



**EUROPEAN COMMISSION**  
**DIRECTORATE-GENERAL FOR ENERGY**  
**SAVE II Programme**



**Energy Savings by CHCP plants in the Hotel Sector**

**Dissemination of results**

**Seminars**

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**May 2001**



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## 1. The seminar in Greece

### 1.1 Seminar

The seminar in Greece was held in the city of Thessaloniki at the Conference Center *Nikolaos Germanos*, Trade International Fair and organised by *Alteren Inc.*

The seminar lasted 4 hours on Friday 15<sup>th</sup> December 2000.

It is important to mention that it was the first time for the hotel sector that such a seminar was held in Greece. The seminar was advertised in the financial pages of Sunday BIMA, one of the most reliable and known newspaper in Greece. This advertisement was listed on the last Sunday before the seminar. Additionally, a newsletter was sent to all interested participants and an advertisement on the internet was made on the Altaren website, <http://www.alteren.gr>.

The newsletter consisted of the:

- aims of the seminar;
- target group of the seminar;
- program;
- application form;
- invitation.

The receivers of the newsletter were:

- Hotels;
- Hotel Associations from all over Greece;
- Consulting companies related to energy projects;
- Natural gas private technical companies;
- Institutions and Companies of public sector related to energy;
- Universities;
- other companies.

It has to be mentioned that the target group was selected from all over Greece, but focused on the hotel sector. Other companies that were informed were the natural gas technical companies, and the energy consulting companies. The seminar was also open to other sectors, since CHCP plants could be applied to a broad area of industries.

The total number of participants was 31. The percentages of participation are presented in the table below:



<b>Sector</b>	<b>%</b>
Consulting Companies	32
University	23
Public	16
Hotels	10
Gas Companies	10
Manufacturers and representatives (of heating and cooling/refrigeration equipments)	6
Other	3
<b>TOTAL</b>	<b>100</b>

The participation of the seminar was free of charge and included coffee and dinner.



## 1.2 Program

Cogeneration and Absorption Cooling in Hotels,  
Conference center *Nikolaos Germanos*,  
Room C of HELEXPO, Trade International Fair, Thessaloniki

The program of the seminar is presented as follows:

<b>5.00 – 5.15</b>	<b>Introduction</b>	<b>Alteren Inc.</b>
5.15 – 5.50	Energy use in hotel sector - Results of energy audits - Energy saving measures	<i>Dr Charis Demlias,</i> Alteren Inc.
5.50 – 6.25	Co-generation and absorption cooling in hotels	<i>A. Christoforides,</i> Alteren Inc.
6.25 – 6.45	The use of natural gas in Thessaloniki	<i>Dr E. Kyriakidis,</i> Thessaloniki Gas Distribution Company (EDA Thessaloniki S.A.)
<b>6.45 – 7.00</b>	<b>Break - Coffee</b>	
7.00 – 7.30	Financial analysis of energy savings by CHCP plants in tertiary sector - Feasibility study for a large hotel unit	<i>Dr A. Mourelatos,</i> KLIMATAIR S.A.
7.30 – 8.00	Statutory and financial environment for promoting co-generation in Greece – Financial Opportunities	<i>Dr. G. Paparsenos,</i> Minis- try of Development
8.00 – 8.30	Conclusions	
<b>8.30</b>	<b>Dinner</b>	

Cogeneration and Absorption Cooling in Hotels  
Friday 15<sup>th</sup> December 2000 – Thessaloniki – Greece



### 1.3 List of participants

The list of participants in the seminar is shown in the table below:

	<b>Name</b>	<b>Title</b>	<b>Company</b>	<b>Sector</b>
1	Iosif Katsanevakis	Chem. Eng	ENERVAC FLUTEC LTD	Consulting
2	Dimitrios Mendrinos	Mech. Eng, Meng, MBA	Center for Renewable Energy Sources -C.R.E.S.	Public Institute
3	Athanasios Papadopoulos	Chem. Eng, M.Sc.	SIGMA CONSULTANTS	Consulting Company
4	Konstantinos Paspalas	Mech. Eng.	Aristotle University of Thessaloniki - A.U.TH.	University
5	Lefteris Zisis	Key - Account Manager	TECHNOTHERM S.A.	Private company – Manufacturer of heating equipment
6	Odisseas Tzavelas	Managing Director	InterMAK S.A.	Gas Applications
7	Athanasios Konstas	Managing Director	MAK GAS	Gas Applications
8	Mihalis Chamalelis	Sales Engineer	DAIKIN LTD	Private company – Representative of heating and cooling equipment
9	Konstantinos Papakostas	Mech. Eng.	Teaching and Research Assistant, Aristotle University of Thessaloniki - A.U.TH.	University
10	Michael Fyticas	Prof. of Geothermy	Aristotle University of Thessaloniki - A.U.TH.	University
11	Dimitrios Papageorgiou	Mech. Eng, M.Sc.	ATLANTIS S.A.	Consulting company
12	Stergios Florokapis	General Manager	DEMO S.A.	Private company – Textile manufacturer
13	Basilios Karahalios	Sales Engineer	GASTEAM CONSTRUCTIONS	Gas Applications
14	Stergios Dakouras	Mech. Eng.	CENTRE OF BUSINESS & CULTURAL DEVELOPMENT (K.E.P.A.)	Public Organization
15	Evangelos Tzelepis	Mech. Eng.	PUBLIC POWER CORPORATION (DEI)	Public Company



16	Apostolos Apostolidis	Consultant	BUSINESS ARCHTECTS CONSULTANCY	Consulting Com- pany
17	Efstathios Trifidis	Mech. Eng.	SANI S.A.	Hotel
18	Thomas Spahos	Mech. Eng.	Self employed	Consulting Com- pany
19	Margaritis Tsotas	Mech. Eng.	Self employed	Consulting Com- pany
20	Manolis Georgakakis	Elec. Eng.	Self employed	Consulting Com- pany
21	Dimitrios Dimou	Mech. Eng.	Self employed	Consulting Com- pany
22	Dimitrios Kalofolias	Mech. Eng.	Self employed	Consulting Com- pany
23	Lefteris Pet- ridis	Maintenance	SUN BEACH, AG.TRIADA	Hotel
24	Athanasios Anagnostou	Maintenance	SUN BEACH, AG.TRIADA	Hotel
25	Makis Karagianidis	Mech. Eng.	Self employed	Consulting Com- pany
26	Konaris Georgios	Mech. Eng.	Aristotle University of Thessaloniki - A.U.TH.	University
27	Nikolaos Andritsos	Chem. Eng.	Institute of Chemical Engi- neers	Public Institute
28	Panagiotis Christoforakis	Mech. Eng.	Aristotle University of Thessaloniki - A.U.TH..	University
29	Koroneos Christofis	Chem. Eng.	Aristotle University of Thessaloniki - A.U.TH.	University
30	Nikos Kikas	Mech. Eng.	Aristotle University of Thessaloniki - A.U.TH.	University
31	Ioannis Tsiafis	Mech. Eng.	President of the Associa- tion of Mechanical and Electrical Engineers of Northern Greece (SMHBE)	Public Association

## 1.4 Summary of the lectures

### Energy use in hotel sector - Results of energy audits - Energy saving measures

Dr. C. Demoulias is an electrical engineer and a member of *Alteren Inc.* The presentation included the following items:

First the energy rating of the hotels according to data available from EU was presented. Then the results of the energy audits performed by *Alteren* for the Greek audited hotels were pre-



sented. The classification of the respective hotels according to the previous energy rating was shown.

Finally, energy-saving measures were suggested, so as to improve the energy performance of the hotels before they proceed to the evaluation of a CHP installation.

### **Cogeneration and absorption cooling in hotels**

Mr A.Christoforides is a mechanical engineer and a member of *Alteren Inc.* He presented the basic concept of the CHOSE- project and the results.

Technical advice and information on the application of the appropriate Combined Heat and Power (CHP) systems (reciprocating engines, gas turbines) and absorption chillers were presented. It was emphasized the importance of choosing the optimum size of CHCP plant in relation to actual energy demands of a hotel size. Guidelines on the CHP installations in combination with absorption chillers in hotels were presented.

The technical and economic evaluation of two cases, and of a medium sized hotel (130 rooms) and another of a large hotel (400 rooms) were presented.

Finally the software for CHCP evaluation, developed by CHOSE team was also presented.

### **The use of natural gas in Thessaloniki**

Dr E. Kyriakidis is the Head of Technical Department of the Gas Distribution Company of Thessaloniki (EDA Thessaloniki S.A.).

The lecture reported how EDA is systematically preparing the institutions, the firms and the households in order to welcome the use of natural gas in Thessaloniki. It was also presented how EDA has developed a complex of activities in areas such as management, research projects, communication and promotion.

### **Financial analysis of energy savings by CHCP plants in tertiary sector - Feasibility study for a large hotel unit**

Dr A. Mourelatos is the Head of Energy Department of KLIMATAIR in Athens.

KLIMATAIR S.A. is a private company in the air-conditioning, heating and co-generation sector.

The lecture included the use of natural gas and the production of electrical and thermal power in tertiary sector. Additionally, it was presented a feasibility study for a large hotel unit which were examined two proposals:



- Reciprocating engine without absorption chiller
- One or two reciprocating engine with one or two absorption chillers

It was also examined the major parameters affected the financial viability of a cogeneration investment.

### **Statutory and financial environment for promoting co-generation in Greece – Financial Opportunities**

Dr G. Paparsenos is counselor of Ministry of Development in Greece.

The presentation included the general policy of Ministry of Development for energy savings. It was also presented the financial opportunities related to the installation of CHCP plants in hotel sector.



## **2 The seminar in Italy**

### **2.1 Seminar**

One of the phases of the CHOSE project was the dissemination, through seminars in each country, of energy savings by CHCP plants in the hotel sector.

The seminar in Italy was held in Rome at the *CONFINDUSTRIA* conference centre and organised by *Federturismo and DEAF*. The seminar lasted all the day on 16<sup>th</sup> November 2000. A newsletter was sent to all interested parts and an advertisement of the seminar was realised through direct invitation made by Federturismo.

The newsletter consisted of the description and objectives of the research. The receivers of the newsletter were:

- hotels
- hotel associations from all over Italy.

It has to be mentioned that the target group was selected from all over Italy, emphasising in the hotel sector. The participation of the seminar was free of charge and included coffee and lunch.

The total numbers of participants were about 20.



## 2.2 Program

The program of the seminar is shown below.

### **Seminar CHOSE Project Rome, November 16<sup>th</sup>, 2000**

- |              |   |
|--------------|---|
| <b>09:00</b> | <b>Reception of the participants and material delivery</b>  |
| 09:30        | Welcoming address of a representative of Federturismo   |
| 09:45        | Introduction – The Chose project<br>Prof. Ing. Ennio Cardona – University of Palermo                                |
| 10:45        | The role of the hotel sector within the national and European economy<br>Mr. Roberto Pedrazzi, Manager of AICA-UNAI |
| <b>11:15</b> | <b>Coffee Break</b>   |
| 11:30        | Energy saving in the Hotels<br>Prof. Ing. Salvatore Culotta – University of Palermo                                 |
| 12:15        | Energy saving of primary sources<br>dott. Mattia Molfetta – GFE consulting  |
| <b>13:00</b> | <b>Lunch</b>  |
| 14:00        | The results of the research CHOSE<br>Prof. Ing. Ennio Cardona   |
| 14.45        | Discussion  |
| 15.30        | Conclusions<br>Representative of Federturismo   |

Coordinatore di questo progetto è la società Energikonsult (Svezia). Al progetto prendono parte inoltre il DEAF (Dipartimento di Energetica) dell'Università di Palermo, la società Alteren di Thessaloniki (Grecia), l'Istituto Inesc di Coimbra (Portogallo) e la S.R. Environmental Management Consultants ltd di Cyprus.

I costi energetici rappresentano una buona aliquota dei costi totali nel settore alberghiero; la possibilità di un risparmio energetico -valutabile sino al 20% annuo- rappresenta quindi una non trascurabile risorsa per la gestione degli alberghi.

Obiettivo è quello di verificare la convenienza economica di sostituire impianti tradizionali di produzione separata di energia elettrica e termica con impianti di cogenerazione di piccola taglia.

Di particolare interesse appare l'opportunità di effettuare un'analisi su campo che riguarda unità ricettive ubicate dal Nord Europa sino al bacino del Mediterraneo.

Gli impianti CHCP ( Combined Heat, Cooling and Power ) sono economicamente convenienti quando coprono i carichi termici ed elettrici per un lungo numero di ore di funzionamento. Le unità alberghiere ben si prestano per l'utilizzazione di impianti di cogenerazione, essendo queste strutture caratterizzate da una domanda di energia elettrica, termica e frigorifera che si articola nell'arco di tutto l'anno. Ulteriore fattore incentivante è costituito dal fatto che la domanda di energia per il condizionamento estivo può essere soddisfatta da macchine frigorifere ad assorbimento, che richiedono in ingresso energia termica.

Il progetto, che si concluderà nel dicembre 2000, prevede 6 fasi:

- Fase 1 – Analisi delle strutture del settore ricettivo
- Fase 2 – Metodologia per l' audit energetico nel settore alberghiero
- Fase 3 – Audit energetici e casi studio
- Fase 4 –Analisi degli impianti e delle macchine
- Fase 5 – Valutazione dei CHCP ( Combined Heat, Cooling and Power Plant )
- Fase 6 - Disseminazione dei risultati



La possibilità di penetrazione degli impianti CHCP negli Hotels viene valutata attraverso una analisi di sensibilità che riguarda i seguenti parametri:

- dimensione, tipo di clientela, occupazione, categoria, posizione geografica degli Hotels;
- dimensione e tipologia dei diversi impianti CHCP ;
- disponibilità di fonti energetiche tradizionali ed alternative;
- la possibilità di vendere il surplus di energia elettrica alla rete.

La predisposizione di linee guida faciliteranno la decisione di installare un impianto CHCP negli Hotels attraverso indicazioni su:

- appropriato tipo di impianto CHCP per ogni tipo di Hotel
- dimensionamento dell'impianto di CHCP per ogni tipo di Hotel
- periodo di ritorno e valore attuale netto dell' investimento

I risultati del progetto sono disponibili sul sito WEB: <http://www.inescc.pt/urepe/chose/>



## 3 The seminar in Portugal

### 3.1 Introduction

The main objective of the CHOSE project was to study the technical and economical viability of introduction of CHCP plants in the hotel sector. Another objective related with this, was to calculate the energy savings resulting from this situation. With this objective, dissemination of the conclusions achieved was always an essential part, and this led to the planning of seminars to be held in each country.

In Portugal the dissemination occurred in two phases. The first one was held on the headquarters of the *Centre region branch of the Board of Engineers*, in Coimbra, the 15<sup>th</sup> December 2000, organised by *INESC Coimbra* and "*Colégio de Engenharia Electrotécnica da Região Centro da Ordem dos Engenheiros*". Its purpose was presenting the CHOSE project and its preliminary results. It was dedicated only to energy technicians. The second phase was a seminar held on the *Instituto de Engenharia e Tecnologia Industrial (INETI)*<sup>1</sup> Auditorium, in Lisboa, the 08<sup>th</sup> February 2001, organised by *INESC Coimbra*. It's main purpose, besides the dissemination of the CHOSE project conclusions, and in part due to these, was to reinforce the dissemination of known savings measures on the electrical and thermal systems used in hotels.

For the first presentation an invitation and a registration form was sent by mail to all electrical-, mechanical- and civil-engineers that are members of the Portuguese Board of Engineers. An e-mail invitation was sent to all students and teachers of the Electrical Engineering Department of the Coimbra University, as well as to all students and teachers of the Polytechnic Institutes of Coimbra, Leiria and Viseu. The total number of participants was 31 engineers (26 electrical; 2 mechanical; 1 electromechanical; 1 civil; 1 designer/projectist ). All the participants received documentation about the project and the preliminary results.

For the second phase, the registration form was sent to all Portuguese hotels, hotel associations, tourism schools and engineering schools. One announcement was also made on the national newspaper called "Expresso". The total number of participants was 56, from equipment representatives, research institutes, energy agencies, hotels and press (tourism related).

In the following, translated versions of some documents are presented, corresponding to the ones in Portuguese language used in the two dissemination actions referred.

Another form of dissemination developed by the CHOSE team for the project was the web pages available at <http://www.inescc.pt/urepe/chose> that will continue providing the results of this project to any future visitor.

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<sup>1</sup> National Institute for Engineering and Industrial Technology

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## 3.2 Seminars

### 3.2.1 First seminar

#### **The combined production of electricity, heat and cold and the CHOSE project: Energy savings by CHCP plants in the hotel sector**

##### Program

<b>18h00</b>	<b>Reception and delivery of materials</b>
18h30	The combined production of electricity, heat and cold and the CHOSE project: Energy Savings by CHCP plants in the hotel sector Eng <sup>o</sup> Luís Neves and Eng <sup>o</sup> Paulo Tavares - INESC Coimbra
19h15	Discussion
20h00	Closing Prof. Dr. António Gomes Martins, Scientific Coordinator of INESC Coimbra

The seminar was free of charge for participants

### 3.2.2 Summary of presentations of the first seminar

#### **The combined production of electricity, heat and cold and the CHOSE project: Energy Savings by CHCP plants in the hotel sector**

Luís Neves is an electrical engineer working as Assistant professor at the Polytechnic Institute of Leiria and researcher with the R&D group UREPE of INESC Coimbra. Paulo Tavares is an electrical engineer working as researcher with the R&D group UREPE of INESC Coimbra.

They presented the technology involved in the project and the principle behind "trigeneration". The CHOSE project and the preliminary conclusions of the project were also presented.

##### **Closing**

A. Gomes Martins is professor at the Department of Electrical Engineering of the Faculty of Science and Technology of the University of Coimbra, director of the Research group on Rational Use of Energy and Energy Planning (UREPE) and Scientific Coordinator of INESC Coimbra.



### 3.2.3 Second seminar:

#### Energy savings by CHCP plants in the hotel sector

#### Program

#### 9h Reception and delivery of materials

9h45 Opening - Eng<sup>o</sup> José Penaforte e Costa,

Representative of the General Director for Energy

10h Opportunities for rational use of electrical energy in the hotel sector

Eng<sup>o</sup> Paulo Santos – Contawatt, Lda

#### 10h45 Coffee break

11h Opportunities for rational use of thermal energy in the hotel sector

Eng<sup>o</sup> Norberto Duarte – Quality and Welding Institute (ISQ)

11h45 Some considerations about the electricity sector and the Independent Power Producers

Prof. Dr. João Santana, ERSE

#### 12h30 Lunch

14h An example of a CHCP plant in a services building

Eng<sup>o</sup> Ricardo Manzoni – Galp Power, SGPS, S.A.

14h45 Presentation of the CHOSE results

Eng. Luís Neves - INESC Coimbra

#### 15h30 Coffee break

15h45 The Rational Use of Energy in Services sector

Eng<sup>a</sup> Isabel Viegas Soares – Energy Efficiency Division Chief Officer – Directorate General for Energy

16h30 Discussion

17h15 Closing – Eng<sup>a</sup> Isabel Vinagre,



Representative of the General Director for Tourism



### 3.2.4 Summary of presentations of second seminar

#### **Opening**

José Penaforte e Costa as a major role at the Directorate General for Energy. He presented some of the main ideas behind the Portuguese energy policy:

#### **Opportunities for rational use of electrical energy in hotels**

Paulo Santos is an electrical engineer and a senior partner of Contawatt, Lda, an energy service company, specialised in electrical energy audits and management, with large experience in industry and service buildings.

He presented several efficiency measures available for electrical systems in hotels, with data from case studies, and also the options provided by the Portuguese Electric Rates for a minimum cost. The focused issues were lighting, efficient motors, power factor correction, efficient use of transformers, energy management systems and energy monitoring.

#### **Opportunities for rational use of thermal energy in hotels**

Norberto Duarte is a mechanical engineer with a large experience in energy audits, well known in the hotel sector.

As main ideas from his presentation we can extract the statement that there are several opportunities for reducing thermal energy consumption in the Portuguese hotels, and specially in the larger and higher rank hotels. In some hotels the energy use is not satisfactory due to a bad design or a bad surveillance of the equipment manufacturers. He advised the complete study of the systems in each hotel and perseverance for a continuous process of adjustments to achieve the best result for each case.

#### **Some considerations about the electricity sector and the Independent Power Producers**

João Santana is a professor at the Department of Electrical Engineering of the Instituto Superior Técnico on the Technical University of Lisbon, and member of the Office for Regulation for the Portuguese Electricity Sector (ERSE).

He presented the Portuguese power generation system, its capacity and perspectives for the future. He also presented how the Portuguese market is regulated and what are the conditions to which independent producers are obliged.

One of the main ideas resulting from his presentation, is that cogeneration, more than any other form of independent power production, is desirable in the Portuguese Power System, as a constant source throughout the year, not affected by weather conditions.



### **An example of a CHCP plant in a services building**

Eng<sup>o</sup> Ricardo Manzoni is a member of the Galp Power company. The purpose of this company is the implementation of cogeneration systems both in industry and in service buildings.

He presented the success case that represents the CHCP plant in his company headquarters building.

### **Presentation of the CHOSE results**

Luís Neves is an electrical engineer working as Assistant professor at the Polytechnic Institute of Leiria and researcher with the R&D group UREPE of INESC Coimbra.

He presented the CHOSE project and the conclusions of the project. He also explained the principle behind "trigeneration" or CHCP.

### **Rational Use of Energy in Services Sector**

Eng<sup>a</sup> Isabel Viegas Soares is the Energy Efficiency Division Chief Officer of the Portuguese Directorate General for Energy, and among other things, the SAVE II representative in Portugal.

The presentation focused the SAVE II programme, its main objectives and areas of interest, and a balance of other financial programmes supported by DG XVII. Finally she presented the Operational Programme Economics (POE) and the possible ways for getting funds for energy efficiency projects.

### **Closing**

Eng<sup>a</sup> Isabel Vinagre was representing the Portuguese Director General for Tourism. She presented made some considerations on the relevance of the discussions held at the seminar to the Portuguese hotels and to the Portuguese tourism policy in general.



## 4. The seminar in Sweden

### 4.1 Introduction

The seminar gave a short introduction to the technology and possibility the produce electricity, heat and cooling locally. Experiences from the CHOSE project regarding energy use were shared, both from a national and international perspective. Most of the seminar was focused on control of energy use in buildings, computerised solutions and IT-applications in buildings, and methods to follow-up energy consumption.

During the seminar there were possibilities to share experiences, meet experts and ask questions. A dinner was held after the lectures so the discussions could continue.

This seminar was mostly directed towards energy and environmental responsible managers, and operation and managing directors, within building companies and real estate companies. Also representatives from the energy and consultant sector were present.

The participation of the seminar was free of charge and included coffee, lunch and dinner as well as the documentation of the lectures.

An invitation to the seminar was sent to:

- hotels selected;
- hotel associations.

Also a selected number of companies, institutions and other sectors were invited, since CHCP plants could be applied to a broad area of industries:

- Consulting companies related to energy projects;
- Natural gas private technical companies;
- Institutions and companies of public sector related to energy;
- Universities;
- other companies.

The invitation consisted of the:

- aims of the seminar;
- target group of the seminar;
- program;
- application form;



It has to be mentioned that the target group was selected from the south of Sweden where there exists a market of natural gas.

The total number of participants was 55.

The percentages of participation are presented in the table below:

<b>Sector</b>	<b>%</b>
Consulting Companies	18
University	2
Public	4
Hotels and others	27
Energy Companies	24
Manufacturers and representatives	9
Other	13
<b>TOTAL</b>	<b>100</b>



## 4.2 The seminar programme and participants

Seminar 30 November 2000 in Malmö, Scandic Hotel Triangeln:  
Energy use in buildings – Production, Control, Follow-up and future Energy Efficiency possibilities in hotel and other real estates.

### 4.2.1 Programme

#### 8.30 Registration and coffee

9.00	Introduction	ÅF-Energikonsult AB
9.20	Energy use in hotels – data on energy use obtained from measurements during a year	Per Blomberg, ÅF-VVS Projekt AB
10.00	Technological and economic possibilities for local production of electricity, heat and cooling (CHOSE) and future areas of use.	Lars-Åke Cronholm, ÅF-Energikonsult AB
10.40	<b>Pause</b>	
11.00	Lower need of energy by co-operation between building and installation processes.	Peter Muth, ÅF-RNK AB
11.40	The "POSITIV" project – computerised operation control for buildings.	Göran Leander, Bostads AB Poseidon
12.20	<b>Lunch</b>	
13.20	Energy use follow-up by using "Degree-Days" and "Energy-Index", and operation control by aid of weather forecasts.	Ola Hjærtström, SMHI. (Swedish Meteorological and Hydrological Institute)
14.00	Follow-up of energy use using "Energy Signatures"	Christer Hjalmarsson, Bengt Dahlgren AB
14.40	<b>Coffee</b>	
15.20	Research and development regarding energy efficiency.  Subsidies and advice: best practice purchase of energy consuming equipment.	Tomas Berggren, Statens Energimyndighet (Swedish National Energy Administration)
16.00	<b>CONCLUSIONS</b>	ÅF-Energikonsult AB
17.00	<b>Dinner</b>	



#### 4.2.2 Exhibition

An exhibition is held in conjunction to the seminar with following exhibitors: SMHI (Swedish Meteorological and Hydrological Institute), VITEC, Bengt Dahlgren AB, ÅF-RNK AB. The companies provided demonstrations of computerised systems for operation control and follow-up. The exhibition was available during breaks in a seminar room adjacent to the conference room.

#### 4.2.3 Participants

<b>Name</b>	<b>Company</b>
Mattias Adolfsson	PKAB
Lennart Ahlgren	ÅF Mamö
Lars Alvgrim	Göteborg Energi AB
Roland Andersson	Scandic Hotels AB S:t Jörgen
Staffan Bengtsson	Energimagasinet
Tomas Berggren	Statens Energimyndiget
Per Blomberg	ÅF-VVS Projekt AB
Lars-Åke Cronholm	ÅF-Energikonsult AB
Jarl Dahlberg	Sydsvenska Energiteknik AB
Sören Dahlin	Malmö Högskola
Anders Enström	Graninge Energimarknad AB
Stefan Ernebrandt	Turbec AB
Bengt Frick	SRÖKAB
Erlandh Gunnarzon	J & W Sjölander
Peter Hadartz	Göteborg Energi AB
Anders Hedin	Scandic Hotels AB
Christer Hjalmarsson	Bengt Dahlgren AB
Ola Hjærtström	SMHI
Folke Holmqvist	Padox AB
Staffan Ivarsson	Sydgas AB
Stina Jansson	TAC AB
Hasse Johansson	Göteborg Energi AB
Tommie Johansson	Kosta Vårdshus AB
Thorleif Johannesén	Sv. Bredbandsbolaget AB
Jonny Jönsson	Sydskraft Värme Syd AB
Dick Jönsson	Göteborg Energi AB
Jörgen Kaptein	Maintech i Trelleborg AB
Göran Karlsson	Haldux Brake Products AB
Marina Karlsson	Padox AB
Göran Leander	Bostads AB Poseidon
Per-Arne Lilja	Göteborg Energi AB
Lars Lindberg	SkansTornet AB
Inge Mattisson	Elite Hotel Savoy-Residence
Jan Morén	Göteborg Energi AB

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Peter Muth	ÅF-RNK AB
Jan Morén	Göteborg Energi AB
Bertil Nilsson	Trelleborg Industri AB
Björn Nilsson	Graninge Energimarknad AB
Bo Olsson	Sydsvenska Energiteknik AB
Göran Olsson	Hotel & Restaurang AB
Ulf Olsson	Celsius/Kockums Industrier AB
Irene Olsson	Radisson SAS Hotel
Michale Radike	Apple Hotels
Olov Sandberg	VITEC AB
Björn Sandström	Sydsvenska Energiteknik AB
Kent Skoog	Scandic Hotel Horisont
Rubert Svensson	Lomma Fastighets AB
Johan Rietz	Svenskt Gastekniskt Center AB
Håkan Segerholm	Lundafastigheter
Nils-Eric Sjöstrand	Lundafastigheter
Poul Sönniksen	Göteborg Energi AB
Peter Wendel	Graninge Energimarknad AB
Bertil Åberg	Volvo Personvagnar AB

### 4.3 Summary of the lectures

#### **Energy use in hotels – data on energy use obtained from measurements during a year**

Per Blomberg, Tech. Dr., ÅF-VVS Projekt AB, performs measurements and calculations on installations. He previously worked at the Royal Institute of Technology.

The purpose of these measurements was to obtain good data to be able to assess the economy for the CHCP. Good data means continuous values per hour, for the electricity, heat and cooling consumption, during a whole year. Examples were given from different hotels.

For an efficient follow-up of how the different sub-systems function, an automatic measurement of the different parts of energies, i.e. the electricity consumed in the kitchen, hot water in kitchen, electricity for cooling etc., is required. These automatic measurements should be continuous in time, and include an automatic data conversion, for example print-out of diagrams. A manual reading once a month is desirable to verify the systems.

The measurement system is a cost, but unnecessary use of energy cost much. Small malfunctions in one apparatus can yield a significant increase of energy use.



### **Technological and economic possibilities for local production of electricity, heat and cooling (CHOSE) and future areas of use.**

Lars-Åke Cronholm is consultant at ÅF-Energikonsult AB. He has experience from a variety of energy and industrial projects.

The CHOSE, (Energy Savings by CHCP Plants in the Hotel Sector), project was presented. With natural gas and development of networks for natural gas new possibilities arise to efficiently produce local energy. It is possible for hotel buildings, hospitals etc. to produce electricity, heat and cooling efficiently with a compact unit fuelled by natural gas or biogas etc. For example, Combined Heat and Power (CHP) systems (reciprocating engines, gas turbines) and absorption chillers. Installation of cooling units will increase in Europe and that will increase the use of electricity. The compact plant will lessen this need.

The project method and results were discussed. The importance of choosing the optimum size of CHCP plant in relation to actual energy demands of a hotel size where discussed. The software for CHCP evaluation, developed by CHOSE team was also presented and the profitability of the system was analysed.

### **Lower need of energy by co-operation between building and installation processes.**

Peter Muth, ÅF-RNK AB, has 30 years of experience as a project leader for construction projects. He works with cost efficient climate control, among other projects.

In order to achieve a cost efficient maintenance of a building the different systems must cooperate. It is also crucial to use the inherent building materials' abilities to even out climate variations. The operation control system can be regulated dynamically including the properties of the building materials. An IT-based system is preferable. The ventilation may need regular adjustments regarding season and amount of people in the premises. One method to regulate heat is to install a solar film on sun-exposed windows. The properties of this film are translucency, reduction of radiating heat etc.

### **The "POSITIV" project – computerized operation control for buildings.**

Göran Leander, Bostads AB Poseidon, has 20 years experience of energy projects. He is responsible for the computerised operation and maintenance follow-up system "POSITIV" for heating, water, ventilation and other systems.

The average energy saving since the installation of new equipment in their real estates has been 6,9%. The next stage is optimisation of the operation and maintenance. The resulting energy saving was yet too early to tell. The third stage includes the possibilities of more exact regulation with the new computerised system. Poseidon expects significant energy savings from this stage too.



### **Energy use follow-up by using “Degree-Days” and “Energy-Index”, and operation control by aid of weather forecasts.**

Ola Hjærtström, SMHI, is marketing manager for service to the energy and real estate sector. He has knowledge and experience from climate and weather influence on energy consumption in buildings.

“Degree Days” is a method for predicting energy consumption developed by SMHI. Other models were described which included solar radiation heat, heat from electrical appliances, heat from people, ventilation, building factors, meteorological data etc. The “Energy Index” is a service that, among other factors, take wind conditions into consideration. The method concerning operation control by aid of forecasts can give energy savings of 10-20 kWh/m<sup>2</sup>, more even indoor climate and reduced environmental load. The method is based on data regarding weather, sent from SMHI’s server to the buildings’ operation control system, via a computer network.

### **Follow-up of energy use using “Energy Signatures”**

Christer Hjalmarsson, licentiate of engineering, Bengt Dahlgren AB, consultant with 30 years of experience from energy technology, life cycle costs, environmental aspects and ventilation and more.

“Degree Day”-correction is not sufficiently accurate for monitoring of energy use. Especially during abnormal weather, and when energy saving measures have been made. *The E-Signature*, (**Energy-Signature**) method is computerised for PC. It is based on a simple linear regression analysis of measured data on energy use and temperature. A mathematical relation between energy use and outdoor temperature can be obtained. This relation is called the *E-Signature* of the building. The advantage of this method is that it can also be used for prognosis.

The program also calculates threshold values unique for each building. Above or below this value the system gives an alarm, considering the standard deviation that are normal for the actual building.

### **Research and Development regarding energy efficiency. Subsidies and advice: Best practice purchase of energy consuming equipment.**

Tomas Berggren, Statens Energimyndighet (Swedish National Energy Administration) has worked with energy efficiency in various projects for many years.

The presentation included the general policy of Swedish National Energy Administration for energy savings. The national program for Research and Development regarding energy efficiency was also presented specially the program for *Co-operative Procurement* and *The market acceptance for Innovative Energy-Efficient Technologies*. Also Life Cycle Cost and Life Cycle Assessment (LCA), methods for investment analysis were discussed, as well as the financial opportunities related to the installation of CHCP plants in hotel sector.