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# The Future of Solar Thermal Energy in Buildings - Important Pillar or Minor Element?

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**Gerhard Stryi-Hipp**

*Coordinator Smart Energy Cities*

Fraunhofer Institute for  
Solar Energy Systems ISE

*President*

European Technology  
Platform on Renewable  
Heating & Cooling

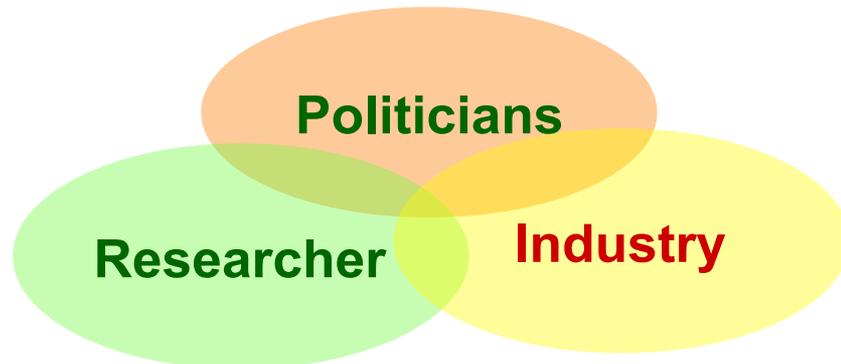
**SHC-Conference**

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# What is the future of Solar Thermal Energy in general?

The Solar Thermal Technology Platforms are working since 2005 on European and German level on visions and deployment concepts

## Technology Platform concept



Objective: accelerate the technological development

## Solar Thermal Vision 2030

Role of solar thermal energy in 2030, which technologies will be used?

## Strategic Research Agenda

Which R&D is necessary to let the vision become reality?

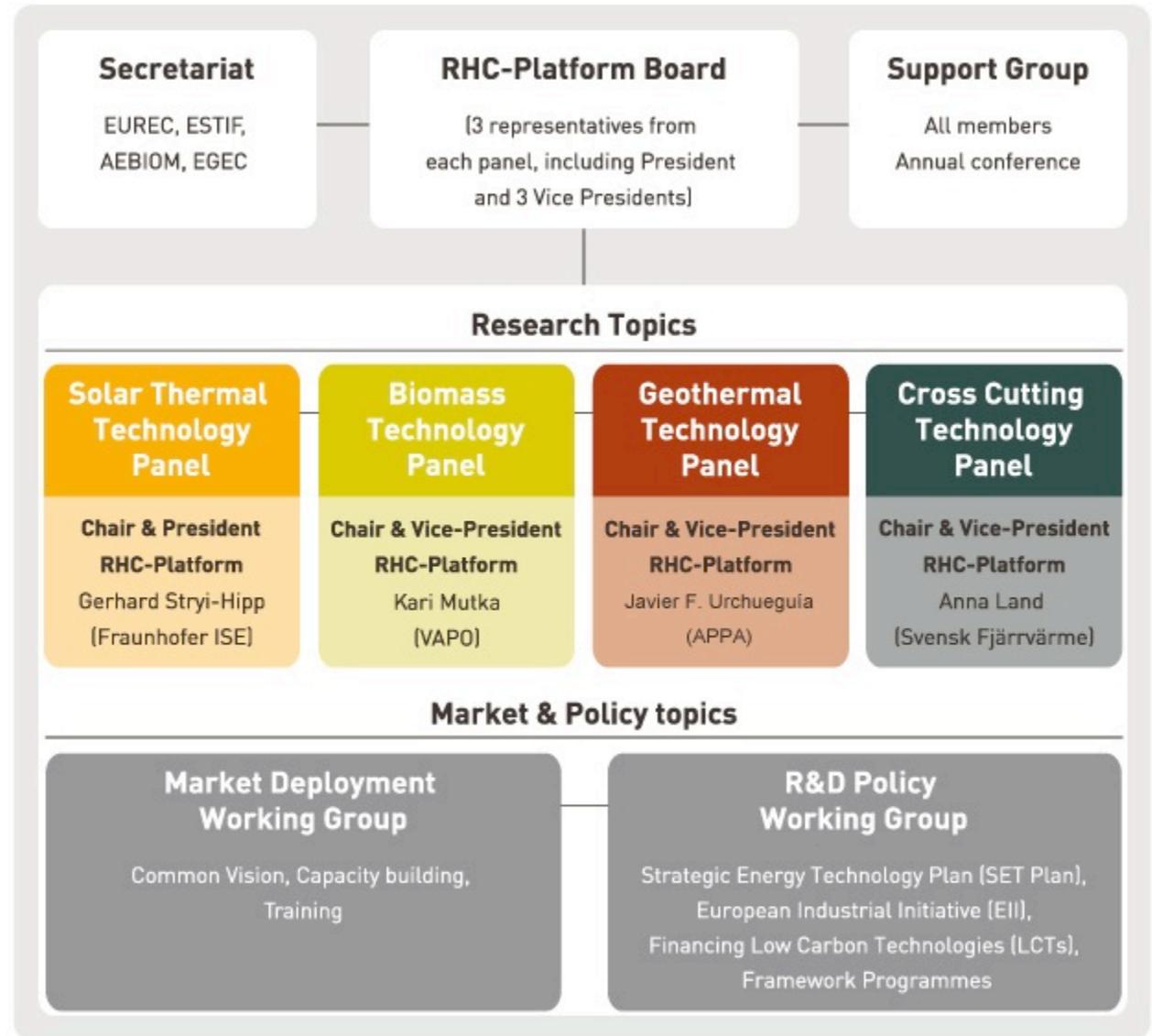
## Implementation Roadmap

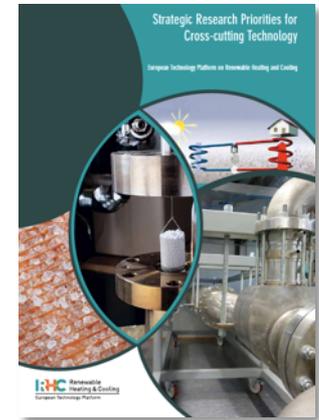
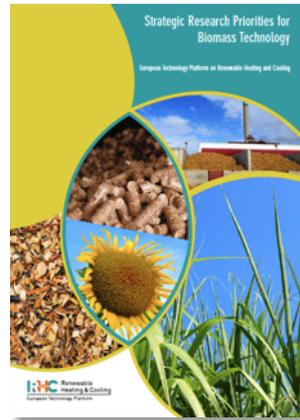
Working on R&D programs, political advice, ...

## Facts and figures

- Founded in 2008
- 4 panels, led by steering committees
- Supported by the European Commission
- More than 600 members
- Annual conference

[www.rhc-platform.org](http://www.rhc-platform.org)





**Common  
Vision  
2020 - 2030 -  
2050**

----- **Strategic Research Priorities of** -----  
**Solar  
thermal**      **Biomass**      **Geo  
thermal**      **Cross-  
cutting**

**Under development: Roadmap of the RHC-Platform**

# Solar Thermal Vision 2030

of the Solar Thermal Technology Panel of  
the European Technology Platform on RHC

- **New buildings: Solar-Active-House**  
100% solar heated buildings (building standard)

- **Existing building stock: Solar Refurbishment**  
Solar refurbished buildings will be the most cost effective way to refurbish the building stock (solar fraction > 50%)

- **Industrial + Agricultural Solar Applications**  
Solar thermal systems will cover process heating and cooling demands

- **Solar district heating and cooling networks**  
will be widely used in urban areas

**Overall goal: ca. 50% of the low temperature needs (up to 250°C) will be provided by solar thermal**



# The vision fits very well with the European policy

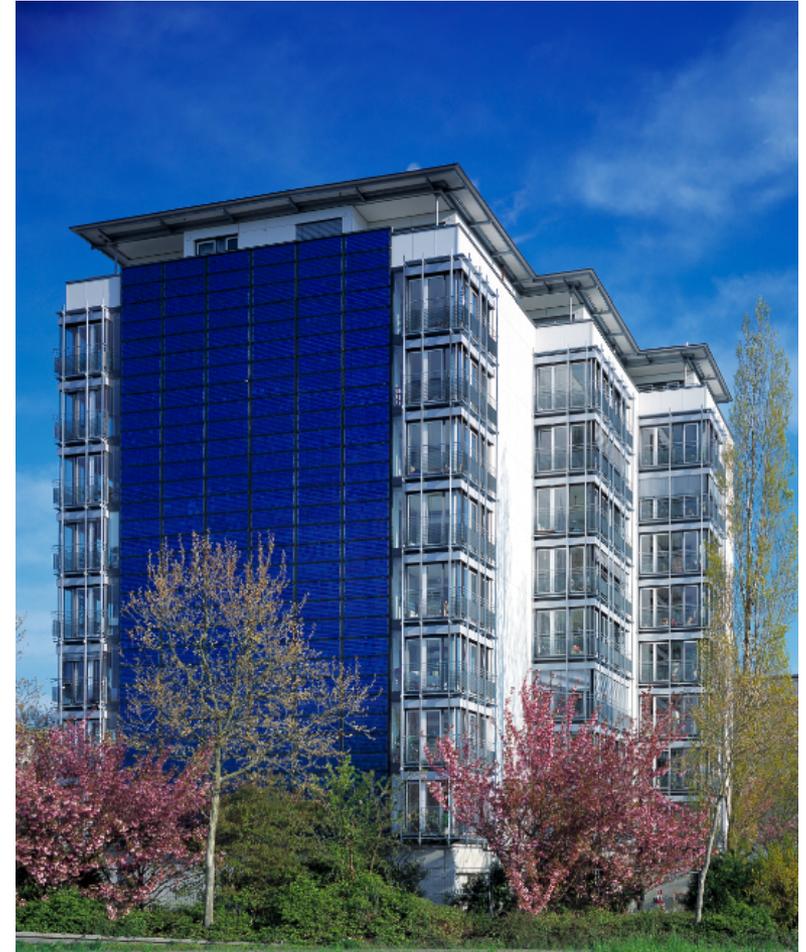
Buildings have to be nearly zero-energy buildings by 2020

Buildings will use their roofs and façades to produce electricity and heat.

Solar thermal energy **can be a relevant path** to achieve the goal of the European Directive of nearly zero-energy buildings!



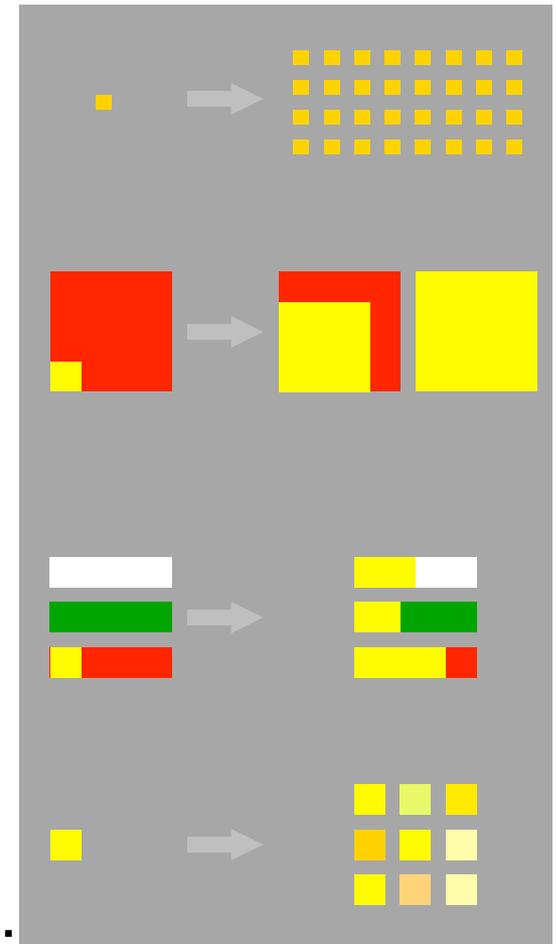
Source: Schüco



Source: Hotz Architekten

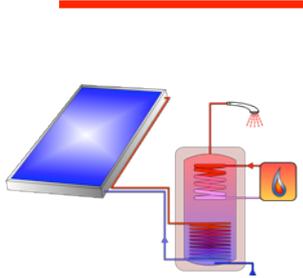
# Four strategies to develop the full potential of ST and related R&D tasks

1. The **number of solar thermal systems** has to be sharply increased  
**=> lower costs for standard technology,...**
2. The **share of solar thermal energy per building** has to be increased step-by-step up to 100%  
**=> system technology, storage tanks,...**
3. **Existing technology to be introduced in new market segments** like public buildings and commercial sector  
**=> collector & system technology,...**
4. **New technologies & applications** have to be developed like district and process heating and on longer-term solar assisted cooling  
**=> component, system & application technology,...**

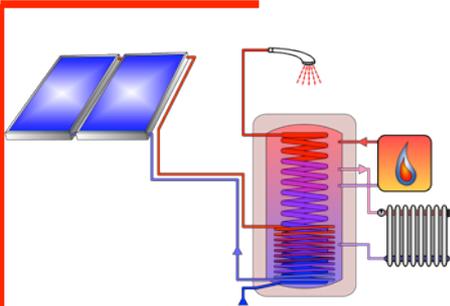


# From SDHW only ..... to 100% solar heated buildings

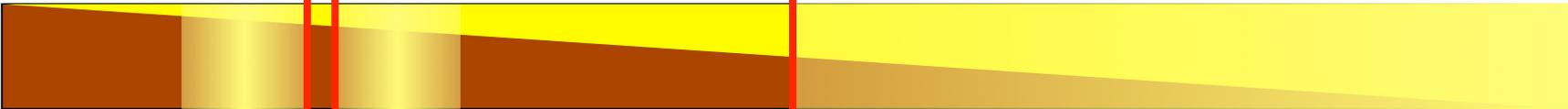
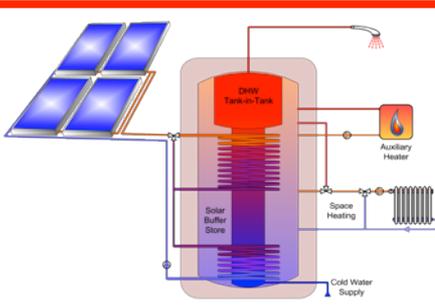
**SDHW**  
solar domestic  
hot water heating  
**10%-20%**



**SDHW + space  
heating support**  
**20%-30%**



**'Solar-Active-House' mainly heated by solar**  
**SDHW + space heating support (large share)**  
**50% - - - - - 100%**



0%    10%    20%    30%    40%    50%    60%    70%    80%    90%    100%

Share of solar thermal energy in the heat demand of a building

# Are we on the track to achieve the solar thermal vision?

## Market status and perspective Germany and EU27

### ■ Solar thermal market Germany

2009: - 25%    2010: - 25%

2011: + 10%    2012: - 9%

**1-7/2013: - 12%**

**=> Stagnation**

### ■ Solar thermal markets in Europe

**Most countries are declining** or stagnating (France, Spain, Italy), only a few countries are growing (Poland, Denmark, Belgium)

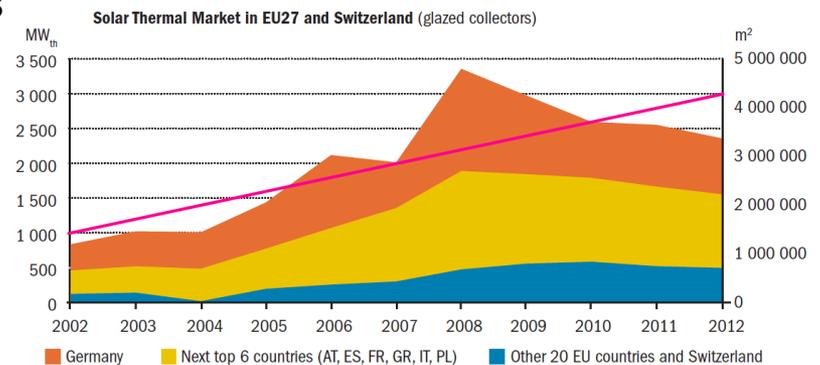
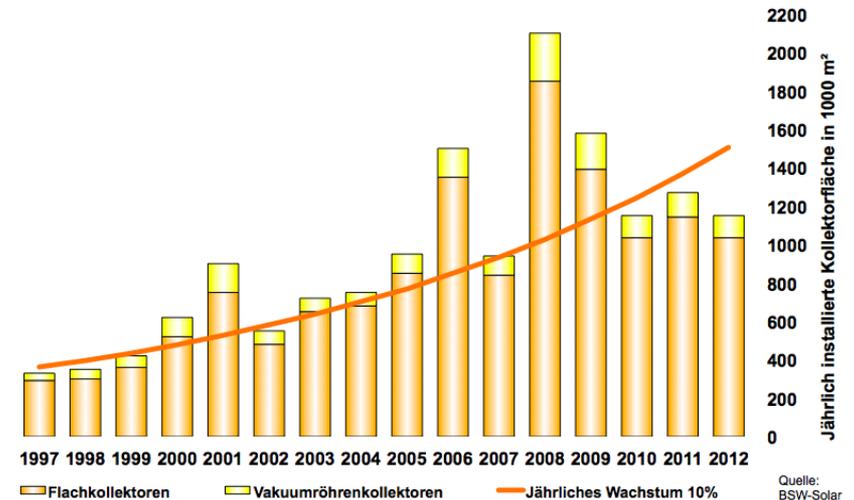
### ■ Perspective 2020

National Action Plans of EU member countries assume moderate growing demand

### ■ Long-term vision (2030-2050)

**High targets are set** in the vision of the European Technology Platform:  
**up to 50% Solar thermal on heat demand**  
**= 8 m<sup>2</sup> collector area/inhabitant**

Development of the German solar thermal market



# Perspective solar thermal: the development of the competing technologies is essential

## 1. competition: fossil fuels against renewable energy sources (RES)

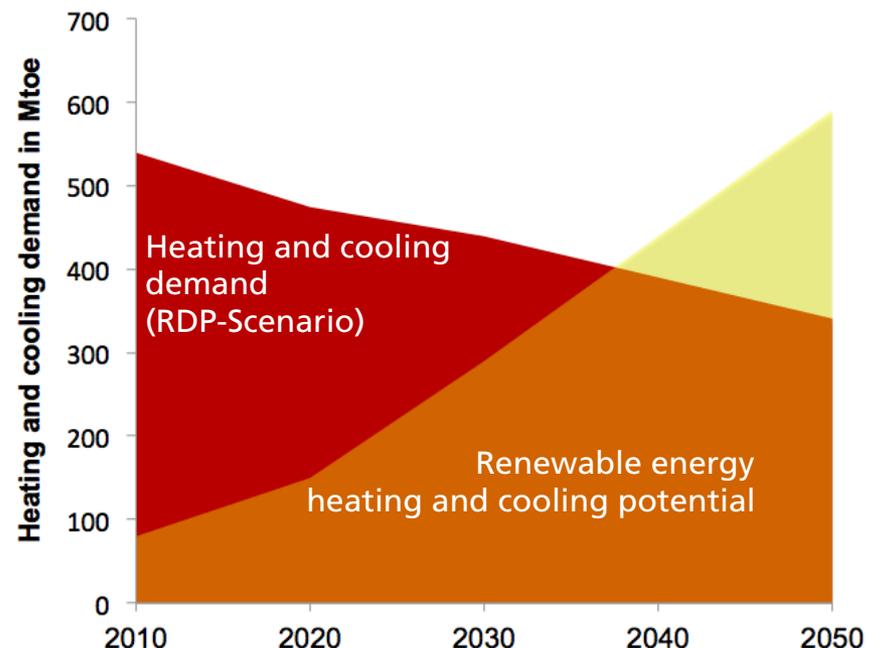
Due to scarcity (peak oil), growing import dependency and/or climate change regulation fossil fuels will be replaced by renewable energy sources

**Renewable energy sources will replace fossil fuels!** (but solar thermal is not benefitting automatically)

## 2. competition: solar thermal against other RES (Biomass, Geo thermal, heat by RES electricity and heat pumps,...)

**Solar thermal lost competitiveness – the perspective is unclear!**

## Renewable energy sources could deliver 100% of the European heating and cooling demand by 2040



Source: EHC-platform, Common vision for the RHC-sector, 2011  
RDP-Scenario = Full Research, development and policy scenario

# How optimistic are you regarding the future of solar thermal energy in buildings?

- Solar thermal energy in buildings means **talking about space heating with increasing solar fraction**  
=> ST will stay marginal if only DHW is generated
- Nearly zero-energy buildings and passive houses can reduce space heating demand significantly  
=> **But a lot of existing buildings will not be turned into passive houses and solar thermal could be an alternative**
- **Vision and strategies are developed**, roadmap will be finalized soon
- **Increased awareness** for solar thermal and heating and cooling, increased budgets for solar thermal research, at least in Germany and Austria
- **However**
  - **European solar thermal markets are declining or stagnating**
  - **Solar thermal is losing competitiveness**
  - **The belief in the great future of solar thermal is disappearing**

# What can we learn from these findings?

- The situation of the European solar thermal sector is dramatic : stagnating markets and no idea, how to overcome this market phase  
**=> a realistic, brutally honest review of the ST situation is necessary**
- The attractiveness to invest in ST was often overestimated in the past and did not improve over the last years  
**=> due to a more realistic view of the customer and growing competition, solar thermal lost its attractiveness**
- Solar thermal is very much dependent on external factors (oil price, public awareness, ...), which we cannot be influenced  
**- but there are several weaknesses in the solar thermal sector, which can be changed by the sector us** (price, reliability, yield transparency,...)
- The attractiveness of solar thermal will increase with fuel price increase, with limited success of energy efficiency, with a realistic assessment of the alternatives (PV, biomass,...)  
**- but the framework conditions will improve only mid or long-term, and ST will only benefit, if it is able to overcome its weaknesses**

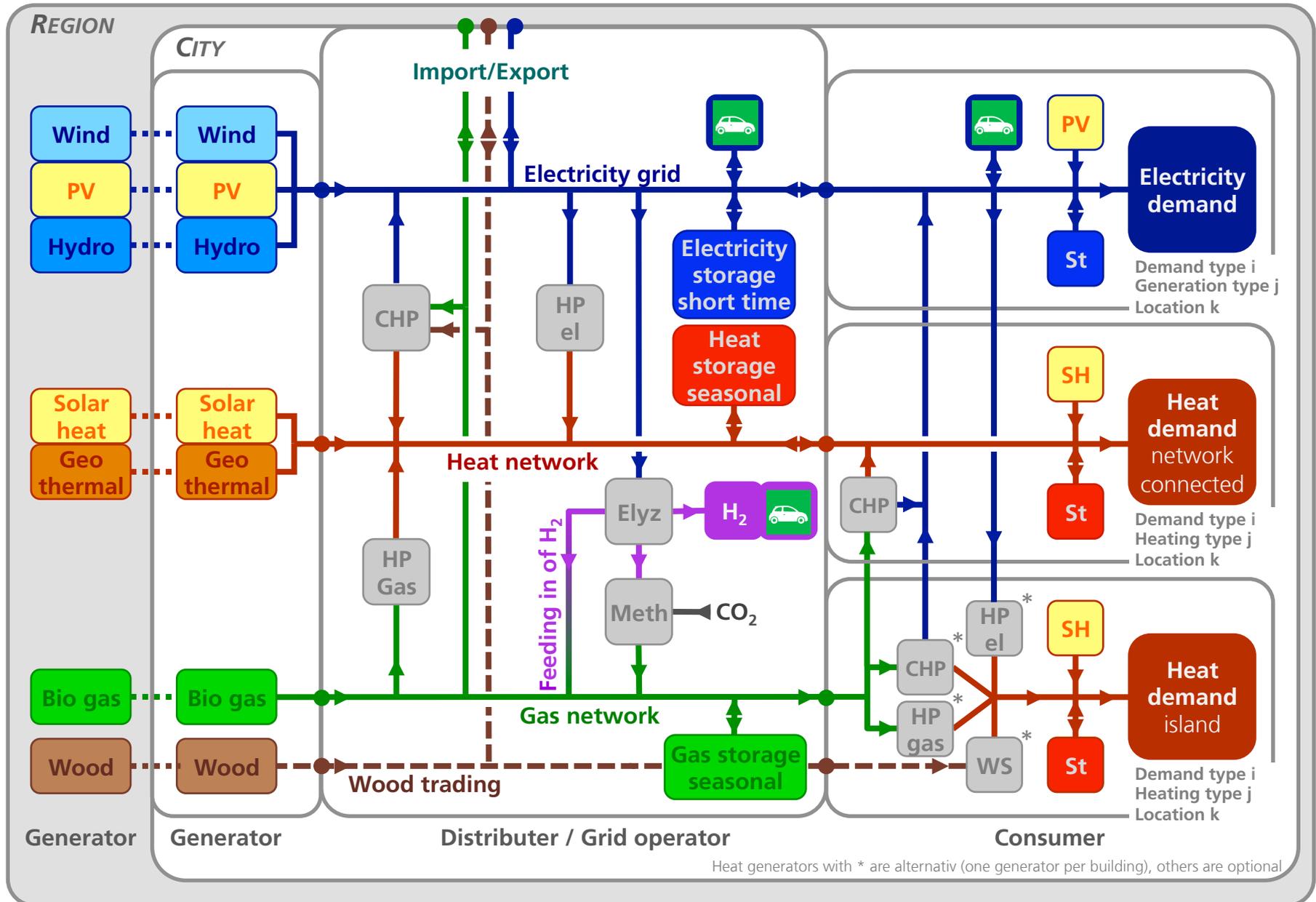
# Topics which we have to work on

- **Reliability:** Did we really solve the challenge of stagnation (especially by increasing solar fraction)?
- **Reduction of complexity** will help to reduce installation failures and costs and increase reliability
- **Integration** of the solar thermal into the heating system of the building
- **Integration** of the solar thermal collectors into the building envelope
- **Transparency on energy yield:** we do not inform the customer about the expected solar energy yield and the energy saved by solar thermal energy
  - => he cannot compare ST price with other technologies
  - => he cannot compare different offers of solar thermal systems
  - => price reduction by competition is not happening
  - => he often does not know, if his system is working well
- **Integration of solar thermal energy into the overall energy system** (collector > solar thermal system > heating system > building > heating concept of the district > overall energy system)



**We have to analyse and to understand the relevance of solar thermal energy in a sustainable energy system in order to identify the opportunities for solar thermal energy in future**

# Urban Energy System based only on Renewable Energies



HP el/gas = Heat pump electric / gas driven, CHP = Combined heat and power, WS = Wood stove, St = storage, SH = Solar heat, Elyz = Elektrolyzer, Meth = Methanation

# Electricity generation from PV and Wind in Germany

## There is not enough RES electricity in winter for heating!

Monthly electricity generation from Wind and PV in 2012

Monthly generation  
Wind + Photovoltaic:

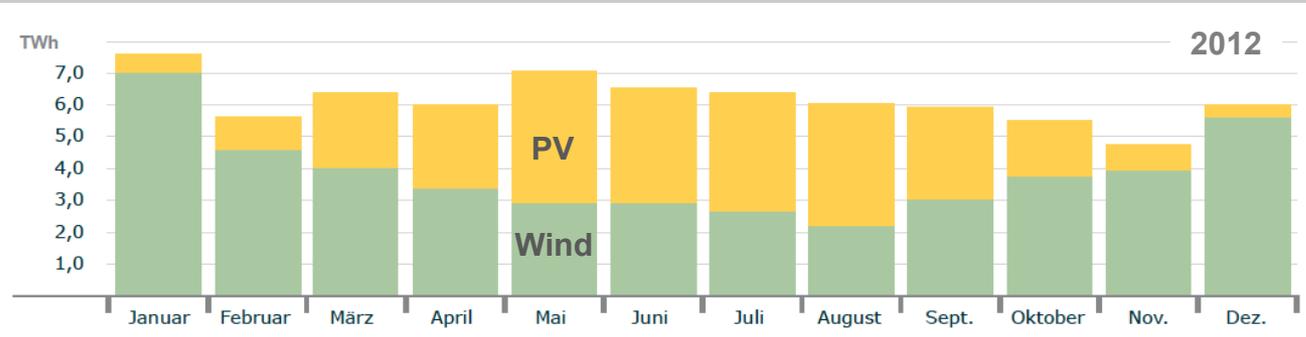
Min.: 4.7 TWh

Max.: 7.6 TWh

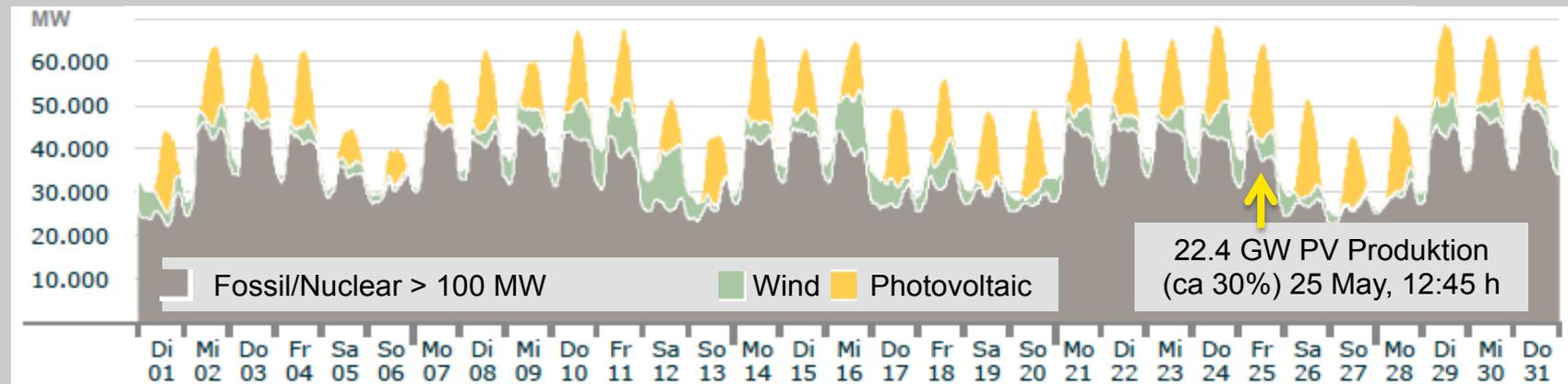
Annual generation:

PV: 27.9 TWh

Wind: 45.9 TWh



Electricity generation May 2012: Wind, PV and fossil/nuclear power stations > 100 MW



# Heating and cooling in Smart Energy Cities

- **Smaller buildings** can **become plus-energy buildings** and produce more electricity as needed and enough heat (and cold) to cover the needs by solar systems on roof and façades
- **Urban areas with high building density** can use **district heating and cooling (DHC) systems** with seasonal heat stores which allow a high share of renewable energy
- **Smart solutions** will **combine electric and DHC systems** by using excess electricity from PV and Wind, integrating heat pumps and combined heat and power plants with biomass as well as geothermal and solar thermal systems



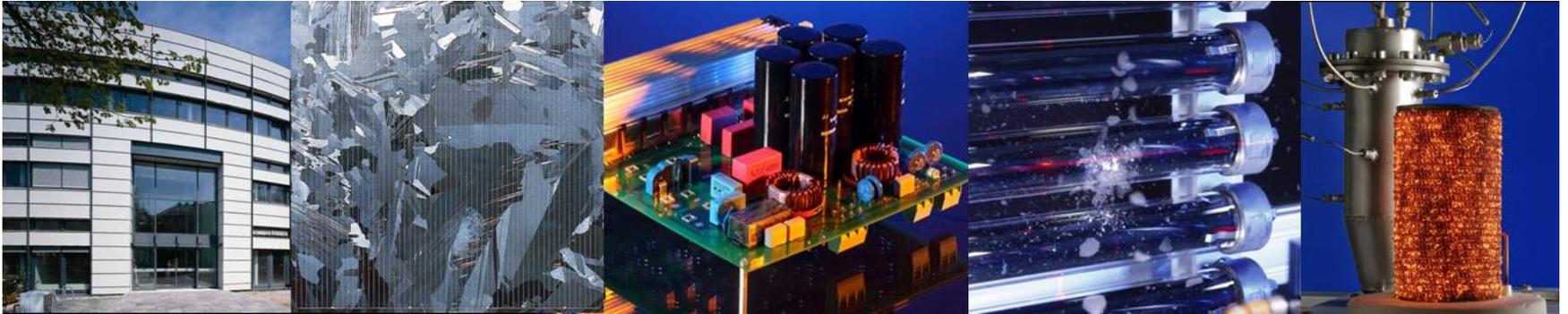
Top to bottom: District heating system with solar thermal collectors in Neckarsulm, seasonal heat store in Hamburg and Eggenstein, Solar PV district in Freiburg. Pictures: Solites, Solarsiedlung

# Conclusions

- **Solar thermal energy has the potential to become one of the main heat sources in buildings**
- **Today bad market development in Europe**
- **The solar thermal sector has to identify its weaknesses and has to work hard to overcome them**
- **Important elements: cost reduction, system simplification and transparency on the energy yield**
- **The solar thermal sector has to analyse its role in the sustainable energy system**



# Thank you very much for your attention!



Fraunhofer Institute for Solar Energy Systems ISE

Gerhard Stryi-Hipp

[www.ise.fraunhofer.de](http://www.ise.fraunhofer.de)

gerhard.stryi-hipp@ise.fraunhofer.de