

# EUROPEAN HEAT PUMP SUMMIT

POWERED BY CHILLVENTA

SYMPOSIUM + EXPO  
NUREMBERG, 20-21.10.2015

Industrial | Commercial | Residential  
Heating & Cooling | Components & Equipment

[hp-summit.de](http://hp-summit.de)

NÜRNBERG / MESSE

---

# Fuel driven heat pumps – overview technology and markets (IEA HPT Annex 43)



---

Dr.-Ing. Peter Schossig  
Dipl.-Ing. Ivan Malenkovic

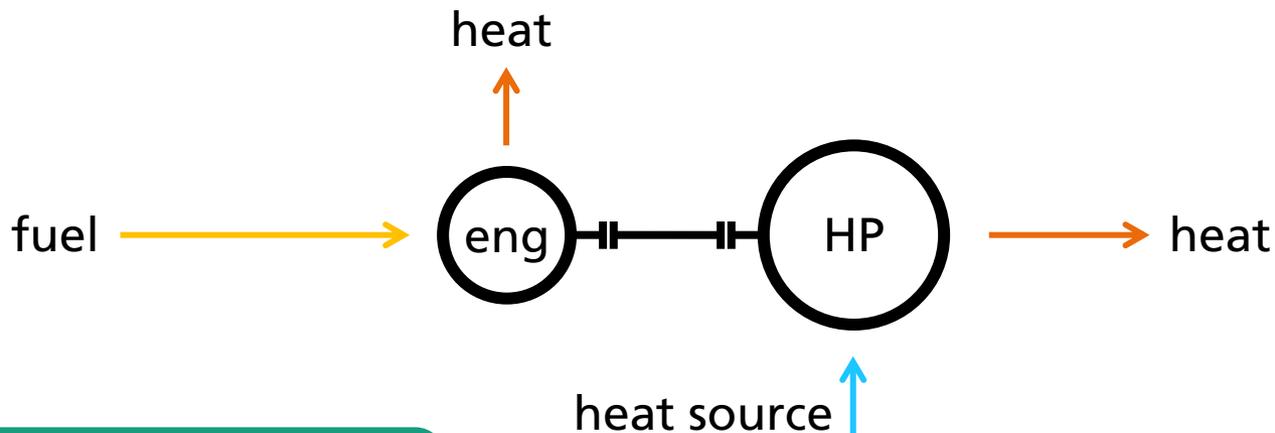
Fraunhofer Institute for  
Solar Energy Systems ISE  
[www.ise.fraunhofer.de](http://www.ise.fraunhofer.de)

Nürnberg, 20 October 2015

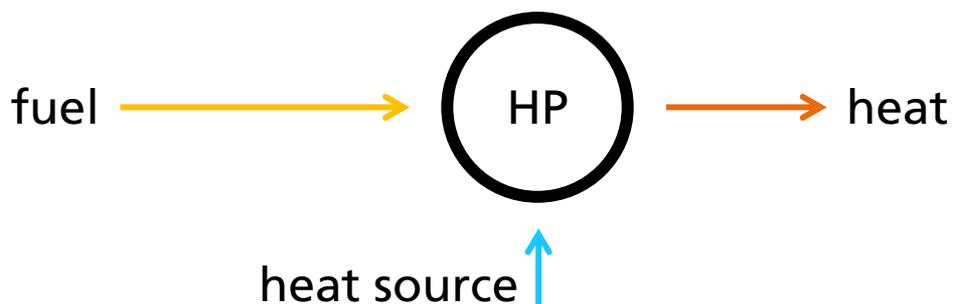
# Outline

- Fuel driven heat pumps: motivation and technology
- Recent market developments
- Scope and goals of Annex 43
- Outlook

# Fuel driven heat pumps



## Scope of Annex 43



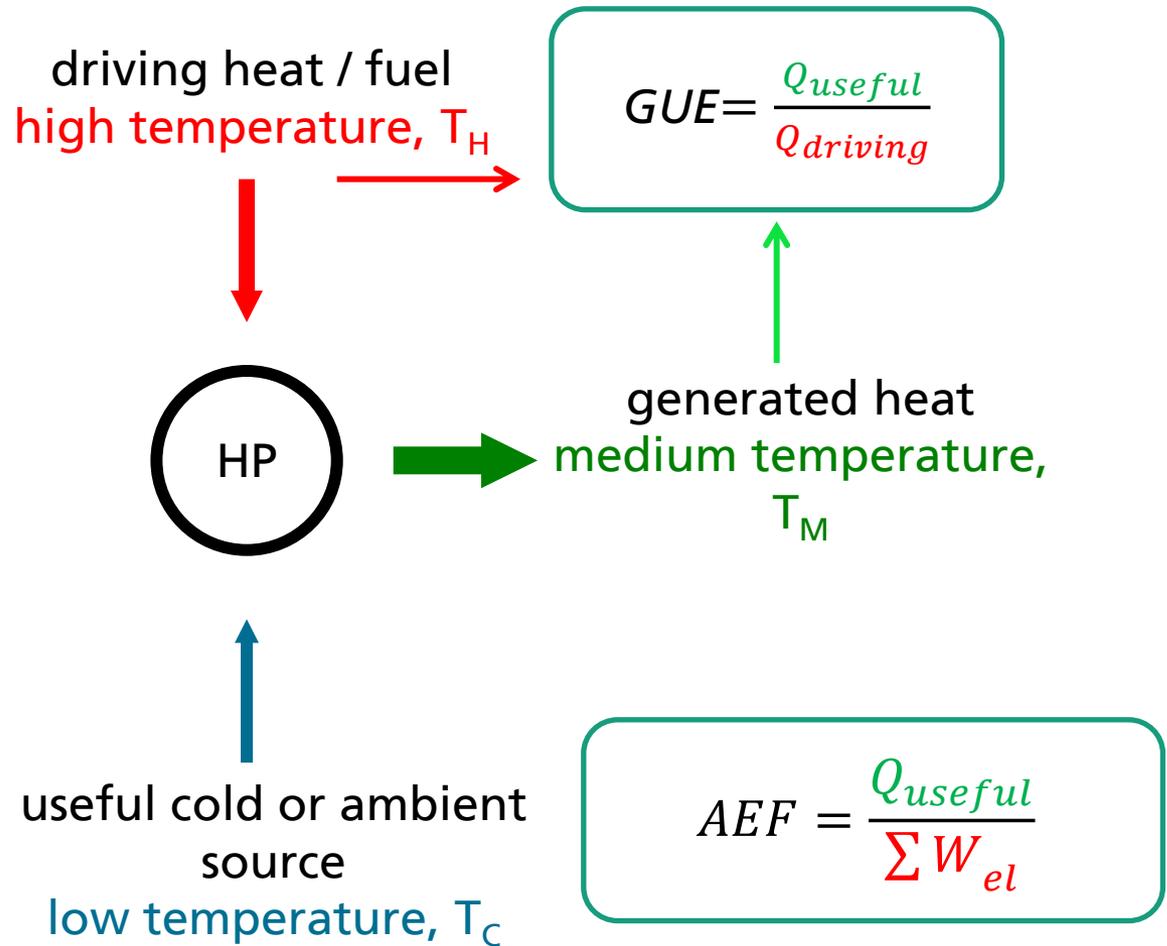
# Fuel driven sorption heat pump

## Principle

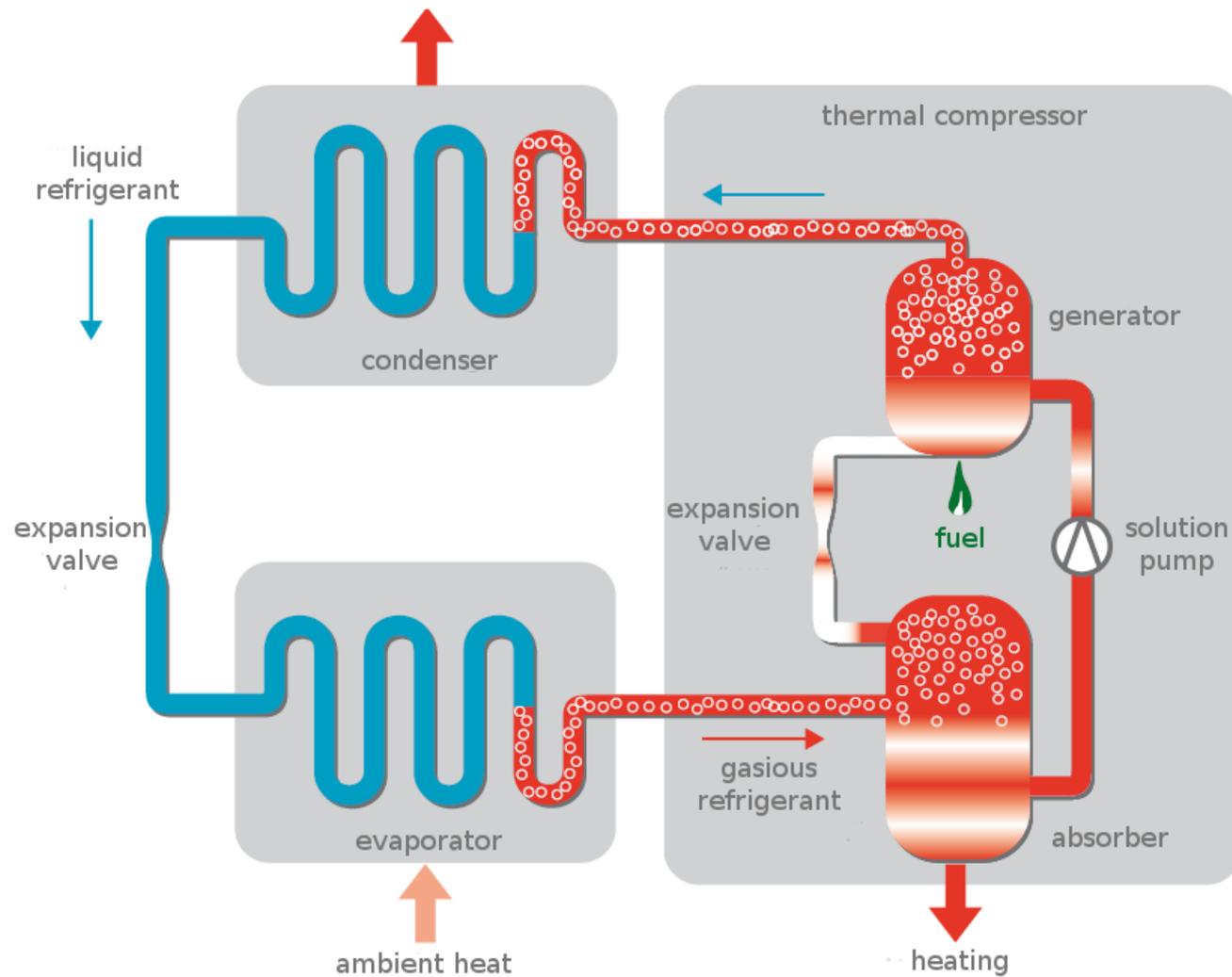
- 3 Temperature levels
- generated heat = driving heat + low temperature heat

## Technologies

- Absorption
- Adsorption



# Working cycle: absorption



Source: IGWP



# Reasons for fuel driven heat pumps

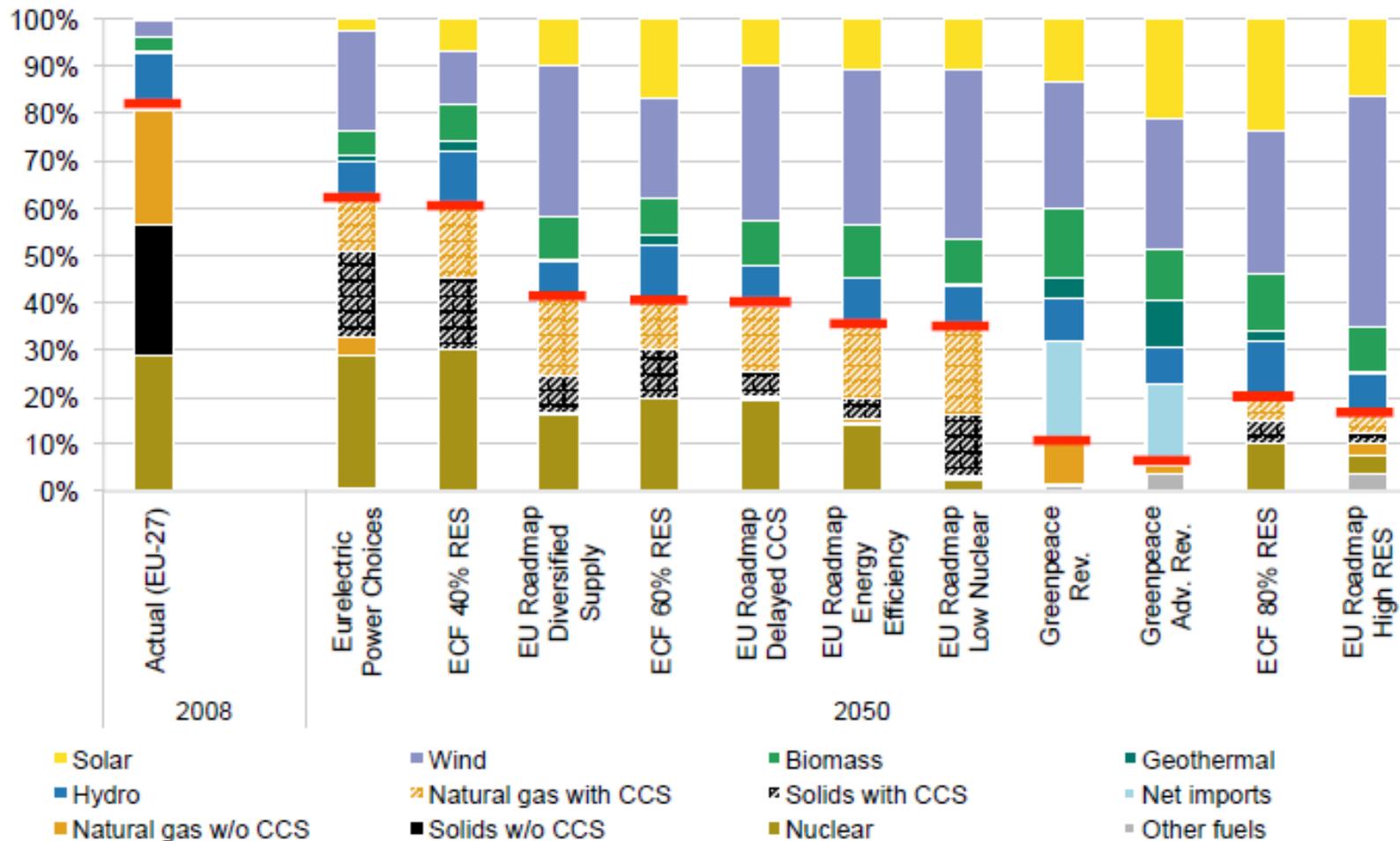
## Demand side

- Buildings with high temperature heat distribution systems
- Easy boiler replacement, minimum changes on existing system
- Conservative user behavior regarding energy carrier
- Comparatively smaller size of the heat source

## Supply side

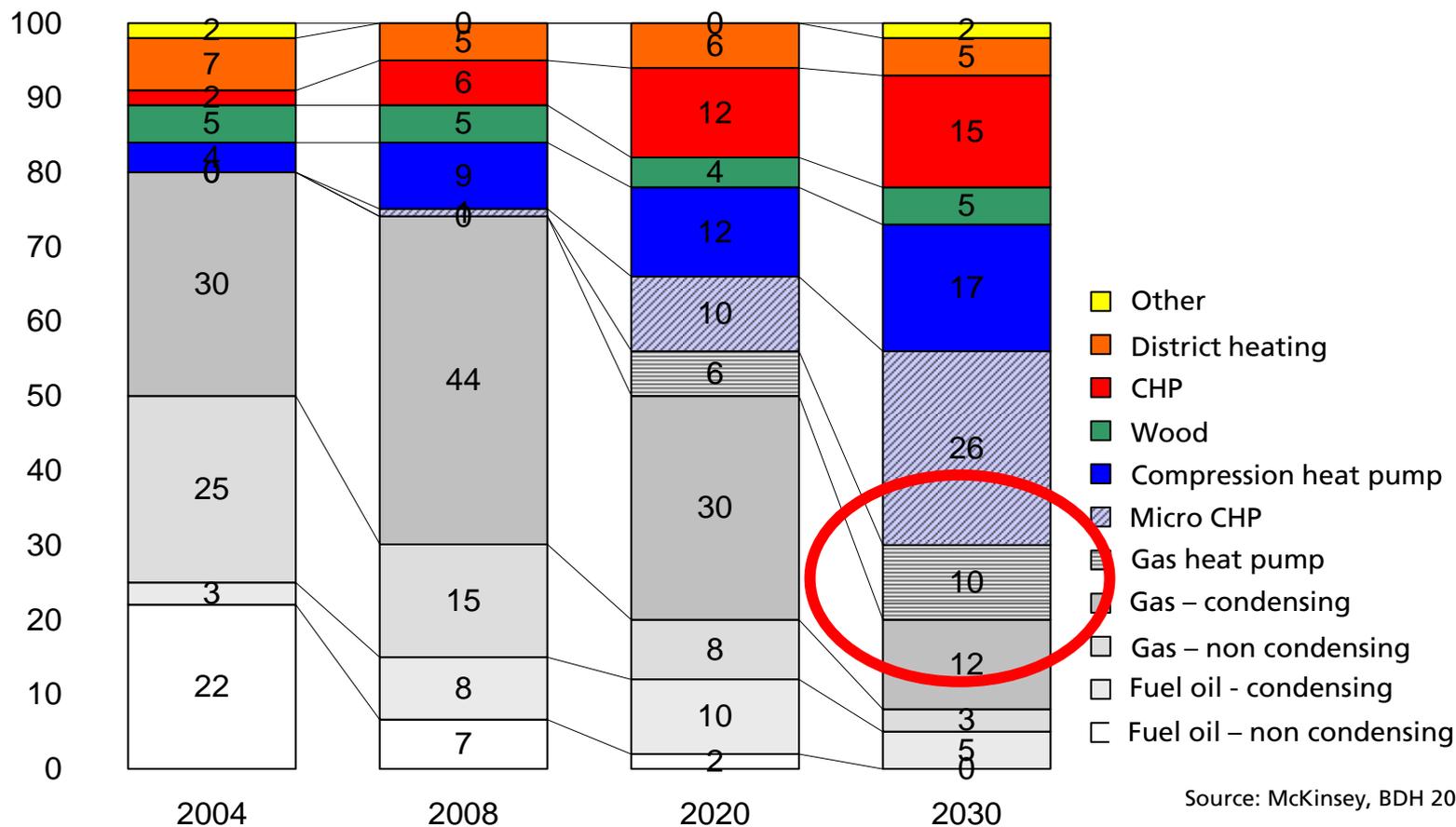
- Gas is expected to play an important role in future energy supply
- Security of supply
- Diversification of energy supply / grid balancing
- Net decarbonisation of gas grid
- Power2gas perspective as net decarbonisation

# Gas will continue to play an important role in energy supply



Source: SEFEP 2012, Metastudy Analysis on 2050 Energy Scenarios

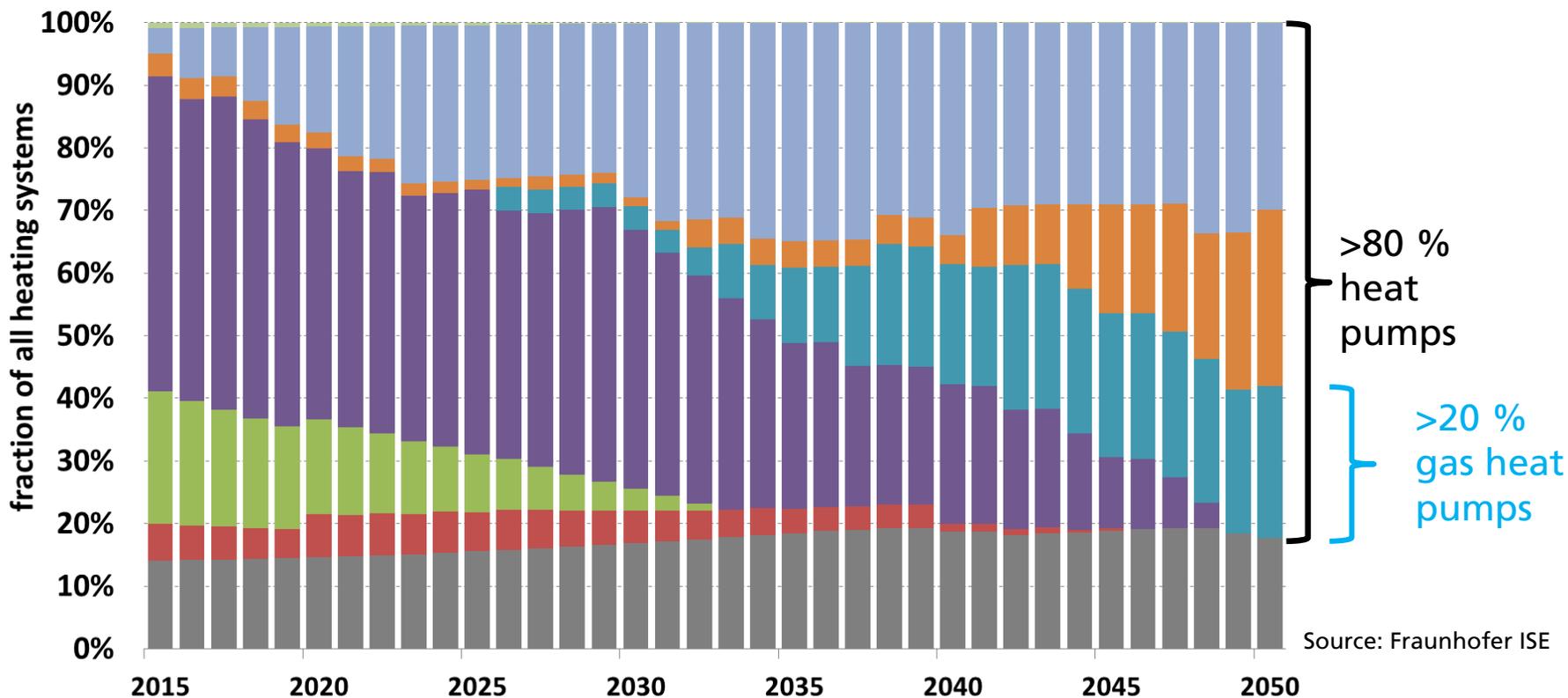
# Development of the boiler market



# Forecast of the heating market development in Germany

Scenario: -85% reduction in CO<sub>2</sub> emissions; housing stock fully retrofitted until 2040 with 10 % share of passive houses

- district heating
- biomass
- oil boiler
- gas boiler
- gas heat pump
- electric heat pump (ground)
- electric heat pump (air)
- hybrid heat pump
- small scale CHP



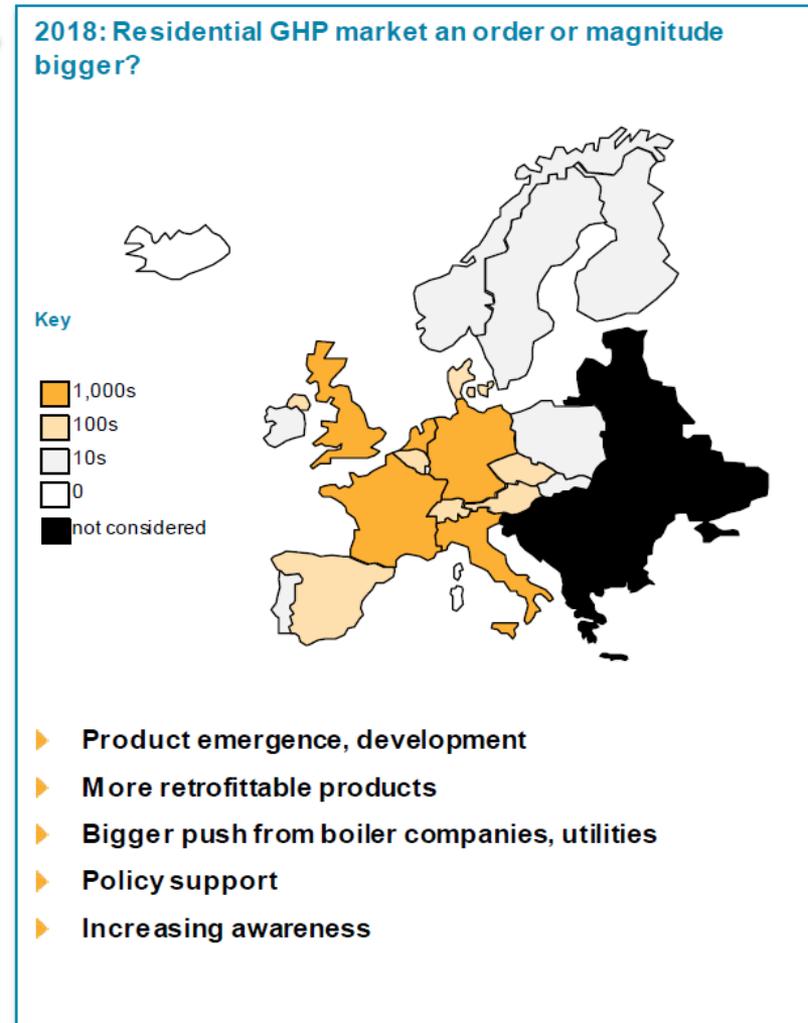
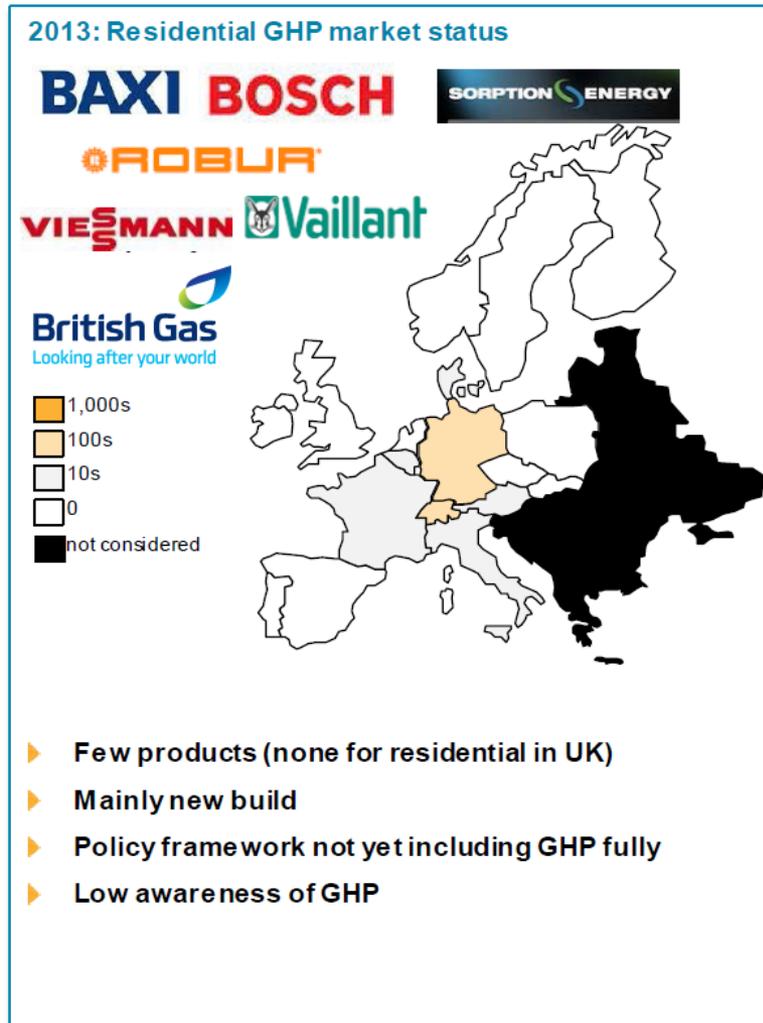
# More forecasts...

## Equipment market shares in the residential sector in the Eurogas Roadmap



Source: eurogas

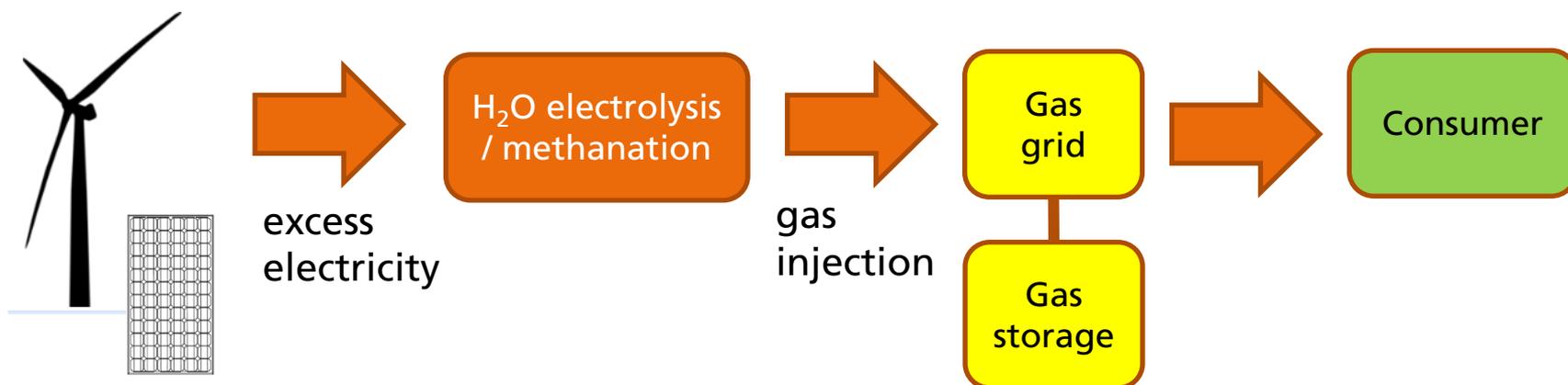
# Projection of market development for GHP



Source: Delta EE

# Decarbonisation of gas grid in the future?

- Biogas from biological waste: agriculture, landfill, waste (sewage) water
- Usage of biogas: heat and power generation, grid injection and vehicle fuel
- Substantial potential to inject biomethane into existing gas grid to lower the net CO<sub>2</sub> emissions
- There are some plans in countries with well developed gas grids to do so (e.g. Germany: 7%, The Netherlands 2% by 2020, France: 17% by 2030)
- Power2gas from wind and solar electricity production



# Recent developments

## Products

- New market entries in different market segments
- New companies and further products expected soon

## Legislation

- Ecodesign Directive, Lot 1
- EPBD
- RES Directive
- F-Gas Directive

## Standards

- Revision of EN 12309
- VDI 4650-2

## Activities

- IGWP: 2008 – 2012
- New WG within EHPA on TDHP
- New WG within EHI on TDHP
- EU – Project “Heat4U”
- IEA HPP Annex 34
- IEA HPP Annex 43

# Sorption heat pumps: products and developments

< 10 kW Single family houses

15-41 kW – multi family – light commercial

## Products



Vaillant / 10 kW



Viessmann / 10 KW



Robur



Buderus



Remeha/Oertli

## Under development



Climatewell/ ?? kW



Sorption Energy / 10 kW



On sale next summer

Junkers, Buderus / 18 kW



Robur / 18 kW

On Sale in Italy since September 2015

# Why an IEA Annex / international project

## Motivation

- Market for fuel driven heat pumps is developing
- Emerging technology just starting to enter market
- Need for further standards on test procedures
- Big need for quality insurance measures
- Big need to optimize best system configurations for different applications
- Need for common understanding regarding field tests
- Raise awareness about the technology among all market players

# Annex 43:

## “Fuel driven sorption heat pumps”

### Scope

- Fuel driven sorption heat pumps for residential and light commercial
- Focus on heating mode, reversible allowed

### Goals

- Identification of market opportunities and barriers
- Identification of the potential applications and importance in future energy systems
- Identification of market supporting measures
- Easy and sustainable market entrance and development

# Annex 43: Structure

Task A: Generic systems and system classification

Task B: Technology transfer

Task C: Field test and performance evaluation

Task D: Market potential study and technology roadmap

Task E: Policy measures and recommendations, information

# Participants

## Current participants

- Germany (OA)
- Italy
- UK
- France
- Austria
- USA
  
- since 12/2014: Korea

## Institutions

- ISE, Stiebel-Eltron, Bosch, SorTech,....
- Politecnico di Milano, CNR-ITAE
- University of Warwick, Delta EE
- GDF, GRDF, Boost heat
- AIT, University of Graz
- ORNL
  
- Korea Institute of Energy Research

## Interest expressed from Poland and Sweden Participating as observers

(Flowair and Climatewell)

# Timeline

- Duration of the Annex: July 2013 – Juni 2017
- Semiannual expert meetings
- Next meeting: December 09/10 in Wernau, Bosch



New participants welcome!

## Next steps:

- round robin test on gas driven heat pumps – comparing EN 12309 and VDI 4650
- simulation study for different types of gas heat pumps
  - different system layout
  - climates
  - building types
  - different sources
- field test in different European countries
- verify lab test results with field test SPF and simulation
- **generate trust and awareness!**

# Following presentations:

- Ivan Malenković : Gas heat pump development and performance evaluation
- Marcello Aprile: Comparing gas driven heat pumps to other technologies – a simulation study
- Axel Albers: Applications of gas driven heat pumps and field test results

# Information and contact

[www.annex43.org](http://www.annex43.org)



Operating Agent:

Peter Schossig

Fraunhofer ISE

[peter.schossig@ise.fraunhofer.de](mailto:peter.schossig@ise.fraunhofer.de)

# EUROPEAN HEAT PUMP SUMMIT

POWERED BY CHILLVENTA

SYMPOSIUM + EXPO  
NUREMBERG, 20-21.10.2015

Industrial | Commercial | Residential  
Heating & Cooling | Components & Equipment

[hp-summit.de](http://hp-summit.de)

NÜRNBERG / MESSE