



## The IEA Heat Pump Programme

Research, Development, Demonstration and  
Promotion of Heat Pumping Technology

**Sophie Hosatte**  
IEA HPP Chairman

IEA Heat Pump Programme – Workshop – Vienna, Austria, November 9, 2010

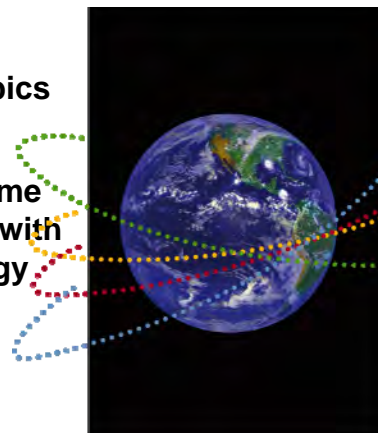
[www.heatpumpcentre.org](http://www.heatpumpcentre.org)

## What is the IEA Heat Pump Programme?



One of the “Implementing Agreements” (IAs) of  
the International Energy Agency (IEA)

- Collaborations between  
member countries on topics  
of mutual interest
- The Heat Pump Programme  
is one of the IAs dealing with  
efficient end-use of energy



IEA Heat Pump Programme – Workshop – Vienna, Austria, November 9, 2010

[www.heatpumpcentre.org](http://www.heatpumpcentre.org)

## HPP objectives



- **Energy Efficiency and Environment**
  - Quantify and publicise the energy saving potential and environmental benefits
- **Market and Deployment**
  - Develop and deliver information to support deployment
- **Technology**
  - Promote and foster international collaboration to develop knowledge, systems and practices
- **Information Management**
  - Provide effective flow of information to, from and between stakeholders

Austria, November 9, 2010

[www.heatpumpcentre.org](http://www.heatpumpcentre.org)

## Research, Development, Demonstration and Promotion of Heat Pumping Technology

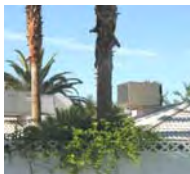


The programme is not just about heating



It covers the **technology** of heat pumping

- Heating (Heat upgrading)
- Air conditioning
- Refrigeration



and its **applications**:

- In buildings (Residential, commercial, and institutional)
- In industry

IEA Heat Pump Programme – Workshop – Vienna, Austria, November 9, 2010

[www.heatpumpcentre.org](http://www.heatpumpcentre.org)

## Current Member Countries



Austria	Italy	Sweden
Canada	Japan	Switzerland
Finland	Netherlands	The United States
France	Norway	The United Kingdom
Germany	South Korea	

IEA Heat Pump Programme – Workshop – Vienna, Austria, November 9, 2010

[www.heatpumpcentre.org](http://www.heatpumpcentre.org)

## Organisation



- **Executive Committee**
  - The board of HPP; one vote per member country
- **The Heat Pump Centre**
  - The central information activity of HPP
  - Secretariat functions, including information dissemination
- **National Teams**
  - People and organisations representing national HP activities
- **Cooperation Agreements**
  - with the International Institute of Refrigeration (IIR) and the European Heat Pump Association (EHPA)

IEA Heat Pump Programme – Workshop – Vienna, Austria, November 9, 2010

[www.heatpumpcentre.org](http://www.heatpumpcentre.org)

## The Heat Pump Centre



### Information dissemination

- Project reports
- Electronic newsletters
  - short version: abstracts
  - long version: articles
- Website:

[www.heatpumpcentre.org](http://www.heatpumpcentre.org)



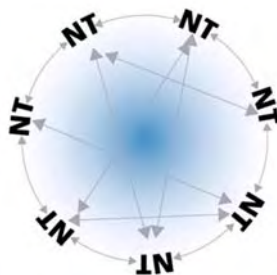
### Programme Support

- To ExCo, NTs and project leaders

IEA Heat Pump Programme – Workshop – Vienna, Austria, November 9, 2010

[www.heatpumpcentre.org](http://www.heatpumpcentre.org)

## National Teams



Last meeting in  
September 2010  
in Sweden

### Objectives

- Identify new ideas
- Generate activities (e.g. Annexes)
- Create a forum for discussion
- Exchange and disseminate information
- International network
- Increasing knowledge by international cooperation

IEA Heat Pump Programme – Workshop – Vienna, Austria, November 9, 2010

[www.heatpumpcentre.org](http://www.heatpumpcentre.org)

## What do we do? – “Annexes”



- **Collaborative projects** between organisations in member countries
  - Technical Activities (R&D, demonstration, tools and guidelines, ...)
  - Surveys (Market analyses, barriers, ...)
  - Workshops
- Participants can be energy agencies, universities, research centres, companies, etc from member countries
- Participants decide on access to results
  - Summary reports generally become public, but may be restricted to participants for, say, two years
  - Detailed reports may be public or restricted to participants
- Annexes are self-funding
  - Participants recognise that they get back more than they put in
- Annexes are managed by an Operating Agent (OA)

IEA Heat Pump Programme – Workshop – Vienna, Austria, November 9, 2010

www.heatpumpcentre.org

## Annex 29



### Ground Source Heat Pumps – Overcoming Market and Technical Barriers

- State-of-the-art and market analysis
- Matrix of ground source systems under different climates and site conditions
- Overcoming legal and economic barriers
- Operating Agent: **Austria**



www.heatpumpcentre.org

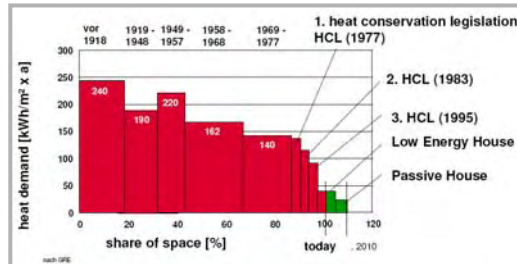
## Annex 30

Final Report completed



### Retrofit Heat Pumps for Buildings

- Potentially important market with past difficulties and new opportunities
- State-of-the-art and market analysis
- Matrix of heat pumps
- Overcoming economic, environmental, and legal barriers
- Improvement of components and systems
- Operating Agent:  
**Germany**



IEA Heat Pump Programme – Workshop – Vienna, Austria, November 9, 2010

www.heatpumpcentre.org

## Annex 31

Final report  
to be completed



### Advanced modeling and tools for analysis of energy use in supermarkets

- Development of performance indices for different regions and climates in order to compare systems
- Better understanding of advanced refrigeration technologies and HVAC&R integrated technologies
- Operating Agent:  
**Sweden**



IEA Heat Pump Programme – Workshop – Vienna, Austria, November 9, 2010

www.heatpumpcentre.org

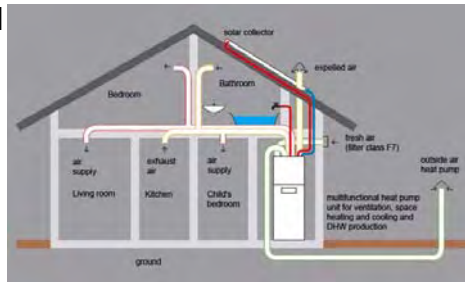
## Annex 32

Final report to  
be completed



### Economical heating and cooling systems for low energy houses

- Improve multi-functional (domestic hot water, cooling, and heating) heat pump systems in terms of overall energy use, thermal comfort and costs
- Gather more field experience from real-world operation of integrated heat pump systems
- Develop design guidelines
- Operating Agent:  
**Switzerland**



IEA Heat Pump Programme – Workshop – Vienna, Austria, November 9, 2010

www.heatpumpcentre.org

## Annex 33

Final report available



### Compact Heat Exchangers in HP Equipment

- Decrease working fluid inventory, minimise environmental impacts, increase HP system performance
- Identify compact HXs for HP applications
- Identify or develop methods of predicting heat transfer, pressure drop, and void fractions
- List operating limitations (e.g. maximum pressure, temperature, material compatibility, ...)
- Operating Agent:  
**United Kingdom**



IEA Heat Pump Programme – Workshop – Vienna, Austria, November 9, 2010

www.heatpumpcentre.org

## Annex 34

Ongoing



### Thermally driven heat pumps

- Reduce the environmental impact of heating and cooling by the use of thermally driven heat pumps
- Market overview and state of the art
- Performance evaluation
- Apparatus technology
- System technology
- Implementation
- Operating Agent: **Germany**

IEA Heat Pump Programme – Workshop – Vienna, Austria, November 9, 2010

[www.heatpumpcentre.org](http://www.heatpumpcentre.org)

## Annex 35

Ongoing



### Application of Industrial Heat Pumps

#### Objective

**Facilitate heat pump adoption in the industrial sector**

- In process industry such as chemical industry with its distillation columns, the pulp and paper and steel industry.
- In industrial processes on a smaller scale, especially in food industry (breweries and dairies), where both heating and cooling are used.
- Expansion of cooling processes towards the use of condenser heat and heat wasted in cooling towers, as this is one of the new developments among suppliers of refrigeration and cooling concepts.
- In small manufacturing companies, often located at a common area, where warming of offices is the main use of heat and the other energy need is power to drive machinery.

Operating Agent: **Germany**

IEA Heat Pump Programme – Workshop – Vienna, Austria, November 9, 2010

[www.heatpumpcentre.org](http://www.heatpumpcentre.org)



## Annexes under development



### Demonstration of Field Measurements on Heat Pumps Systems in Buildings

#### Objectives

- Demonstrate the potential of heat pumps for all types of buildings from field measurements. The focus will be on the best available techniques in order to achieve further acceptance for heat pumping technology.
- Ensure the quality of the performed field measurements concerning, system boundary, measured parameters, sampling interval, accuracy of measurements etc.
- Establish a data base connected to the Heat Pump Centre website where data from this and other field measurements are presented.

IEA Heat Pump Programme – Workshop – Vienna, Austria, November 9, 2010

[www.heatpumpcentre.org](http://www.heatpumpcentre.org)

## Annexes under development



### System using Solar Thermal Energy in combination with Heat Pumps

#### Objective

- To analyse different possible systems and their potential for residential applications (heating and hot water) in different climates and under different boundary conditions

[Annex under Solar Heating and Cooling and Heat Pump Programme IAs](#)

IEA Heat Pump Programme – Workshop – Vienna, Austria, November 9, 2010

[www.heatpumpcentre.org](http://www.heatpumpcentre.org)

## Annexes under development



### A Common Method for Testing and Rating Residential HP and AC seasonal Performance

#### Objectives

- To develop common calculation methods for SPF using a generalised and transparent approach, based on lab measured data
- Establish comprehensive test methods based on further development of existing test standards. The test standards should include test conditions needed for the future SPF calculations
- A method to evaluate additional heat pump performance, e.g. Carbon Footprint, Primary Energy Saving or Energy Savings

IEA Heat Pump Programme – Workshop – Vienna, Austria, November 9, 2010

www.heatpumpcentre.org

## Annexes under development



### Quality Installation and Maintenance

#### Objective

To investigate and quantify the effects of poor heat pump system installation and maintenance procedures

By evaluating heat pump faults commonly found in operating equipment, and assessing the relative capacity and efficiency degradations, stakeholders will be better positioned to understand how installation and maintenance practices affect heat pump performance.

**Operating Agent :** The United States

IEA Heat Pump Programme – Workshop – Vienna, Austria, November 9, 2010

www.heatpumpcentre.org

## Annexes in preparation



### Heat Pumps for Cold Climates

- Establish heat pump system performance objectives for building space conditioning, water heating, etc., in cold climate locations
- Identify a number of potentially strong product and system design possibilities for further evaluation and study

IEA Heat Pump Programme – Workshop – Vienna, Austria, November 9, 2010

www.heatpumpcentre.org

## Potential impacts of Heat Pumps on Energy Policy Concerns 1 (4)



### Heat pumps can have a material impact on GHG emissions at modest cost

In terms of GHG emissions Heat Pumps could save

**50% in the building sector**

**5% in the industrial sector**

This means:

**1 800 Mt CO<sub>2</sub>-eq. per year**

**8 % of total global emissions**

- Significant portion of the 16 % savings postulated in the IEA scenario for 2030
- Significant portion of the 60 % expected from end-use efficiency



IEA Heat Pump Programme – Workshop – Vienna, Austria, November 9, 2010

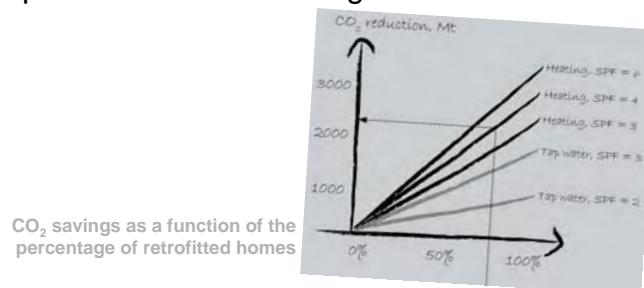
www.heatpumpcentre.org

## Potential impacts of Heat Pumps on Energy Policy Concerns 2 (4)



### The 8% figure could be increased

- Efficiencies can be improved
- Electricity generation can become less carbon-intensive
- Market penetration could be higher



IEA Heat Pump Programme – Workshop – Vienna, Austria, November 9, 2010

www.heatpumpcentre.org

## Potential impacts of Heat Pumps on Energy Policy Concerns 3 (4)



### Relevance: Supply security

- By significantly reducing energy important levels and providing greater fuel flexibility through the use of electricity as a multi-fuel based carrier

### Relevance: Developing economies

- By reducing the infrastructure costs for energy supply networks

IEA Heat Pump Programme – Workshop – Vienna, Austria, November 9, 2010

www.heatpumpcentre.org

## Potential impacts of Heat Pumps on Energy Policy Concerns 4 (4)



### Priorities of actions

- Continue RD&D to increase technical and economic performance
- Address market barriers (capacity building activities, ...)
- Promote, jointly with IEA Secretariat, policy measures to encourage HP wide adoption

IEA Heat Pump Programme – Workshop – Vienna, Austria, November 9, 2010

[www.heatpumpcentre.org](http://www.heatpumpcentre.org)

## Opportunities for Heat Pumps



- **Buildings and Housing**
  - Increased needs for air conditioning
  - Part of the integrated systems for meeting near-zero and net-zero energy houses and buildings
- **Neighbourhoods and Communities**
  - Part of the district heating and cooling strategies
  - Combined with short and long (ground) term storage
  - Waste heat upgrading
- **Industry**
  - Waste heat upgrading
  - Refrigeration
  - Strong need for developing reliable and economically viable and technologies enabling heat upgrading at medium temperatures
- **Distributed Generation**
  - High interest for thermally activated heat pumps for heating or cooling in tri-generation applications

IEA Heat Pump Programme – Workshop – Vienna, Austria, November 9, 2010

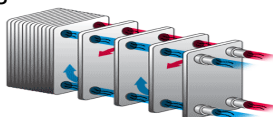
[www.heatpumpcentre.org](http://www.heatpumpcentre.org)

## Activities for improving Heat Pump Performance and costs 1 (2)



- **Equipment and systems**

- Ejectors and electronic valves as replacement of the expansion valves
- Compact heat exchangers
- Working fluids (primary and secondary)
- Small-capacity turbo-compressors
- Thermally-activated heat pumps



- **Control and Operation**

- Fault detection and diagnosis for equipment and systems
- Re / On-going / Commissioning practices for integrated systems
- Improved control techniques and sequences
- Guidelines and computed-tools for optimizing system design and operation

IEA Heat Pump Programme – Workshop – Vienna, Austria, November 9, 2010

www.heatpumpcentre.org

## Activities for improving Heat Pump Performance and costs 2 (2)



### Deployment and support to policies

- **Communication**

- Publicise heat pump energy and environmental impacts and benefits
- Increase awareness of heat pump system's annual performance

- **Codes and standards**

- Have heat pumps included in building codes as an option to reduce energy consumption and GHG emissions

- **Support to policies**

- Have policies in place to recognize and credit renewable resource utilization of air, water, and ground source heat pumps

IEA Heat Pump Programme – Workshop – Vienna, Austria, November 9, 2010

www.heatpumpcentre.org

## The 10th IEA Heat Pump Conference, 2011



### Heat Pumps – The Solution for a Low Carbon World

**Date:** May 16-19, 2011

**Location:** Tokyo, Japan

#### Topics

- Environmental-friendly Technology
- Systems and Components
- Applications
- Research and Development
- Policy, Standards and Market Strategies
- Markets
- International activities



#### Workshops

#### Exhibition

**Regional Coordinators:** Dr Monica Axell - [Monica.axell@sp.se](mailto:Monica.axell@sp.se)  
[www.hpc2011.org](http://www.hpc2011.org)

IEA Heat Pump Programme – Workshop – Vienna, Austria, November 9, 2010

[www.heatpumpcentre.org](http://www.heatpumpcentre.org)

## Further information



### Talk to us now

Contact the Heat Pump Centre  
Look at the website  
[www.heatpumpcentre.org](http://www.heatpumpcentre.org)

Contact your delegate and alternate delegate  
Prof. Herman Halozan

IEA Heat Pump Programme – Workshop – Vienna, Austria, November 9, 2010

[www.heatpumpcentre.org](http://www.heatpumpcentre.org)