pump industries which threaten to dominate the European market.

In view of new technological developments of the role which heat pumps can play in reducing CO<sub>2</sub> and other pollutants and of the problems related to CFC, it was decided to carry out a study to assess the possibilities for heat pumps under these new conditions, in particular for the European heat pump industry.

This study (JOU EI0046) will be carried out by interviews and a number of meetings and workshops. The following topics will be dealt with:

- Identification of limits and ways to overcome them (increase the temperature range, intensify heat flux, cost reduction, CFC, etc.).
- Evaluation of different heat pump and refrigeration cycles and systems; analysis of the internal structure of heat pumps.
- New technologies and materials.

This study should result in recommendations for future R&D.

#### Principal Researchers:

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#### E. Project:

Glazing with aerogels.

#### Objective:

Develop and demonstrate the potential of aerogels for use in diffusing windows, skylights, roofs and Trombe walls. Methods will be developed to fill granular silica aerogel between two sheets of glass.

#### Brief Description of the Research Project:

Aerogel systems containing transparent or translucent gels between two glass panes give a much better heat insulation than existing glass windows. If these systems could be used in windows this could lead to large energy savings. In addition aerogels can reduce the transmission of noise drastically.

Work will be carried out on the following topics:

- Evaluation of material and system properties, in particular heat transfer, illumination and acoustic properties and transmission of radiation (ISE, IBP).
- Testing of double windows filled with presently available aerogel rules for different window sizes ( $0,5 \times 0,5 \text{ m}^2$  and  $1,2 \times 1,6 \text{ m}^2$ ) and different sealing technologies (Pilkington, Glaverbel Vegla).

- Development of improved aerogel varieties (BASF).
- Investigation of window systems consisting of two glass panes filled with aerogel granules size of the unit, separation between the panes, filling process, evacuation, weathering, long-term behaviour, etc. (BASF, Solar and Environmental Technologies, IBP, ISE), indoor, outdoor and field testing for different applications (ISE, IBP Pilkington, Glaverbel Vegla).

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#### F. Project:

TECLA project: European absorption air-conditioning technology.

#### Objective:

Development of two ammonia/water absorption heat pumps for heating/air-conditioning applications built according to different concepts and for different applications areas (medium 50 kW and large size 100-500 kW).

#### Brief Description of the Research Project:

Absorption heat pumps (AHP) offer the possibility to produce heat with very high efficiency. Systems which use 30-50% less primary energy than conventional systems are envisaged; AHP can also be used for refrigeration. It is possible to use a variety of fuels such

as methane, coal, oil waste heat, solar heat, but methane is predominantly used. In a EC market study, heating/air conditioning (e.g., in Southern European countries and office buildings all over Europe) was identified as one of the most promising application areas. This project (JOUE/0059) therefore aims at the development of AHP for such applications. Work will be carried out on two types of ammonia/water AHP; a medium size unit (50 kW) consisting of two stages with different solutions thus increasing the efficiency. A large unit consisting of a single stage with very compact heat exchangers (700 to 1,400 m<sup>2</sup>/m<sup>3</sup>) and a new type of solution pump.

The project will be carried out in the following way: a first study will be made of the heating/air-conditioning market in Europe including the regulations in different countries. On the basis of the data obtained, the basic components of the two proposed prototypes will be designed and constructed. Special attention will be given to the design of the burners and combustion chambers to achieve the maximum efficiency in the consumption of primary energy and reduce the emissions of pollutants, especially NO<sub>x</sub>. The experimental prototypes will then be assembled and tested carrying out the required iterations to optimize the operation of the system. In parallel, the external exchange units will be adapted and integrated and the regulation and control system will be designed. Once the tests of the experimental prototypes have been completed, the pre-commercial prototypes will be constructed with their final configuration. Lastly, the construction specifications of the heat pumps will be developed to permit their industrial operation.

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#### G. Project:

SOLINFOR: Technology Transfer for the European Building Industry.

#### Objective:

This project aims to develop a number of innovative mechanisms and tools which can improve the information flow of results from researchers to users such as architects and developers in particular and the building industry in general.

#### Brief Description of the Research Project:

The activities in the project SOLINFO 2 are:

- Revision and extension of the European passive Solar Handbook with additional volumes including passive solar design, catalogue of components and products, guide to literature and software.
- Maintain a cooperation network of national experts which will support dissemination activities in each member state.
- Provide information and professional support in the form of Newsletter and Research Digest services and in various media based on EC competition material, the passive Solar Handbook, etc., maintain update and expand existing databases.
- Examine the practical needs of the architects, builders, engineers and developers, in order to make the industry and public more aware of energy performance. The feasibility will be investigated (in collaboration with EUROCODE) of an European Energy Cost index for buildings, an award for energy efficient building will also be initiated.
- Explore the possibility of setting marginal design advice services in combination with a number of energy-saving design studies for most common prototype buildings.

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**H. Project:**

Daylight and lighting control.

**Objective:**

Investigate the influence of daylight on the luminance distribution in an office and the appreciation of this luminance distribution by people. Develop and test procedures for dynamic control systems in an integrated daylight/artificial light environment.

**Brief Description of the Research Project:**

The following work will be carried out:

- Investigation of daylight parameters (literature study).
- Review of existing lighting control systems.
- Extension of existing models to model the combined luminous distribution produced by natural and artificial lighting under various control strategies; use of these models for office buildings (University of Strathclyde).
- Investigate the appreciation of luminance by people in an operational test-office building. This work includes: establishment of a list of requirements, questioning of persons working in the office under different conditions, measure the actual lighting values and calculation of energy consumption with different control strategies. The impact of extreme daylight conditions will also be evaluated.

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**I. Project:**

COMBINE

**Objective:**

COMBINE is a first step to intelligent integrated building design. The objective is to provide a conceptional basis for the future integration of different tools, such as architectural modelling emphasizing the integration of energy related aspects and to demonstrate these concepts through six design "prototypes".

**Brief Description of the Research Project:**

Until now several attempts have been made to link Building Performance Evaluation (BPE) tools (models for thermal behaviour of buildings, control, comfort, etc., to Computer Aided Design (CAD) systems. These efforts however were inadequate to provide efficient design support. Therefore a group of 16 laboratories participating in the collaborative project COMBINE and a number of design practitioners will address this problem again.

This development of the Integrated Data Model (IDM) forms the backbone of the COMBINE effort. This model will provide an interface between a variety of BPE design tools, and will define and specify the selected six "prototype" tasks which each deal with an aspect of building design (CSTB, FNB, TPD, EdCAAD, VTT, TUD). This model must be conceptional close to the emerging AEC-STEP standard and reflects other European standardization work such as EUROCODE.

The documentation and uniform description of BPE tools (models for thermal behaviour of buildings, control, comfort, maintenance, passive coolings, etc.) is supervised by CSTB and BRE.

DEMO task structures the involvement of design practitioners in COMBINE. This ensures an input and feedback from the daily practice of building design (all participants).

Six "prototypes" have been selected, each of which deals with an aspect of building design and contains one or more BPE. The integrated Data Model will be applied to these cases and will demonstrate the feasibility of the concept. The six "prototypes" are:

- Construction design of external building elements (NCLE, BRE).
- HVAC design (UCG, COSTIC).
- Dimensional and functional organization of inner spaces (LEMA).
- Input generation of a thermal simulation tool at a later stage (SBI, FIB).

- L-T method in early design stage (EdCAAD, UCD).
- Energy economic design (VTT, PI-C).

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**J. Project:**

Holographic optical elements: specification and development for building application.

**Objective:**

Develop and demonstrate technical feasibility of dichromatic gelatine hologram technology for daylight in buildings.

**Brief Description of the Research Project:**

Daylight techniques are used to bring daylight deeper into buildings. In this way artificial light is avoided and cooling requirements reduced; this can lead to large energy savings. Presently techniques such as light shelves, reflective blinds and prismatic tools however are expensive (500 to 1,500 ECU/m<sup>2</sup>). The field of hologram technology is therefore explored as a way to exploit daylight at a considerably lower cost (50 ECU/m<sup>2</sup>).

The principle of this technology is that windows are coated with a transparent coating in which an invisible diffraction pattern is "printed" by a holographic technique. The window can now deflect transmitted direct and diffuse solar radiation over a well-defined angle (which is defined by the diffraction grid characteristics) deep into the building. Similar grids can also be used to reflect away solar light which impinges on the window from well-defined angles.

The work programme of this project is as follows:

- Establishment of specifications of an ideal holographic film to be used in facade windows in office buildings.
- Design and construction of two single-layer hologram prototypes.
- Design and construction of two multi-layer hologram prototypes (single layers will deflect different colours in white light by slightly different angles resulting in a specimen of colours in the room; multi-layers compensate this effect).
- Evaluation of photometric properties of holographic films.

- Test on scale models in office rooms.
- Recommendations for improvement of the technology.

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**K. Project:**

Dynamic characteristics of daylight data and of daylight design in building.

**Objective:**

Measurement of outside daylight characteristics which will serve as an input to establish the performance of a number of innovative daylight systems with the help of computer simulation models.

**Brief Description of the Research Project:**

Outside daylight measurements will be carried out every five minutes, by each group using a JOULE CLASS STATION. (Faster measurements are possible at CSTB.) The associated groups will process weather data to produce a data base of daylight and sunlight availability.

Computer models for environmental modelling of buildings will be modified to provide information on the relation between outdoor and indoor daylight: CSTB tends to develop control strategies for shading and electric lighting; ENrPE-LASH will characterize daylight systems with the BENELUX code; LNEC will identify parameters which influence dynamic characteristics of daylight in buildings by measuring illuminance in physical models of buildings using the simulation of real sky. The following daylight systems will be analyzed: single and double-size windows clerestories, roof apertures, light-shelves, light-walls or pipes, atria, prismatic

glazing and mirrored louvres and integration of externally reflected sunlight. Also human behaviour will be taken into account.

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**CALENDER OF EVENTS**

IAQ '94  
Engineering Indoor Environments  
**October 29 - November 2, 1994**  
St. Louis, Missouri  
(404) 636-8400

Renewables '94 Conference  
(Renewable energy, energy efficiency and environmental issues)  
**October 31 - November 2, 1994**  
(613) 384-5238

Third International Energy Efficiency and DSM Conference  
**November 1-3, 1994**  
Vancouver, British Columbia  
(215) 667-3114, Fax: (215) 667-5593

Future/Build '94  
**November 6-7, 1994**  
St. Louis, Missouri  
(202) 457-1988

Home and Building Automation '94  
CABA's Annual Conference and Trade Show  
**November 29-30, 1994**  
Toronto, Ontario  
(613) 990-7407



1995 Winter Consumer Electronics Show  
**January 6-9, 1995**  
 Las Vegas, Nevada  
 (202) 457-4900

1995 International Air-Conditioning, Heating,  
 Refrigeration Exposition (AHR Expo)  
**January 30 – February 1, 1995**  
 Chicago, Illinois  
 (203) 221-9232, Fax: (203) 221-9620

1st International Congress on Intelligent Buildings  
**February 6-8, 1995**  
 Tel Aviv, Israel  
 011-972-3-7516422; Fax: 011-972-3-7516635

2nd International Conference on IAQ, Ventilation  
 and Energy Conservation  
**May 10-12, 1995**  
 Montréal, Québec  
 (514) 848-3192

**December 5-7, 1994**

University of Liege

#### 4th International Conference on System Simulation in Buildings Scope of the Conference

As well as the three previous ones, this fourth conference will be organized in very close co-operation with the International Energy Agency (IEA, Energy Conservation Building and Community System) and with the American society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE, TC 4.7. "Energy Calculator").

The following topics will be considered:

- Building and HVAC component.
- Parameter Identification.
- Experimental validation.
- Use of Models for system design optimal control.
- Case studies.

### Practical Information

As for the previous conference, the number of papers will be restricted to a maximum of 35 through severe selection, in order to reserve enough discussion time during the conference. Pre-prints of the communications will be distributed to registered participants before the conference and discussions will be published in the Proceedings.

The number of participants will be limited to a maximum of 75 in order to enhance scientific and technical discussions. In view of the success of the previous conferences, it is highly advised to register as soon as possible.

### Conference Administration

For pre-registration and all enquiries please contact Jean Lebrun, University of Liege, Campus du Sart Tilman Thermodynamics Laboratory. Parking P33. Batiment b-49, B-4000, Liege (Belgium). Phone: +32.41.56.48.12 E-mail: U510417@bliulg11.

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The proceedings for BS '89 and BS '91, are available from the IBPSA Secretariat as long as stocks last.

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## IBPSA Newsletter Contact

Please send articles and announcements to the  
IBPSA Secretariat, c/o Omar Elwedini, Candaplan  
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If possible, please submit material in magnetic form on  
either DOS or Macintosh diskette or via electronic  
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## IBPSA

IBPSA (the International Building Performance  
Simulation Association) is a not-for-profit international  
society of building performance simulation researchers,  
developers and practitioners, dedicated to improving  
the built environment.

## Mission

IBPSA is founded to advance and promote the  
science of building performance simulation in order  
to improve the design, construction, operation and  
maintenance of new and existing buildings worldwide.

## Vision

To take a leading role in the promotion and  
development of building simulation technology,  
IBPSA aims to provide a forum for researchers,  
developers and practitioners to review building  
model developments, facilitate evaluation, encourage  
the use of software programs, address standardization,  
accelerate integration and technology transfer. So  
that, one day:

- members all over the Globe will find membership in IBPSA worthwhile and profitable in their area of interest;
- governments, industry, utilities and academic institutions will look to IBPSA for guidance in determining policies, areas of research, and application development in building simulation;
- local chapters around the globe will benefit from the body of knowledge and experience available through IBPSA;
- IBPSA will act as a clearing house for soft-ware products and services in building simulation;
- members will network with other members and societies through electronic means;
- IBPSA will provide a framework for strategic alliances for information and cooperation in R&D and Technology Transfer.

## Goals

Following goals were identified at the inception of IBPSA:

- Identify problems within the built environment that may be solved by improved simulation tools and techniques;
- Identify the performance characteristics of buildings on which simulation should be focused;
- Identify building performance simulation research and development needs and transfer new developments to the user;
- Promote standardization of the building simulation industry; and
- Inform and educate its members and the public regarding the value and the state-of-the-art of building performance simulation.

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## General Strategy

The areas of interest of IBPSA are all aspects related to building simulation, including building model development, evaluation, use in practice, standardization, integration and technology transfer.

Multi-year Program Initiatives, defined and launched by the IBPSA Board, are the framework in which every IBPSA activity must fit.

IBPSA's strategy as an international **not-for-profit organization**, is based upon seven principles:

- Building membership.
- Pursue sponsors.
- Serve clients.
- Sponsor pre-competitive initiatives.
- Foster building simulation.
- Establish strategic alliances.
- Ensure communication