International Energy Agency
Energy Conservation in Buildings and Community Systems Programme

Energy Situation and Energy Conservation Programme for Buildings in France

By Pierre HERANT, ADEME, France
ECBCS and SHC Executive Committee Joint Meeting
Presentation, Bordeaux, June 13, 2001

Introduction

Since the first oil crisis in 1973 numerous measures have been implemented in France, as in other countries, in order to reduce the total energy consumption of existing and new buildings:

- Information and formation of users for energy-saving behaviours on the long-term,
- Thermal regulations for the design of new buildings,
- Specific standards for existing buildings,
- Public subsidies for energy audits of existing buildings to define the most energy efficient investments before retrofitting,
- Public subsidies for energy conservation investments in existing buildings.

The benefit of these measures, implemented over the last 25 years, is a saving of 14.5 million tons of oil equivalent (Mtoe) per year, corresponding to 15% of the annual energy consumption of the building sector.

Saving more energy is still possible however. Prospective studies have shown that a large potential for additional savings, comprising between 10 to 13 Mtoe, remains accessible and could be reached with additional efforts.

In 1999, after many years of stability on the energy market, growth of energy prices has led decision-makers in France to launch a new energy conservation initiative. It tackles each economic sector and consists of two national programmes:

In this issue:

- The French Programme against Climate Change,
- The French Programme for Energy Efficiency Improvement.

They include measures dedicated to new buildings by means of a reinforced regulation that will rise step by step during the next fifteen years in order to greatly improve the energy-related design of new buildings.

After these improvements, the stakes for energy conservation will essentially be located in the stock of existing buildings. Two thirds of the existing dwellings stock was constructed before 1975 without mandatory thermal insulation. Due to the long life-span, on average, of buildings in France, they will represent more than 50% of the energy consumption of the residential sector in 2050.

The implementation of the different measures included in these two programmes is largely based on the technical and financial means of the French Agency for Environment and Energy Management (ADEME).

Energy Situation in France

France has a land area of 549,000 km^2 and a population of 60.2 million inhabitants.

The soil occupation density is equal to 109 inhabitants per km^2 (EU average: 116 inhabitants/km^2).

As in many other countries, energy management became a priority in France after the two oil crises of 1973 and 1980. After the first oil crisis, France decided to implement energy policies in order:

- To improve the energy security of supply by reducing the dependence on imported fossil fuels,
- To maintain reliable low-cost energy supplies,
- To ensure the competitiveness of the French economy
- To protect the environment.

The strategy to achieve these goals includes, among others, the improvement of end-use energy efficiency and co-operation with other countries through international organisations such as the IEA and the EU.

These energy management policies proved that it was possible to dissociate the total energy consumption curve and the gross national product (GNP) curve. From 1973 to 1989 the growth of French GNP was 44% but the growth of the national energy consumption reached only 15%.

The French energy independency rate also improved between 1973 and 1995. From 23% in 1973, it reached 51% in 1995 and is currently equal to 49.3%.

The national energy bill amounted to 2.7 billion euros in 1973 and reached 24.4 billion euros in 1981. It decreased to 13.7 billion euros in 1986, then to 9.3 billion euros in 1998. But with the growth of the barrel cost and the poor exchange rate of the French franc against the dollar, the total energy cost increased in 1999, reaching 11.7 billion euros.

The French commitment to meeting the objectives set out by the Kyoto Protocol on Climate Change, combined with this rapid growth of energy prices and the fear of potential new stresses on the energy market, led France to decide on a new and ambitious energy policy in 1999, detailed in this article.

Energy Consumption in Buildings

The total final energy consumption represented 214.3 Mtoe for 1999 in France.

Table 1: Final energy consumption by economic sector in France (1999)

Buildings	98.2 Mtoe	45.8 %
Industry	58.5 Mtoe	27.3 %
Transport	54.1 Mtoe	25.2 %
Others (siderurgy, agriculture)	3.5 Mtoe	1.7 %
Total	214.3 Mtoe	100 %

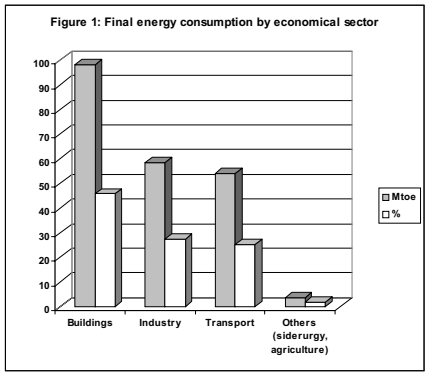


Figure 1: Final energy consumption by economic sector

The building sector (Table 1 and Figure 1) is always the most energy-consuming sector with a contribution reaching 45.8% (average rate for EU: 40.7%), more than the contribution of the industry sector (27.3%) or of the transport sector (25.2%). The consumption share has grown from 40% in 1973 to 45.8 in 1999. 2/3 of the total energy consumption derives from the residential building stock and 1/3 from the commercial and institutional building stock.

Residential Buildings

They represent 28.9 million dwellings that break down into :

23.9 million principal residencies occupied (82.7 %)
2.9 million secondary residencies occupied during holidays and weekends (10 %)
2.1 million vacant dwellings (7.3 %)

16.3 million single family houses (56.4 %)
12.6 million flats in collective buildings (43.6 %)

19.2 million dwellings built prior to 1975 (66.4 %)
9.7 million dwellings built since 1975 (33.6 %)

In less than twenty years the final energy demand of the residential sector (fuel wood excluded) has increased from 43.9 Mtoe to 55.1 Mtoe (+11.2 Mtoe). A breakdown by energy source shows the importance of electricity use in French residential buildings:

- Electricity : 27.9 Mtoe (50.6%),
- Gas : 15 Mtoe (27.1%),
- Fuel oil : 9.5 Mtoe (17.2%),
- Coal: 0.55 Mtep (1%).

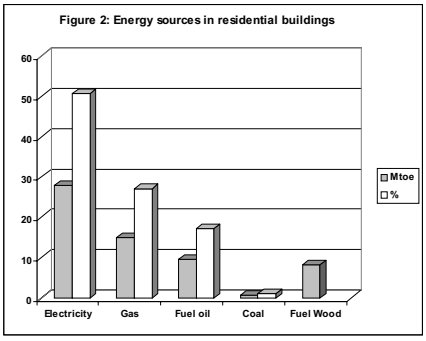


Figure 2: Energy sources in residential buildings

Fuel wood, not included in this total, is significant with 8.1 Mtoe (Figure 2).

Energy consumption of dwellings by end-use breaks down as follows:

- 70 % for space heating (average rate for EU : 69%)
- 12 % for electrical appliances, including lighting (average rate for EU : 11%)
- 11 % for water heating (average rate for EU : 15%)
- 7 % for cooking (average rate for EU: 5%).

The share of energy consumption for space heating is decreasing but electricity consumption for specific uses is rapidly increasing. This trend is stronger for new buildings.

Installation of central heating has dramatically increased during the last 25 years. Central-heated dwellings amounted to 9.6 million in 1975 (53%) and are now amounting to 25.1 million (86.8%). Central heating brings more comfort to users but also higher levels of energy consumption. Electric heating has been widely developed in France since 1973 and the rate of electricity-heated dwellings in France is high compared to other European countries.

For that reason, electrical energy consumption for space heating increased from 5.8 billion kWh in 1973 to 43.2 billion kWh in 1999. It now represents 36% of the total energy consumption of the residential buildings. In total, 7 million dwellings are electrically heated (29.3% of the building stock) and break down as follows:

4 million single houses (57.3%)
3 million flats in collective buildings (42.7%)

---

3 million dwellings in buildings built before 1975 (42.6%)
4 million dwellings in buildings built after 1975 (57.4%)

The French building stock is rather old with 66.4% of the buildings built before the year 1975, when the first thermal regulation was implemented in France. Most of these buildings are still poorly insulated.

Over the last period, 270,000 dwellings were built each year representing 1% of the building stock. Since 1998, this amount has begun to increase, reaching 310,700 dwellings in 1999. But, according to the actual amount of new constructions, the building stock built prior to 1975 will not be totally replaced inside a century.

Nevertheless the total energy consumption of the building stock built prior to 1975 is slowly decreasing, due to the retrofitting of energy-inefficient buildings and the replacement of old boilers by new ones.

The average energy consumption per dwelling amounted to 325 kWh/m^2 in 1973 but has steadily decreased to reach now only 180.6 kWh/m^2 (- 40% less in 25 years), due to the retrofitting of old buildings on the one hand and to successive thermal regulations for new buildings on the other hand. Nevertheless, over the same period, electricity consumption has increased from 13.3 kWh/m^2.to 23.3 kWh/m^2 (+70% more in 25 years).

It is more necessary than ever to convince a great number of building managers to harness new possibilities for energy savings in the existing building stock. Two measures were planned for that purpose:

- A reduced rate of VAT at 5.5% which has been implemented in France since September 1999. It is applied to maintenance or rehabilitation works on dwellings more than two years old.
- ADEME support to building owners for all energy-related decision-making, through subsidies to pre-audits, audits and feasibility studies for the assessment of work and investments within the buildings analysed.

Commercial and Institutional Buildings

This part of the building stock currently represents 753 million heated m^2, breaking down as follows:

- Commercial buildings: 179 million m^2 (23.7%)
- Office buildings: 159.9 million m^2 (21.2%)
- Educational buildings: 159.8 million m^2 (21.2%)
- Hospitals: 88.9 million m^2 (11.9%)
- Hotels and restaurants: 51.9 million m^2 (6.9%)
- Collective dwellings: 51.2 million m^2 (6,8%)
- Sport and leisure buildings: 39.8 million m^2 (5,3%)

- Transportation-related buildings: 22.9 million m^2 (3%).

Final energy consumption for this sector amounts to 201.5 TWh in 1998. It has increased by 37.3 TWh since 1986 (more than 22% in 12 years). This growth is mainly due to the multiplication of specific applications of electricity, such as lighting and computers.

The energy consumption of commercial and institutional buildings (Figure 3) breaks down as follows:

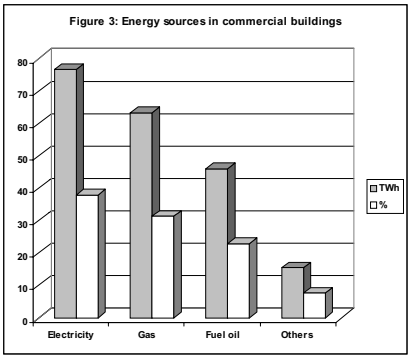


Figure 3: Energy sources in commercial buildings

- Electricity: 76.6 TWh (38%)
- Gas : 63.3 TWh (31.4%)
- Fuel oil : 46.1 TWh (22.9%)
- Others: 15.5 TWh (7.7%).

This sector is characterised by a large diversity of energy uses and by levels of consumption for the various applications that differ significantly for each building's category. For instance, space heating and hot water production represent 85% in educational buildings, only 49% in commercial buildings and 62% in office buildings. Energy consumption is very dependent on the time periods during which these buildings are used. Consequently, measures to be taken into account for these buildings could be very different, depending on their function.

The New French Energy Conservation Programme

In order to meet the EU commitment of reducing emissions of greenhouse gases, important decisions were taken in France in 2000 at the level of the prominent decision-makers. They are defined in two national programmes that have the same objective: to reduce the energy and environmental impacts of the most energy-consuming economic sectors.

These programmes are:

- The French Programme against Climate Change presented in January 2000 that describes the new French commitments for the reduction of greenhouse gas emissions.
- The French Programme for Energy Efficiency Improvement presented in December 2000, that describes the objectives and the means to be implemented in France for new energy savings.

These programmes are dedicated in large part to the building sector. They include measures concerning thermal improvement of the existing building stock and concerning the energy-related optimisation of new buildings.

Greenhouse Gas Emission in France

Total CO_2 emissions reached 493 million tons in 1998. But, taking into account the carbon sink absorption amounting to 152 $MtCO_2$, the real level of emissions amounted to 341 $MtCO_2$ in 1998

Buildings' impacts on the environment are mainly due to pollutants and toxic gas emissions. In the building sector, carbon dioxide is the most important gas for the greenhouse effect. It is mainly due to space heating. CO_2 emissions are related to fossil fuel combustion in individual or collective boilers, on the one hand, and to flame-combustion power plants (that produce a large part of electricity consumed in buildings during the heating season), on the other hand.

As we have seen, the total final energy consumption of buildings in France amounts to 98.2 million tons of oil equivalent, i.e. 45.8% of the total energy consumption.

Electricity is the main energy source with a consumption of 50.7 Mtoe (53%). It is followed by natural gas with 18.6 Mtoe (19.4%), fuel oil with 17.1 Mtoe (17.8%) and renewable energy, mainly wood fuel that amounts to 8.6 Mtoe (9%).

In the building sector the CO_2 emissions represent 117 million tons or 24% of the total French emissions. This corresponds roughly to 30 million tons of carbon (MtC). It has been steadily decreasing since 1992.

Emissions have been cut down by 15%, due to policies implemented since the year 1990. Evaluation shows that emissions will reach 28.4 MtC in 2010 for the whole building stock. But the limit of emissions taken into account in the French commitment for the 2008-2012 period is only 26.3 MtC for the building sector.

The programme decided by the French government will have to stop the increasing trend and reduce the current level of emissions.

The Building Contribution to the Reduction of Greenhouse Gas Emissions

The Kyoto Protocol identifies six gases for which emissions must be reduced because of their strong greenhouse effect. For these six gases, total emissions in France amounted to 144 MtC in 1990, including 103.4 $MtCO_2$. A business-as-usual scenario leads to 175 MtC produced in 2010. Taking into account the total set of measures decided before the Kyoto Protocol, this figure falls at 160 MtC (including 122.8 $MtCO_2$). It is 16 MtC more than the total emission level for 1990, the reference year of the Protocol.

The new measures, decided under the

2000 French Programme against Climate Change, are expected to meet this additional 16 MtC reduction. The efforts to be made are slightly different, depending on the sector:

- Industry: 3.42 MtC
- Transport: 4.00 MtC
- Buildings: 2.66 MtC
- Agriculture and forests: 0.75 MtC
- Wastes: 1.1 MtC
- Cooling gases: 1.45 MtC
- Energy production: 2.63 MtC

The effort of 2.66 MtC in the building sector corresponds to 16.6% of the goal of 16 MtC to be reached. The set of measures identified is as follows:

- Regulation and controls (reinforcement each fifth year of the thermal regulation for new buildings, components standards, mandatory thermal audits before sale or leasing, more regulation controls),
- Voluntary agreements,
- Actions on the building stock of large building owners (institutional buildings, large commercial buildings...),
- Renewable energy sources (wood fuel, solar energy, geothermal energy, district heating grids using renewable energy sources),
- Support to realisations (concerted operations for large scale retrofitting of buildings, energy-efficient components and equipment, energy conservation or renewable energy labelled buildings),
- Taxes (CO_2 taxes, reduced VAT rate),
- Green buildings,
- Information and training of professional actors.

Evolution of the Thermal Regulation for New Buildings

The rate of renewal of the building stock is low in France (1 to 2% per year). Nevertheless, new buildings are a field where cumulative savings due to new mandatory energy consumption limitation can be rapidly significant and very important in the long-term. It is due to the long life-span of buildings (frequently 100 years) in which more than 80% of the energy consumption is incurred during their life span against less than 20% incurred for their components and their construction.

It is also via new buildings that the different solutions of energy-efficient technologies are spread towards retrofitted buildings . Less efficient technologies are replaced and are more rapidly eliminated from the market.

It is therefore very important to increase the energy efficiency of new buildings as much as possible, within the acceptable technological and economical limits, in order to reduce the greenhouse gases emissions.

The measure for the new buildings consists of:

- Reinforcement of the thermal regulation by 10% every 5 years, beginning in 2000, for all concerned technical aspects (shell, HVAC equipment, lighting, summer comfort...) after a technical and economical evaluation of the potentialities,
- Implementation in 2003 of new mandatory limits for energy consumption of air-conditioned buildings,
- Implementation of energy labels for residential, commercial and institutional buildings in order to prepare the new steps of the regulation,
- Effective control of the regulation and implementation of penalties if necessary.

The complete application of this measure will lead to a saving of 0.3 MtC in 2010.

Subsidies from ADEME

In France, the Ministry of Industry and the Ministry of Land-Use Planning and the Environment are responsible for energy policy and for energy efficiency policy. The 22 regional directorates for industry, research and environment are responsible for licensing the construction and operation of energy facilities, pollution control and auditing of plants. Moreover, ADEME, the French Agency for the Environment and Energy Management is the main executive body implementing actions for energy savings and for environment conservation in order to tackle climate change and to achieve sustainable developement (Figure 4). ADEME has 26 regional offices in all parts of the country that operate in a very decentralised way.

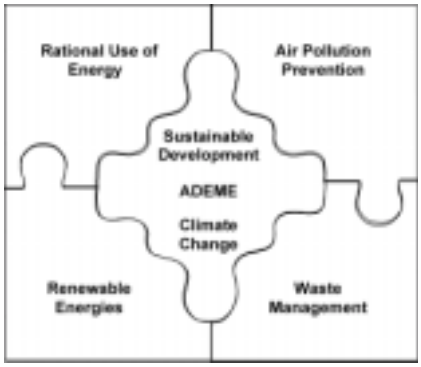


Figure 4: ADEME - the French executive body for tackling climate change and for implementing sustainable development

ADEME was set up in 1991, bringing together the former Energy Conservation Agency, the Air Quality Agency and the Waste Agency. It receives funding from both the Min-

istries of Environment, Industry and Research in order to undertake policy analysis, co-ordinate energy efficiency activities between institutional bodies, to liaise with the private sector and to co-ordinate R&D on energy conservation and renewable energy.

In May 1999, the French government announced a new policy for energy management through ADEME, that will include well organised new support activities for all economic sectors. It is to be funded as of 1999 with an extra 76.2 million euros per year and will be implemented with the reinforcement of the Agency's human resources. Due to co-operation with each administrative region in the framework of contracts "ADEME - region", the total available budget in France for energy management in all economic sectors reached 230 million euros in 2001.

Despite this large amount of money available in the energy conservation field, extensive and systematic subsidies by ADEME remain impossible. ADEME therefore implements partnerships with banks, large building stock managers, professional organisations and municipalities.

Schematically, the ADEME support system includes:

- Support for energy-related decision-making through pre-audits, audits and feasibility studies for the assessment of energy conservation investments presenting the best pay-back within the analysed site,
- Support for demonstration and best practice energy projects (implementation of successful energy R&D and of efficient but not yet expanded energy technologies),
- Financial support for the research and the development of technologies or methodologies related to energy efficiency and management (subsidy rate between 30 and 70% of the total cost),
- Subsidies for communication and training dedicated to energy users, managers and consultants.

These supports are implemented at the level of the 26 regional delegations, which are the contact points for project proposals.

New Measures in Preparation

These new measures, included in the French Programme for Energy Efficiency Improvement, concern:

- 25 concerted operations for a large scale retrofitting of buildings. They will be implemented at the local level and will concern energy savings on space heating, hot water, cooling and demand-side management. The selection of municipalities and sites will be based on a precise evaluation of the potential for energy savings and reduction of greenhouse gases emissions in the area. All residential, commercial and institutional buildings will be involved. Subsidies will be brought by ADEME, municipalities, ANAH (French Agency for improvement of existing dwellings) and by associated public bodies to pre-audits, audits, and feasibility studies, energy conservation investments, information and training. The duration of each operation is 4 to 5 years. The 25 operations are to be implemented by ADEME,
- 500 Energy Information Points (PIE) that will provide advice to households, craftsmen and municipalities on studies to undertake, profitable energy conservation investments and efficient technologies,
- Implementation of a large-scale funding system gathering private and public money to finance retrofitting operations,

Reduction of the energy consumption of institutional buildings. A programme has to be prepared by each French Ministry in order to identify all appropriate measures, with the goal of being a showcase for all other building managers.

Conclusion

These different measures constitute a set of actions addressed to builders and users of buildings in order to reach France's objectives and to meet its commitment in the framework of the Kyoto Protocol. It represents significant efforts and it is essential to convince all the building stakeholders that their participation is key to the succes of these efforts. Other measures will be implemented in the near future in a trend of progress planned for the next ten years

Liaison, communication, training and information will therefore be more and more important to get professionals truly involved in this large-scale move towards more energy efficient buildings. It is really an important challenge and ADEME is deeply involved in and dedicated to contributing to the attainment of these goals.

Energy Conservation Measures in Japanese Residential and Commercial Buildings

Adapted from a presentation by Hiroto Izumi, Director of Housing Construction and Improvement Division, Ministry of Construction, Japan
Presented at the Joint Meeting of ECBCS and ECES, Tokyo, Japan

1. The Energy Situation in Japan

The long-term energy supply and demand in Japan have been forecast to take into account the Conference of the Parties Third Meeting (COP3) accord. The energy conservation situations for both supply and demand have thus changed in the manner described below.

Supply

(i) Nuclear power

Three new nuclear power generators have been started and one generator has been under consideration by the Power Recourse Development Coordination Council since 1998. An Electrical Supply Plan was released at the end of March 2001. The projected number of nuclear power plants by 2010 will be reduced to 13 units from 20 as originally planned. However, there have been serious safety concerns in recent years.

(ii) Renewable energy

With an increasing interest in the population in environmental issues, the expectation for the use of renewable energy is heightening. Although progress has been made for its introduction, hard work is still required to achieve the desired targets by the year 2010, due to restrictive factors like cost, unstable output and other issues.

(iii) International energy relationships with emphasis on petroleum

Increased dependency on oil from the Middle East (86% in FY1998), increase of oil demand in Asia, the unpredictable cyclic nature of the price of oil, and loss of rights and interest of Arabia Petroleum in Saudi Arabia have caused an increased interest in the stable supply of oil.

Demand

Because of the sluggish economy, the energy consumption change in fact became negative for the first time in the 16 years since the 2nd oil crisis, and was caused by a large downturn in the industrial sector. But, in spite of the sluggish economy, the residential and transportation sectors have both shown large growth. Also the progress of energy conservation will be delayed due to the delay in plant investment in the industrial sector.

Long-Term Outlook for Energy Supply/Demand and CO_2 Emissions

The Advisory Committee for Energy established the current long-term energy supply/demand outlook in June 1998. Energy is the basis of everyday living, economic, and societal activities. A stable energy supply is required, but this is offset by the demands of environmental preservation and energy efficiency. In considering this outlook, energy security must be maintained while achieving 2% economic growth and CO_2 emissions originating from energy production kept at a stable ratio compared to the FY1990 level.

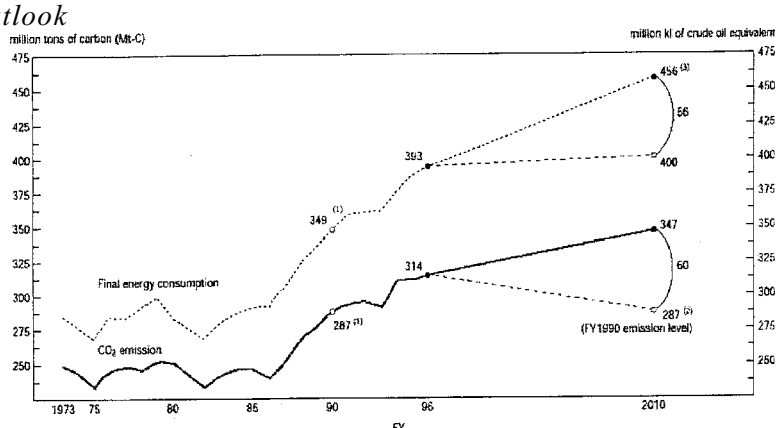
(1) Final energy consumption and CO_2 Emission trends and outlook

(Table 1) Summary of Measures to Reduce CO_2 Emissions in Japanese Residential and Commercial Buildings

2. Overview of Energy Conservation in Japanese Buildings

Energy consumption is increasing due to the pursuit of convenience and comfort, as well as increased use of office equipment. Keeping these facts in mind, the review of energy con-

Figure 1: Final energy consumption and CO2 emission trends and outlook



(1) Nuclear power: 202 billion kWh, New Energy 6.79 million kl (1990FY)
(2) Nuclear power: 480 billion kWh, New Energy 19.10 million kl (The Long-Term Energy Supply/Demand Outlook)
(3) Calculated assuming average economic growth rate for the years from FY2001 to FY2010 of approximately 2%

Table 1

Category	Residential and Commercial Sector
Obligation of energy conservation by the legal provision Subtotal: 27.1 million kiloliter (27.2 million tons of carbon equivalent	Measures to strengthen energy efficiency standards for household electrical products, office appliances, etc. (4.5 million kiloliter) (9.7 million tons of carbon equivalent)
Guidance to energy conservation Subtotal: 14.7 million kiloliter (16.2 million tons of carbon equivalent)	Improvement of energy efficiency standards relating to heat insulation of housing. (2.7 million kiloliter) (2.0 million tons of carbon equivalent)
Guidance to energy sonvervation by indirect measures Subtotal: 8.9 million kiloliter (6.7 million tons of carbon equivalent)	Improvement of energy efficiency standards relating to heat insulation of buildings. (6.0 million kiloliter) (7.5 million tons of carbon equivalent) ++++++++++++++++++++++++++++++++ Technical development of high efficiency lighting, high efficiency liquid crystal display, etc. (1.1 million kiloliter) (2.4 million tons of carbon equivalent)
Radical review of lifestyle of the nation Subtotal: 5.0 million kiloliter (6.4 million tons of carbon equivalent)	Raising indoor cooling temperature to 28 degree C, lowering indoor heating temperature to 20 degree C, etc. (3.1 million kiloliter) (5.0 million tons of carbon equivalent) (More promotion by doing a publicity campaign)
Subtotal: about 55.7 million kiloliter (56.5 million tons of carbon equivalent)	about 17.4 million kiloliter (27.3 million tons of carbon equivalent)
Total: about 56 million kiloliter (about 56.5 million tons of carbon equivalent) By these measures, CO2 emissions originating from energy use in 2010 will be stabilized in comparison with level of 1990.	
In order to stabilize CO2 emissions less than level of 1990, it will be necessary to reduce CO2 emissions originating from non-energy use, to develop technical renovations transcending present expectation and to make more efforts in every field of the nation.	

sumption efficiency for each type of home appliance and office equipment is the starting point for these sectors. Also, promoting thermal insulation for housing and other buildings is necessary to improve energy conservation. On top of this, promoting technological development for employing more highly efficient equipment is required.

1. Efficiency improvement of equipment

The revised "Law Concerning the Rational Use of Energy" (Energy Conservation Law) came into force in April 1999. The "Top Runners Approach" (which aims for standards meeting or exceeding the highest energy efficiency among products under development within a sector) introduced energy conservation standards for household appliances and office equipment in the revised Energy Conservation Law. The energy conservation standards for the various equipment types were established through the activities of the Advisory Committee for Energy, and were published in March 1999.

It will be attempted to improve the energy efficiency of home appliances and office equipment between 14% and 83 % by the year 2010 based on new standards. (Table 2)

Note: Energy conservation of these machines constitutes about 70% of household and about 80% of office electrical energy consumption.

2. Improvement of energy conservation performance of housing and commercial buildings

Energy conservation of housing and commercial buildings has been revised and strengthened, based on the Energy Conservation Law (reducing energy consumption by 20% for air conditioning of housing and by 10% for commercial buildings compared with current standards) and was implemented in March 1999. In a parallel effort, a review of the standards for the performance of building insulation materials has also been conducted.

Moreover, a housing performance indication system (established in June 1999, the "Law for Promoting Quality Assurance of Housing") has been introduced for consumers to be able to understand easily. Also, a privilege system of finance has been established by the Government Housing Loan Corporation and its use promoted. An ESCO (Energy Service Company) model enterprise is also being researched and introduced (Table 3).

3. Future technological developments

a) Energy conservation field technology strategy

The energy conservation field strategy is part of the overall strategy of promoting energy conservation by technological development, including common basic technologies, efficient development, using information technology to develop an energy conservation network, or examining the development of systems.

This 'energy conservation field strategy' is reflected as the "resource en-

Table 2: Target reduction for specific machinery

	Target fiscal year	Effect of energy conservation
Air conditioner (air cooling and heating)	2004 (partially 2007)	63%
Air conditioner (air cooling only)	2007	14%
Television	2003	16%
Video tape recorder	2003	59%
Fluorescent light	2005	17%
Copy machine	2006	30%
Calculator	2005	83%
Magnetic disk	2005	78%
Refrigerator/freezer	2004	30%

Effect compared to '97 (Air conditioner '97, Refrigerator/freezer '98
Note: Energy conservation of these machines makes electrical consumption of about 70% of household and about 80% of office

Housing	Building
Establish a standard for annual heating and cooling load	Development of common items of measures to be taken by owner of building
Establish the heat loss coefficient restrictive than previous standard.	Strengthen standard values regarding measures taken to prevent heat loss through the exterior wall or windows of building and the standard value regarding efficient use of air conditioning equipment
Establish a correction standard of heat loss coefficient regarding passive solar method.	Add 'restaurants' to object building
Method for demarcating regions is changed from prefecture boundary use to municipality boundary use to take more detailed climate differences into account.	Establish a standard value regarding a measure for efficient use of energy for hot-water supply equipment of 'store for selling commodity goods'
Review of the solar heat gain coefficient. Review of the equivalent leakage area.	Establish a standard value regarding a measure for efficient use of energy for conveyor system of 'hotels or inns'

Table 3:Summary of reforms of standards for judgement by owner of building regarding rational use of energy to housing and commercial buildings

ergy field technology strategy" in the national technology strategy.

b) Specific actions

Specific actions include the development of high efficiency lighting using light emitting diodes to aim for improving energy efficiency by 50% compared with luminescent lighting. Research and development related to reducing electrical standby losses for domestic and office equipment, as well as to super low power liquid crystal displays is ongoing. In addition to these, practical energy conservation technologies including high performance building insulation materials are being developed.

4. Radical review of the lifestyle of the nation

An energy conservation labeling system has been designed to inform consumers.

A unified energy conservation labeling system was introduced during Summer 2001 to provide easy to understand information on energy conservation for household appliances, in order to aid consumer choice.

5. Energy conservation effect by energy consumption amount indicator ("Energy Conservation Navi")

The Energy Conservation Center has begun to install the Energy Consumption Amount Indicator ("Energy Conservation Navi") to monitor (using radio transmission) a sample of 800 houses nationwide to indicate their metered consumption of electricity, gas, and water, beginning in November 1998. The energy conservation, which does not appear directly, can be found from the financial savings. The energy conservation target can be set in comparison with the amount used in the previous year, and is easily implemented with a large effect.

3. Energy Conservation Measures for Housing and Buildings

(1) Establishment of the Building Wastes Recycling Act (i.e. an Act concerning the recycling of materials for construction work, etc)

(i) enforces the separation, dismantling and recycling of construction materials,

(ii) establishes a registration system for dismantling business operators.

(2) Establishment of the Basic Law for Creation of a Recycling Society

(i) reduction, reuse, recycling and proper disposal (i.e. the basic principles of the use-and-disposal cycle),

(ii) clarifies businesses' and people's responsibility for waste.

(3) Revision of the Recycling Act (i.e. act concerning the promotion of the effective use of resources)

(i) enforces resource-conservation, long-life design and reusable parts/components design; and

(ii) formulates plans for restricting by-products released by businesses as well as plans for recycling measures.

Strengthen the energy conservation standard based on the Energy Conservation Law

According to the Law Concerning the Rational Use of Energy, energy conservation standards for housing and building are determined, and owners are obligated to take measures for energy conservation based on the standards, "criteria for owner's judgement", and "guidelines of design and construction". Since the law came into effect in 1980 and strengthened the standard in 1992-1993 for responding to the aggravating global warming problem, it was revised again and reinforced on 30th March 1999 (with the next generation energy conservation law).

It is expected by this revision that energy consumption for heating and cooling in housing will be reduced by about 20 %, reduce energy consumption of about 10% for building (non-residential).

Privilege measures by the Housing Loan System for housing which has taken energy conservation measures

- Housing loans are financed by the Government Housing Loan Corporation (GHLC) to promote energy conservation in housing.

(1) A special additional loan for passive solar type energy efficient housing with devices for thermal storage of solar energy (150 million yen additional loans), for housing that conforms to the energy conservation standards of FY1999 (50 thousand yen to l million yen), or for housing which conforms to the next generation energy

conservation standard (250 million yen).

(2) A special additional loan for housing equipped with photovoltaic power generation system (300 million yen), or for housing with heating and cooling equipment that have a certain energy efficiency performance (150 million yen to 200 million-yen additional loans).

(3) Preferential interest is applied to housing that conforms to the energy conservation standard of 1992 and has high-durability by taking measures such as wood preservation, moisture prevention and reinforcement of principal structural parts.

Measures taken by the Development Bank of Japan to promote energy conservation in buildings

- Certain measures are taken by the Development Bank of Japan to promote energy conservation in buildings.

(1) Low interest is applied to building development projects (having a total floor area not less than 2000 m^2) that is well-planned environmentally, has reduced energy consumption by appropriate building planning and is designed to ensure energy conservation performance.

(2) Low interest loans for introducing energy conserving building equipment to high energy saving performance buildings and renovation or upgrading to improve energy conservation performance of equipment in existing building.

Subsidies for Model Projects for Environmentally Symbiotic Housing in Urban Areas

- Subsidies are provided for development projects for urban housing areas to promote Environmentally Symbiotic Housing that is well-planned in relation to global environmental problems such as the prevention of global warming, if they are good practical model cases and meet a required condition including reduction of environmental impact. Subsidies are paid for greenery on rooftops, water permeable pavements and refuse treatment systems for composting, etc. through Model Projects for Environmentally Symbiotic Housing in Urban Areas.

- Subsidies are provided for development of collective housing and building, if they meet a required condition including the energy conservation standard of 1992 in projects relating to urban development or housing development. They promote the formation of a good quality housing stock, contributing to the promotion of urban residences devised to cope with energy and resource-saving in the 21st Century.

- Satisfactory living environments may be formed through utilizing regional wooden materials more often for housing and public facilities, taking into account regional availability. These Forest Town developments, with good quality wooden apartment complexes, will thus be promoted.

Promotion of performance indication of buildings

- The development of the "Environmentally and Energy Excellent Building Indication Mark System" by the Institute for Building Environment and Energy Conservation develops a consciousness of energy conservation in building owners by distinction of buildings by awarding the Energy Conservation Mark for those buildings which have a certain energy conservation performance.

Education of heat insulation construction experts

- Education classes have been opened by local public organizations to popularize and promote heat insulation construction technology in housing for carpenters and companies which support the local housing production. About 64,000 people had attended the class by the end of FY1999.

Introduction of Environment Management Systems using ISO 14000s

- ISO 14000 series is the International Standard (a controlling system for understanding the effect on environment caused by enterprise activities) for Environment Management System for enterprise activities created by ISO (Intemational Organization for Standardization)

- Many companies have already acquired the certification, mainly the industries in fields such as electrical machinery and general machinery.

- Measures are being examined to encourage the introduction of the system smoothly and promptly for small to mid-size producers. This is because the housing and building field remains undeveloped in the popularization of Environment Management Systems based on ISO 14000s, especially in small and medium-sized enterprises for building and housing production.

Housing performance indication based on the Law for Promoting Quality Assurance of Housing

The "Law for Promoting Quality Assurance of Housing" has been developed, which includes the Housing Performance Indication System as one of the principal provisions. The Law for Promoting Quality Assurance of Housing was announced on 23rd July, 1999.

Based on the Housing Performance Indication System, the "Rank of the Measures for Energy Saving" is established as one of the performance indication items.

- Establishment of a Housing Performance Indication System

The system indicates housing performance by item, in terms of grades and other criteria that are easy to understand, including:

(i) a performance indicator of the thermal environment, resistance to deterioration

and building maintenance; and

(ii) a performance indicator of air quality, lighting/visual and sound insulation

It indicates the environmental performance of housing (e.g. energy conservation) in such a way that is easy to understand for consumers, and encourages consumers to choose environment-friendly, high-quality housing.

Invitation for Proposals for a System to Rate Pre-Owned Housing Performance

An invitation has been made to the general public to propose a system that appropriately rates the performance of pre-owned housing. The rating system is based on 5 factors: indication of housing performance; housing remodeling/ownership history; value assessment; warranties; and disclosure of information to consumers. Early introduction of the system will realize market assessment and stimulate the pre-owned housing market.

Research and Development of Information-Oriented Housing

Overall real-time housing performance may be obtained through special building components for information-oriented housing and information networks.

(i) Houses will have a built-in data chip that carries information on the performance/history of each building part.

(ii) The housing performance/history information stored inside the chip will be managed in the form of a "Housing Information Karte" at the data center, where the information of all such chips are collected and managed at one location.

This approach matches diverse needs and available housing resources and stimulates the distribution of housing units, thereby promoting the development of a market in which information about the existing housing stock is able to circulate.

Bookshop Publications

The following bookshop publications are now available.

Annex 28: Low Energy Cooling

Technology Selection and Early Design Guidance,
edited by Nick Barnard and Denice Jaunzens, January 2001,
published by Construction Research Communications Ltd, London,
ISBN 1-86081-458-1,
(ECBCS Code ANN 28 2001:1)

This document contains two reports in a series produced by Annex 28 to assist with the design of low energy cooling systems:

- *Selection guidance for low energy cooling technologies* (a software version of this tool has also been produced.)

The report is based on a Selection Chart to help to identify which of the technologies are likely to be suitable for a particular application on the basis of key building parameters. This is supported by Summary Sheets for each of the technologies giving a brief description and key information. These can be used to refine the selection of technologies for further consideration.

- *Early design guidance for low energy cooling technologies*

This report is a compilation of guidance developed for use during early design. The guidance has been contributed by the individual member countries participating in the Annex. The guidance is based on design charts and tables and practical information. The type of guidance varies between the technologies as appropriate, depending on their type and state of development.

The chapters are:-

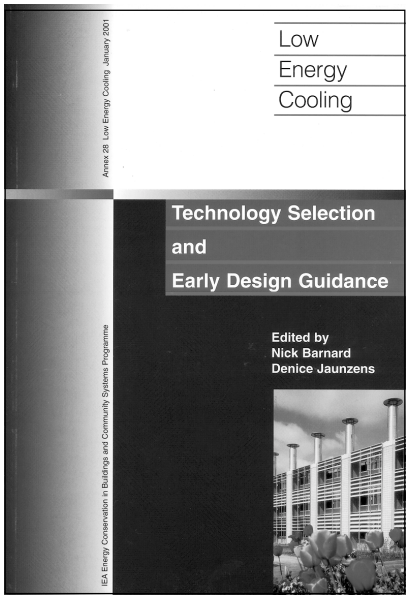
A) The applicability of evaporative cooling in commercial office buildings

B) Evaporative cooling in office buildings

C) Slab cooling system with water

D) Night cooling ventilation in UK commercial buildings

E) Night cooling in residential buildings



F) Ground coupled air systems

The other reports in this series are:-

Review of low energy cooling technologies
(ANN 28 1995:1)

Detailed design tools for low energy cooling technologies
(ANN 28 2000:1)

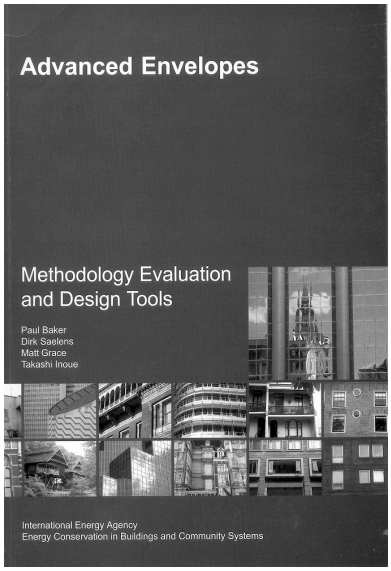
Case studies of low energy cooling technologies
(ANN 28 1999:1)

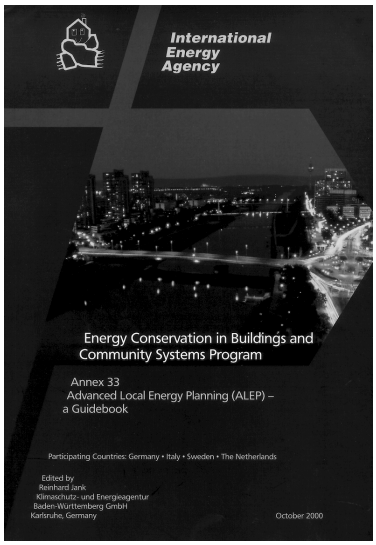
They can be ordered via the ECBCS Bookshop

Annex 32: Advanced Envelopes

Methodology Evaluation and Design Tools,
by Paul Baker, Dirk Saelens, Matt Grace, Takashi Inoue, 2000,
published by Laboratorium Bouwfysica, KU Leuven, Belgium,
ISBN 90-75741-07-3,
(ECBCS Code ANN 32 2000:1)

This report deals with the work of the Advanced Envelopes Thematic Group. Its objective is to study the impact of advanced envelopes on whole building performance, by applying devised methodology to identify areas which have (a) a significant impact and (b) a knowledge deficit, by reviewing recent work which addresses these issues, and through relevant case studies.



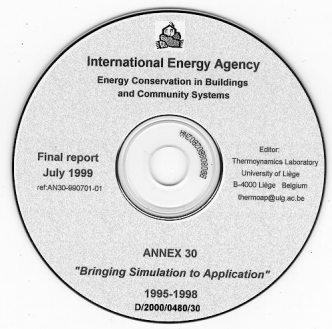


Annex 33: Advanced Local Energy Planning (ALEP)

A Guidebook,
edited by Reinhard Jank,
October 2000,
published by Fachinstitut Gebaeude Klima e.V. (FGK), Bietigheim-Bissingen, Germany,
(ECBCS Code ANN 33 2000:1)

Within the IEA program on Energy Conservation in Buildings and Community Systems four countries have cooperated to apply the approach of 'Advanced Local Energy Planning' (ALEP) to three big cities and three regions in Germany, Italy, Sweden and the Netherlands, using Markal as a comprehensive energy model.

This Guidebook on Advanced Local Energy Planning contains the results of these case studies, a presentation of the 'ALEP philosophy' and a discussion of the potential benefits of energy system models in the context of strategic local energy planning, compared to conventional planning approaches. It has been shown that the results of the energy model could be verified with conventional tools and that the model, once established, allows for much more comprehensive analyses and optimization and thus is better suited to develop a fully consistent long-term energy strategy than conventional means. Although capable of modelling a complex local energy system, there are deficits in user-friendliness which represent a major barrier for wider distribution. Therefore, further development is necessary. With Annex 33, a specification of the needs of practical Local Energy Planning to future energy system models that are at present under development was provided.



Annex 30: Bringing Simulation to Application

Final Report on CD,
edited by Philippe André and Jean Lebrun,
July 1999,
published by Thermodynamics Laboratory, University of Liège, Belgium,
Belgian Legal Deposit numbers D/2000/0480/29 (paper edition) D/2000/0480/30 (CD-rom edition)

News on Ongoing Projects

Annex 40 Commissioning of Building HVAC Systems for Improved Energy Performance

http://eneaweb.cstb.fr/annex40

The objective of the Annex is to develop, validate and document tools for commissioning buildings and building services that will help facilitate the achievement of this goal. These tools will include guidelines on commissioning procedures and recommendations for improving commissioning processes, as well as prototype software that could be implemented in standalone tools and/or embedded in building energy management systems (BEMS).

Annex 39 - High Performance Thermal Insulation (HiPTI)

The general objective of the Annex 39 is to develop reliable components for buildings based on high performance thermal insulation (HiPTI). They are known as HiPTI systems (e.g. façade element, door, water heater). The successful developments should lead to competitive products that are available on the market. The main technology to be used in the Annex is Vacuum Insulation Panels (VIP). They consist of a microporous core material, packed in a gas tight envelope, evacuated to a pressure of about 0.1 mbar.

Annex 38/SHC Task 28 - (Solar) Sustainable Housing

www.iea-shc.org/task28/index.htm

The goal of Annex 38 is to help achieve significant market penetration of sustainable solar housing in the participating countries by the year 2010 by providing homebuilders and institutional real estate investors with:

- A Web site: Model Solar Sustainable Housing which illustrates built projects, exemplary in design, living quality, low energy demand and environmental impact.
- A book: Marketable Sustainable Solar Housing: Plans, Details and Performance which describes and analyses recently built housing. It will include a checklist and advice from the experience gained from these projects to help planers develop marketable designs.
- A handbook: Marketable Sustainable Solar Housing: A Design Handbook with guidelines, graphs and tables derived from building monitoring, lab testing and computer modelling.
- Demonstration Buildings with press kits for articles and brochures in local languages to increase the multiplication effect beyond the local region.

Workshops after the Task conclusion presenting the results of the Task.

Annex 37 - Low Exergy Systems for Heating and Cooling (LowEx)

www.vtt.fi/rte/projects/annex37

The general objective of Annex 37 is to promote rational use of energy by means of facilitating and accelerating the use of low valued and environmentally sustainable energy sources for heating and cooling of buildings. Specific objectives are:

- To investigate the technical and market potentials for replacing high valued energy (e.g. fossil fuels and electricity) by low valued energy sources and to assess its impact on global resources and environment;
- To assess existing technologies and components for low exergy heating and cooling in buildings, to enhance the development of new technologies and to provide the necessary tools for analysis and evaluation of low exergy systems;
- To develop strategic means for the introduction of low exergy solutions in buildings by case studies, design tools and guidelines.

Annex 36 - Retrofitting of Educational Buildings (REDUCE)

www.annex36.bizland.com

The objectives of Annex 36 are:

- To provide tools and guidelines for decision makers and designers to improve the learning and teaching environment of educational facilities through energy-efficient retrofitting,
- To support the decision makers in evaluating the efficiency and acceptance of available concepts,
- To give recommendations on how to operate the retrofitted buildings, and
- To promote energy- and cost-efficient retrofit measures.

Annex 35 - Hybrid Ventilation (HybVent)

www.civil.auc.dk/hotel/hybvent/index.htm

The objectives of Annex 35 are to:

- Develop control strategies for hybrid ventilation systems in office and educational buildings, for both new build and for retrofit,
- Develop methods to predict hybrid ventilation performance in hybrid ventilated buildings,

- Promote energy and cost-effective hybrid ventilation systems in office and educational buildings, and

Select suitable measurement techniques for diagnostic purposes to be used in buildings ventilated by hybrid ventilation systems.

Annex 34 - Computer-Aided Evaluation of HVAC Performance

The objective of this Annex was to work with control manufacturers, industrial partners and/or building owners and operators to demonstrate the benefit of computer aided fault detection and diagnostic systems. Methods were based on either stand-alone "PC" based systems or incorporated within a future generation of "smart" building control systems. Subtasks included:

- Constructing a prototype performance validation system for assisting with the final stages of the commissioning or re-commissioning of HVAC systems;
- Constructing prototype performance monitoring systems to detect unsatisfactory performance by comparing current performance with that predicted by a reference model;
- Interfacing prototype systems to building control systems;
- Testing and demonstrating performance validation and monitoring systems in real buildings.

A final report for this annex is due at the end of 2001.

Annex 33 - Advanced Local Energy Planning (ALEP)

The purpose of the Annex was to apply modern statistical and analytical tools that have been developed for scientific system analysis to the area of local or urban energy and environmental planning. The approach was one of direct application to specific towns and cities within participating countries. The Annex was subdivided into 3 Subtasks covering:

- Transfer and sharing of knowledge,
- Case studies,
- Guidebook production and dissemination.

This annex is now completed.

Annex 31 - Environmental Impacts of Energy in Buildings

The aim of this study is to understand the total energy and environmental impact of buildings. This is based on such factors as the life cycle of the building itself combined with energy and material throughput during building use. The results are being compiled into a comprehensive handbook covering:

- Theory;
- Analytical Evaluation Tools;
- Applications;
- Benchmarks;
- Databases;
- Case Studies.

A high quality final report for this project is in preparation.

Annex 28 - Low Energy Cooling

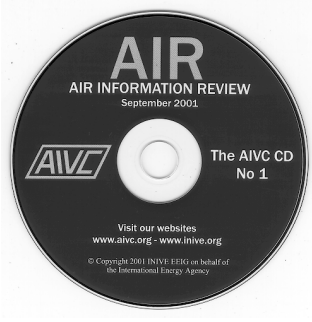
Further products from this completed annex are due soon - see page 11 for details.

Annex 27 - Evaluation and Demonstration of Domestic Ventilation Systems

This annex extension in nearing completion and its products are soon to be available.

Annex 5 Air Infiltration and Ventilation Centre (AIVC)

INIVe eeig has now taken over as Operating Agent for Annex 5. The Annex's newsletter has now changed its name to "Air Information Review" and is distributed together with an informative CD on ventilation issues. The September issue is available free of charge, with subsequent issues being available on an annual subscription basis.



Executive Committee Members

AUSTRALIA
Mr John Murray
National Executive Director, Master Builders Australia, 3rd Floor, Construction House
217 Northbourne Avenue, Turner, Canberra ACT 2612
Tel:+61 6 249 1433
Fax: +61 6 249 1373
e-mail: mbaust@ozemail.com.au

BELGIUM
Prof Jean Lebrun, Director,
Lab.de Thermodynamique,
Université de Liège
Campus du Sart-Tilman, Bâtiment B49
Chemin des Chevreuils, B 4000 Liège
Tel: +32 43 664801
Tel: (Secretariat) +32 43 664800
Fax: +32 43 664812
e-mail: J.LEBRUN@ULG.AC.BE

CANADA
Morad R Atif
Director, Indoor Environment Research Program, NRCC,
1500 Montreal Road (M-24)
Ottawa, Ontario K1A 0R6
Tel: +1 613 993 9580
Fax: +1 613 954 3733
email: morad.arif@nrc.ca

CEC
Erich Nägele
DG RTD J3 MO75 7/18
200 rue de la Loi
B-1049 Bruxelles
Belgium
Tel: +32 2 296 5061
Fax: +32 2 299 3694
email: Erich.Naegele@cec.eu.int

CZECH REPUBLIC
Dr. Miroslav Jícha,
Associate Professor, Dept of Mechanical Engng., Technical Univeristy of Brno, Technická 2, 61669 Brno.
Tel: +425 4114 3271, Fax: +425 4114 3365, email jicha@dt.fme.vutbr.cz

DENMARK
Mr Bjorn Hafstrom
Head of Section, Energy R & D, Danish Energy Agency, 44 Amaliegade, DK-1256 Copenhagen
Tel: +45 33 92 66 60
Fax: +45 33 91 55 81
e-mail: bkh@ens.dk

FINLAND
Mr Esko Virtanen
Programme Manager Construction Technology, TEKES Technology Development Centre, PO Box 69, Malminkatu 34
FIN-00101 Helsinki
Tel: +358 10 521 5833
Fax: +358 10 521 5904
e-mail: Esko.Virtanen@tekes.fi

FRANCE
Mr Pierre Hérant
Bâtiment et Collectivités, Agence de l'Environment et de la Maîtrise de l'Energie
Centre de Sophia Antipolis, 06560 Valbonne
Tel: +33 4 93 95 7947
Fax: +33 4 93 65 3196
e-mail:pierre.herant@ademe.fr

GERMANY
Mr Jürgen Gehrmann
Forschungszentrum Jülich, Projektträger Biologie, Okologie, Energie
Postfach 1913
D 52425 Jülich
Tel: +49 2461 614852
Fax: +49 2461 613131
e-mail:j.gehrmann@fz-juelich.de

GREECE
Mr Dimitrios Nomidis
Head, Energy Saving Division, Ministry of Development, Michalacopoulou str. 80
GR-101 92 Athens
Tel: +30 1 7709100
Fax: +30 1 7717612
e-mail: nomidisd@ypan.gr

ISRAEL
Mr Joseph Nowarski
Director – Energy Conservation
Ministry of National Infrastructure, P O Box 13106 , Jerusalem 91130
Tel: +972 2 5316115
Fax: +972 2 5316081
e-mail: jnow@mni.gov.il

ITALY
ing. Marco Citterio
ENEA ERG SIRE
C.R. Casaccia
Via Anguillarese 301
00060 S. Maria di Galeria
Roma
Tel: + 39 06 3048 3703
Fax:+39 06 3048 6504
marco.citterio@casaccia.enea.it
www.enea.it

JAPAN
Prof Yuichiro Kodama
Kobe Design University, Gakuen-nishi 8-1-1 Nishi-ku , Kobe
Tel/Fax: +81 78 796 2571
e-mail: y-kodama@kobe-du.ac.jp

NETHERLANDS
Mr Piet Heijnen
Account Manager Sector Bouw, NOVEM BV, Swentiboldstraat 21, Postbus 17, 6130 AA Sittard
Tel: +31 46 4 202268
Fax: +31 46 4 528260
e-mail: p.heijnen@novem.nl

NEW ZEALAND
Mr Mark Bassett
Building Research Association of New Zealand Inc, (BRANZ), Private Bag 50908, Porirua
Tel:+64 4 2357600
Fax:+64 4 2356070
email: branzmrb@branz.org.nz

NORWAY
Dr Jørn Brunsell (Vice Chairman)
Norwegian Building Research Institute
PO Box 123 Blindern, N-0314 Oslo
Tel: +47 22 96 55 46
Fax: +47 22 96 57 25
e-mail: Jorn.Brunsell@byggforsk.no

POLAND
Prof Stanislaw Mierzwinski
Silesian Technical University
Faculty of Environmental and Energy Engineering, Dept of Heating, Ventilation & Dust Removal Technology, ul Konarskiego 20
44 101 Gliwice
Tel: +48 32 2 37 1280
Fax: +48 32 2 37 2559
email: kowito@kowito.ise.polsl.gliwice.pl

PORTUGAL
Mr Pedro Figueiral
CCE - Centro para a Conservaçao de Energia
Estrada de Alfragide, Praceta 1
2720-537 Alfragide
Tel: +351 2147 22814
Fax: +351 2147 22898
email: pfigueiral@cce.pt

SWEDEN
Mr Conny Rolén
Formas
Box 1206
Birger Jarls torg 5
S-111 82 Stockholm
Tel: +46 8 775 4030
Fax: +46 8 775 4010
email: conny.rolen@formas.se

SWITZERLAND
Mr Mark Zimmermann
EMPA-ZEN, Uberlandstrasse 129
CH 8600 Dübendorf
Tel: +41 1 823 4178
Fax: +41 1 823 4009
email: mark.zimmermann@empa.ch

TURKEY
Prof Dr Rüknettin Oskay
METU Mech Eng Dept, Makina Mühendisligi Bölümü, Orta Dogu Teknik Üniversitesi
06531 Ankara
Tel: +90 312 2102539
Fax: +90 312 2101266
e-mail: mecheng@rorqual.cc.metu.edu.tr

UK
Oscar Faber Group Ltd
Marlborough House, Upper Marlborough Road, St Albans AL1 3UT
Tel: +44 (0) 20 8784 5784
Fax: +44(0)20 8784 5700

Mr Barry Austin
Ove Arup & Partners, 13 Fitzroy Street
London W1P 4BQ
Tel: +44 020 7465 3063
Fax: +44 020 7465 3669
e-mail: barry.austin@arup.com

USA
Mr Richard Karney (Chairman), Senior Technical Advisor, Office of Building Technologies, State and Community Programmes, US Department of Energy,
Mail Stop EE-421
1000 Independence Ave, SW, Washington DC 20585
Tel: +1 202 586 9240
Fax: +1 202 586 1628
e-mail: richard.karney@ee.doe.gov

Current Projects and Operating Agents

5 Air Infiltration and Ventilation Centre (1979-)
Dr Peter Wouters
INIVE EEIG
Boulevard Poincaré 79
B-1060 Brussels
Belgium

Tel: +32 2 655 7711
Fax: +32 2 653 0729
e-mail: aivc@bbri.be
Web: www.aivc.org

27 Evaluation and Demonstration of Domestic Ventilation Systems (1993-)
Mr Lars-Göran Månsson
LGM Consult AB
Adler Salvius Vag 87
S-14653 Tullinge
SWEDEN

Tel: +46 8 778 5006
Fax: +46 8 778 8125
e-mail: lg.mansson@lgm-consult.se

34 Computer Aided Fault Detection and Diagnosis (1997-2001)
Dr Arthur Dexter
Dept of Engineering Science
Parks Road
University of Oxford
Oxford OX1 3PJ
UNITED KINGDOM
Tel: +44 (0)1865 273007
Fax: +44 (0)1865 273906
e-mail: arthur.dexter@eng.ox.ac.uk
and
Dr Jouko Pakanen
VTT Building Technology
P O Box 18021
FIN 90571 Oulu
FINLAND
Tel: +358 8 551 2033
Fax: +358 8 551 2090
e-mail: jouko.pakanen@vtt.fi

35 Control Strategies for Hybrid Ventilation in New and Retrofitted Office Buildings - HybVent (1998-2002)
Per Heiselberg
Indoor Environmental Engineering
Aalborg University
Sohngårdsholmsvej 57
DK-9000 Aalborg
DENMARK

Tel: +45 9635 8541
Fax: +45 9814 8243
e-mail: ph@civil.auc.dk
http://hybvent.civil.auc.dk

36 Retrofitting in Educational Buildings – Energy Concept Adviser for Technical Retrofit Measures (1998-2002)
Hans Erhorn
Frauhofer Institute of Building Physics
Nobelstr.12
D-70569 Stuttgart
GERMANY
Tel: +49 711 970 3380
Fax: +49 711 970 3399
e-mail:erh@ibp.fhg.de
www.annex36.bizland.com

37 Low Exergy Systems for Heating and Cooling of Buildings (1999-2003)
Markku Virtanen
VTT Building Technology
PO Box 1804
FIN-02044 VTT
FINLAND

Tel:+358 9 456 4710
Fax:+358 9 455 2408
e-mail: markku.virtanen@vtt.fi
http://www.vtt.fi/rte/projects/annex37

38 Solar Sustainable Housing (with Solar Heating and Cooling Task 28) (2000-2005)
Hans Erhorn
Frauhofer Institute of Building Physics
Nobelstr.12
D-70569 Stuttgart
GERMANY

Tel: +49 711 970 3380
Fax: +49 711 970 3399
e-mail:erh@ibp.fhg.de

39 High Performance Thermal Insulation Systems (2001-)
Markus Erb and Hanspeter Eicher
Dr H Eicher and Pauli AG
Kasernenstrasse 21, CH-4410 Liestal
Switzerland
Tel: +41 61 921 99 91
Fax: +41 61 923 00 25
Markus.Erb@eicher-pauli.ch

40 Commissioning of Building HVAC Systems for Improving Energy Performance (2001-)
Jean Christophe Visier
CSTB, Head of Automation & Energy Management Group
84 Avenue Jean Jaurès, BP 02
F-77421 Marne la Vallée Cedex 02
France
Tel: +33 1 64 68 82 94
Fax: +33 1 64 68 83 50
email: visier@cstb.fr

Future Buildings Forum
Dr Jorn Brunsell
Norwegian Building Research Institute
PO Box 123 Blindern
N-0314 Oslo
Norway
jorn.brunsell@byggforsk.no

IEA Secretariat
Mr Clas-Otto Wene
Office of Energy Efficiency, Technology, R&D,
9 Rue de la Fédération
75739 Paris Cedex 15
FRANCE
Tel: +33 140 576622
e-mail: Clas-Otto.WENE@iea.org
www.iea.org

Lynette Rogers-Goderum
IEA Legal Office
9 rue de la Fédération
75739 Paris Cedex 15
France
email: lynette.rogers-goderum@iea.org

Published by
The ECBCS Secretariat (ESSU)
ECBCS Executive Committee Support Services Unit/ECBCS Bookshop
c/o Janet Blacknell, Oscar Faber Group Ltd,
Beaufort House, 94/96 Newhall Street, Birmingham B3 1PB
Great Britain

Tel: +44(0)121 262 1900
Fax: +44(0)121 262 1999
email bookshop@ecbcs.org
Web www.ecbcs.org