

# Renewable energy for SMEs

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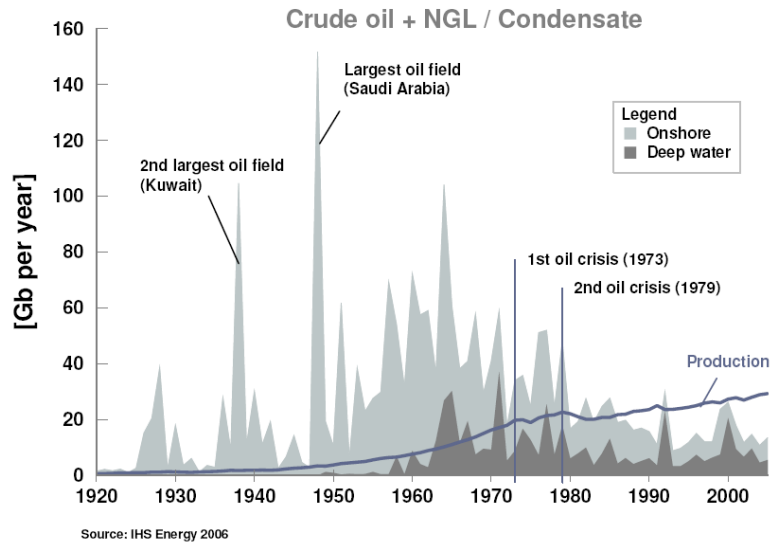
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## The Energy Challenge

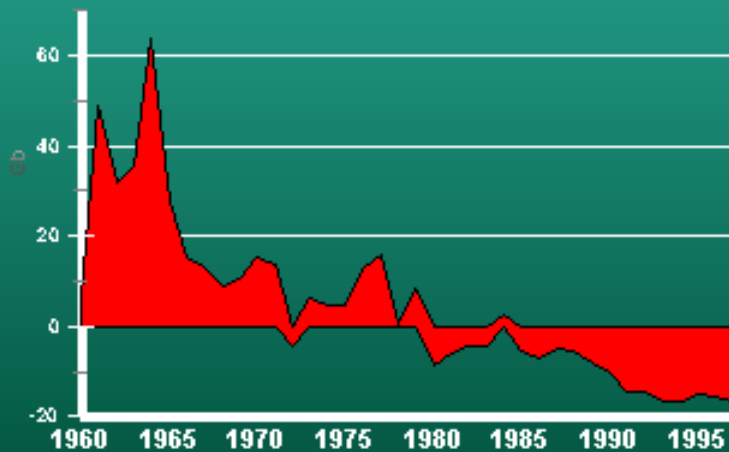
### why do we deal with energy efficiency and renewable resources?

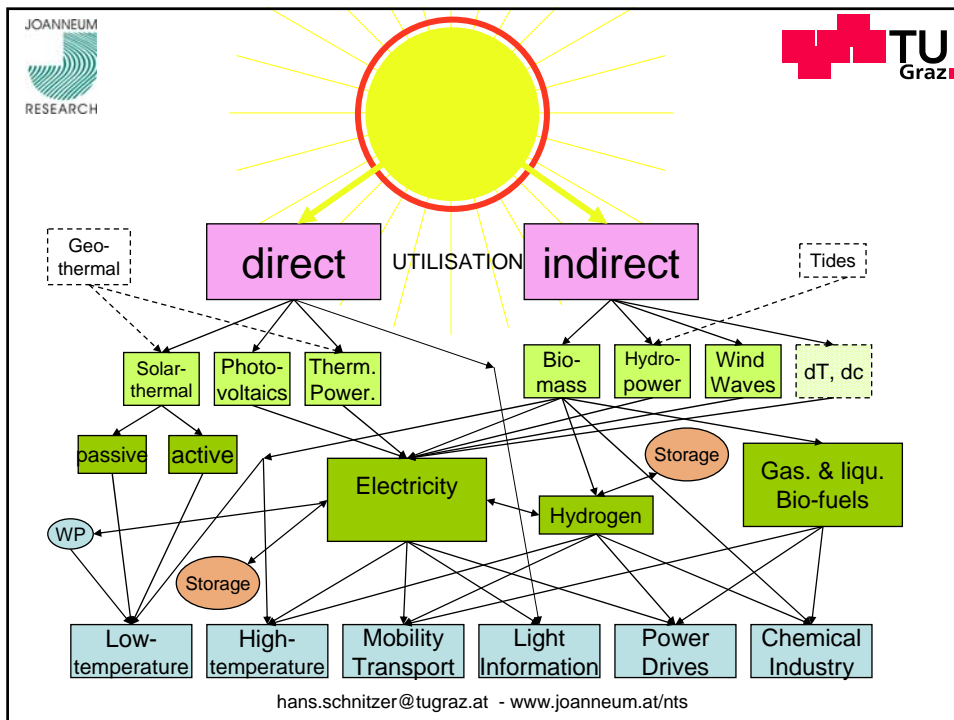
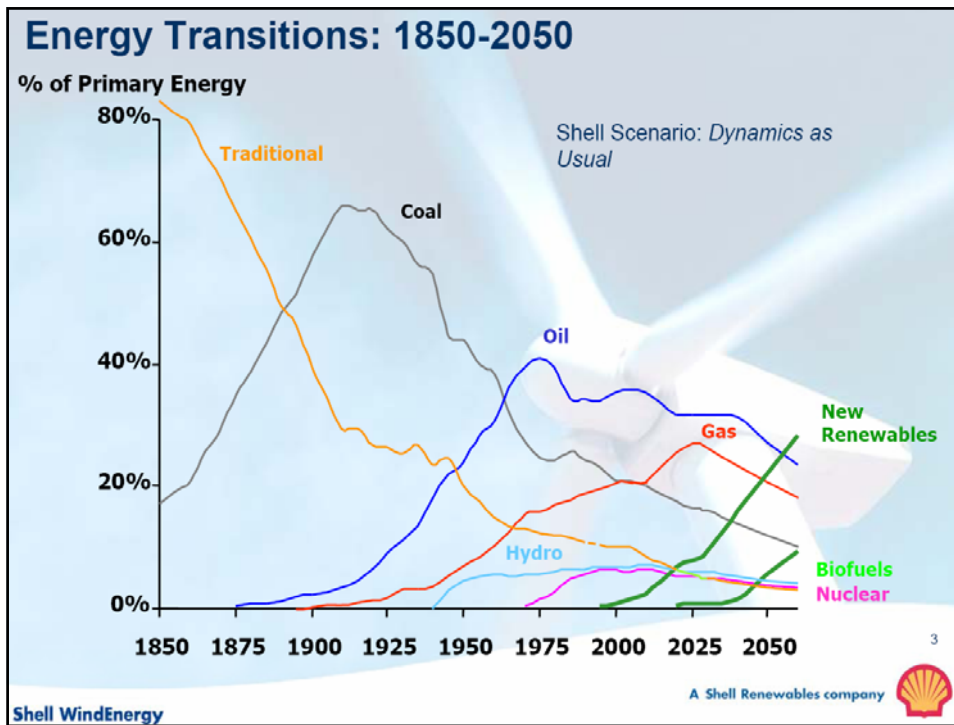
- World energy demand will increase significantly due to:
  - Growing world population
  - Fast economic growth in large countries
  - Globalization
  - ...
- World energy supply is mostly fossil-based and will remain so for decades
- Energy-related worldwide environmental impacts will continue to grow: GLOBAL WARMING
- Access to affordable energy is not uniform
- Energy will continuously increase in price

# History of oil discoveries and production



## GROWING DEFICIT Between Discovery & Consumption





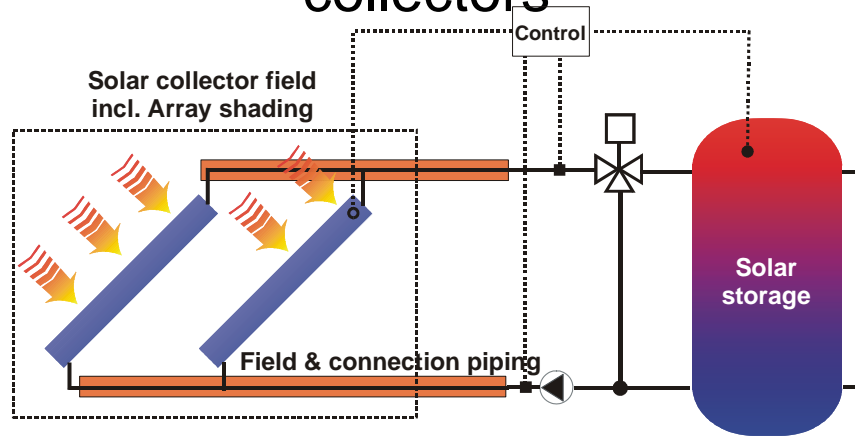
## Hierarchy of Approaches to Energy Efficiency

- Reduce demand, cut peak demand
- Utilize available waste heat
- Cogeneration (heat / power / cold,...)
- Renewable forms of energy
- Sell waste heat

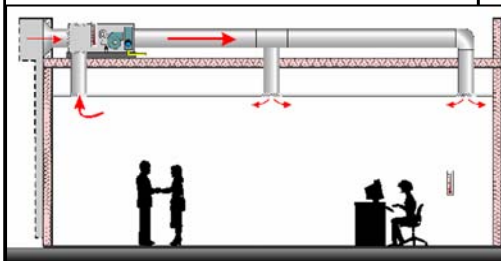
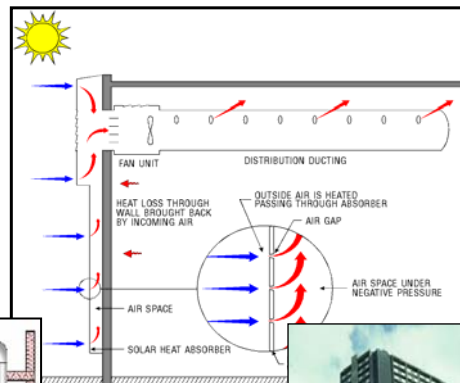
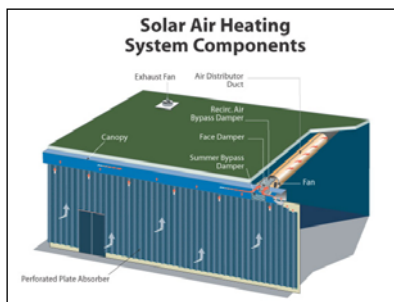
## Renewables for space heating and hot water

- Solar thermal collectors
- Biomass boilers
- Waste heat from motors, compressors, ...
- Solar air heating for production halls

## Hot water from thermal solar collectors



## Solar air heating systems for production halls and apartment buildings



Apartment Building,  
Ontario, Canada



# Facades for active generation of electricity and heat



# Solar heat for a micro- brewery

Brauerei Neuwirth



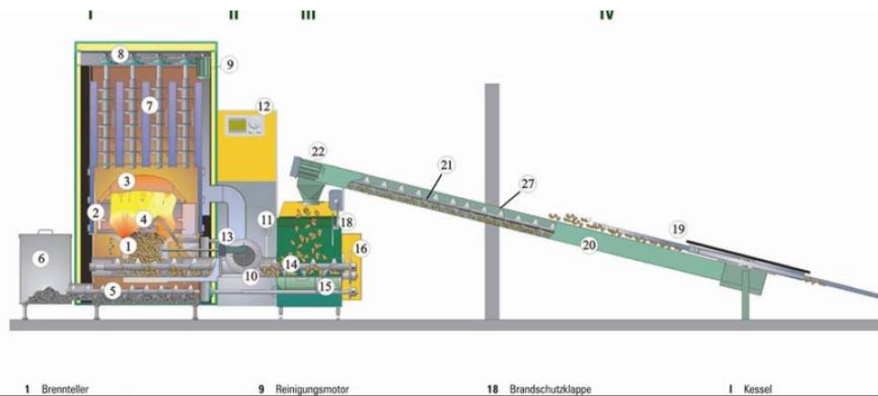
Collector: 14 kW<sub>th</sub> (20 m<sup>2</sup>)

Hot water storage: 1 m<sup>3</sup>

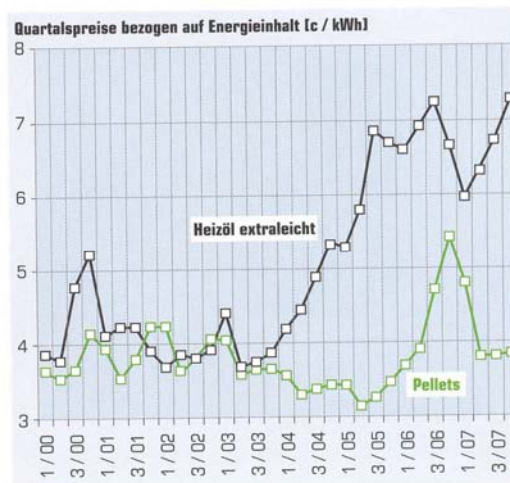
Brewing vessel: 400 liter

# Biomass boilers

Cross section of KWB Multifire D 15 – 100 kW  
and KWB Multifire ZI 15 – 100 kW with stirrer



# Development of prices for Pellets and light fuel oil in Austria



(Quelle: IWO, Genol,  
proPellets Austria;  
Stand: 7. November 2007)

## Electricity from renewables

- “Green supply”
  - Engage in wind energy installations
  - Change to “green supplier”
  - ...
- Generate electricity by your own
  - Diesel engines, emergency generator (Biodiesel, Biogas,...)
  - Photovoltaic
  - Biomass plus ORC, Stirling or steam turbine
  - Small scale hydro power
  - (Wind)
  - (Geothermal)

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## PV-Generator at Hartlauer

- 629 polycrystalline KYOCERA modules KC120-1 with each 120 Wp. This results in a power of 75,48 kWp.



## PV on buildings

- Not usually cost-effective without subsidies
- Justified by:
  - Image
  - Environmental benefits
  - Market stimulus
- Long-term commitments by manufacturers, governments and utilities have reduced costs



Solar Roofing System  
Photo Credit: Atlantis Solar Systeme AG



PV Integrated in Office Glazing  
Photo Credit: Solar Design Associates (IEA PVPS)



Shopping center  
Weiz



OÖ Trendforschungsinstitut,

Photos: KW Solartechnik Graz



List-Halle Graz



Plus-energy dwellings in  
Weiz

Photo: KW Solartechnik Graz

## Photovoltaic modules mounted on noise barriers

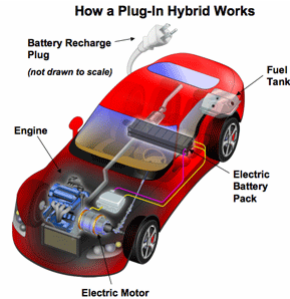


Highway near Gleisdorf

- Changeover to Biodiesel
- Changeover to Biogas
  - trucks
  - Passenger cars
  - Fork lifters, ...
- Changeover to green electricity
  - Fork lifter
  - Passenger cars (Plug-in Hybrid)

# Plug-In Hybrid with green electricity

- A **plug-in hybrid electric vehicle (PHEV)** is a **hybrid vehicle** with **batteries** that can be recharged by connecting a plug to an **electric power** source. It shares the characteristics of both conventional **hybrid electric vehicles** and **battery electric vehicles**, having an **internal combustion engine** and batteries for power.
- The cost for electricity to power plug-in hybrids for **all-electric operation** in California has been estimated at less than one quarter of the cost of **gasoline**. Compared to conventional vehicles, PHEVs can reduce **air pollution** and dependence on **petroleum**, and lessen **greenhouse gas** emissions that contribute to **global warming**. Plug-in hybrids use no **fossil fuel** during their **all-electric range** if their batteries are charged from **renewable energy** sources. Other benefits include improved national **energy security**, fewer fill-ups at the filling station, the convenience of home recharging, opportunities to provide emergency backup power in the home, and **vehicle to grid** applications.



Source: [http://en.wikipedia.org/wiki/Plug-in\\_hybrid](http://en.wikipedia.org/wiki/Plug-in_hybrid), March 2, 2009



# Biogas cars

- Passenger cars
- Trucks
- Fork lifters



# Light

## Solar lamps



## Biogas lamps



www.joanneum.at/nls

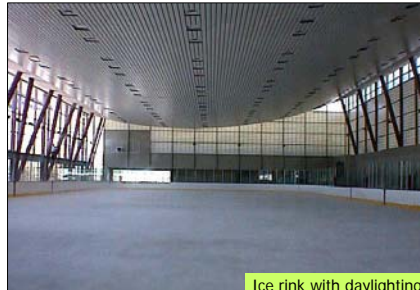
# Daylighting



Tageslichtrohr



Quelle: [www.baulinks.de/webplugin/2005/1070.php4](http://www.baulinks.de/webplugin/2005/1070.php4)



Ice rink with daylighting

Photo Credit: Skating Club of San Francisco

# Solar Cooling

## Office building



- 2 heat driven absorption chillers with 90 kW
- 226 m<sup>2</sup> /160 kW Solar collectors
- 4 m<sup>3</sup> storage
- 220 kW back cooler
- Back up for peak demand: compression chiller with 30 kW.

## Wine cooling

- 100,8 m<sup>2</sup> Flat plate collectors
- 40 kW wood chip boiler
- 2 x 2000 l Storage
- 10 kW Ammonia/Water Absorption Chiller
- 500 l cold brine storage
- Cooling cycle with micro-cooling tower
- Remote monitoring



Quelle: S.O.L.I.D.

Graz (2007)

2AMC  
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## Cooling and air conditioning with cold from the night

Like storing solar heat from the day to the night, cold from the night can be stored for the day.

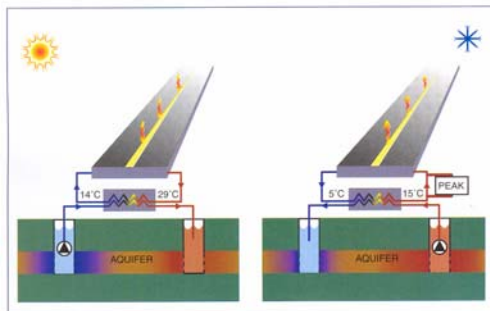
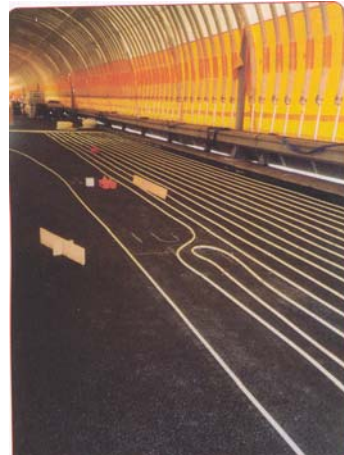
- Cooling of mass (buildings, water,...) during the night
- Operation of refrigeration machine in the nights and storage of ice, ...
- Installation of water tanks in cooling cycles that are chilled at night and replace chiller operation during the day

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J F M A M J J A S O N D

## Miscellaneous

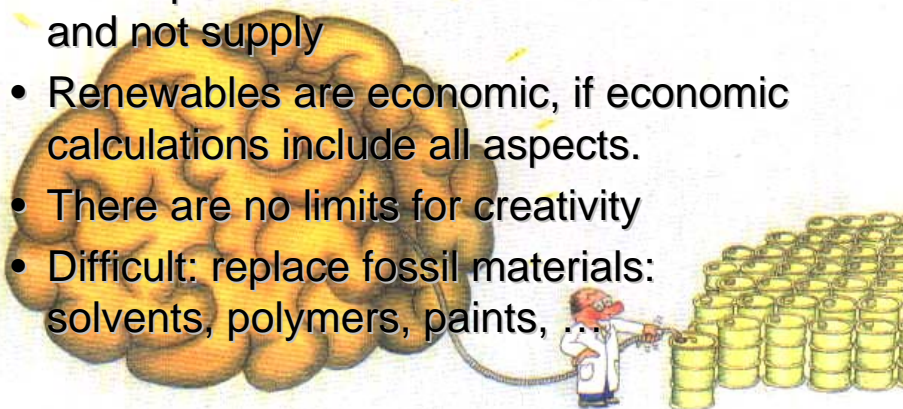
- De-icing of roads and parking lots  
(can also be done with waste heat from processes)



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## Let's sum up!

- It is important to consider the **SERVICE** and not supply
- Renewables are economic, if economic calculations include all aspects.
- There are no limits for creativity
- Difficult: replace fossil materials: solvents, polymers, paints, ..



## How to make a SMEs neutral regarding global warming

- Electricity:
  - Equity holding in wind farms
  - Change over to green electricity
  - Photovoltaic installation
  - Daylighting and Solar lamps
- Heat:
  - Biomass
  - Thermal solar installations, façade collectors, ...
  - Utilization of waste heat, district heating,...
- Mobility
  - Bio fuels
  - Green electricity
- other:
  - compensation through international engagement

EFFECTIVITY

## Contact and further information:

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