

For Our Environment

Umwelt Bundesamt

Sustainable Built Environment 2016 Hamburg

COP21 and the consequences for sustainable building

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COP21 and the consequences for sustainable building

Content

- 1 COP 21
- 2 A Greenhouse Gas Neutral Society
- 3 Consequences for buildings

17.03.2016 SBE 16 Hamburg | UBA Dr. Harry Lehmann 2

COP21 and the consequences for sustainable building

COP 21 – Paris Agreement

MAJOR ACHIEVEMENTS

- Legally binding Paris Agreement with universal participation of 195 member states
- Aims (Article 4):
 - Holding the global average temperature increase to „well below 2 ° C“ and pursuing efforts to limit to 1.5 ° C
 - Peaking of greenhouse gas emissions as soon as possible
 - Net zero balance in the second half of this century



→ Complete decarbonization of the economy

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COP 21 – Paris Agreement

RAISING AMBITION

- all states put forward voluntary Intended Nationally Determined Contributions (INDCs)
- 5-year-ambition cycle
- Transparency framework and global stocktake

→ Clear signal to investors

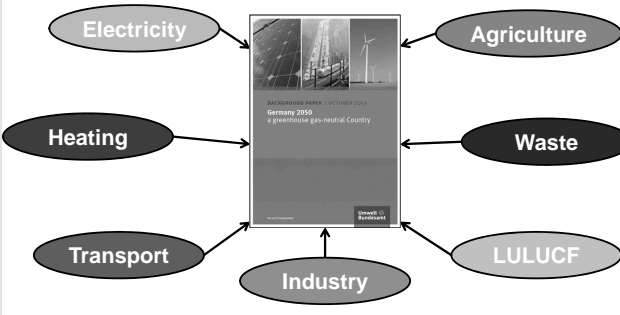
UN Secretary-General Ban Ki-moon: „*The low-emissions transformation of the global economy is inevitable, beneficial and already under way.*“ (Paris, 07.12.2015)



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Elements of a Greenhouse Gas Neutral Society



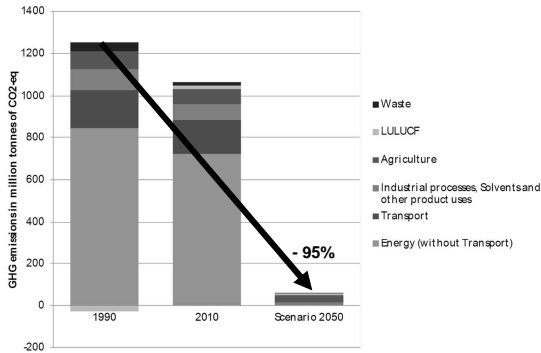
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Elements of a Greenhouse Gas Neutral Society

- Per capita emissions of just one metric ton of CO₂eq in 2050
- Final energy demand in 2050 reduced by 50 % versus 2010
- Sector coupling via “Power to Gas” and “Power to Liquid” implies a steep rise in electricity consumption
- The net energy to be generated amounts to approximately 3.000 TWh p.a. predominantly produced by wind and PV installations (2014: 511 TWh)
- No use of neither energy crops nor CCS nor nuclear energy is assumed

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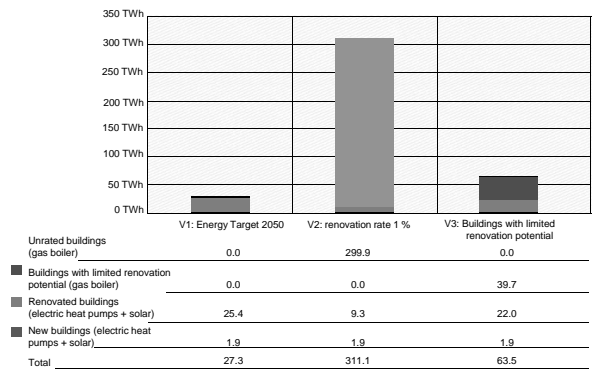
UBA scenario – sustainable space heating supply

- Reducing the high demand of heat substantially through energy savings
- Interaction between the power and heating sector is expected (Sector Coupling)

UBA scenario – sustainable space heating supply

- **Retrofitting** of the building stock as well as tightening the energy saving regulation
- A consequent **cascade** utilisation in industrial processes and external use of industrial waste heat
- **Transformation** of heating supply
 - Direct use of renewable energy
 - Use of heat pumps (Power to Heat)
- **Transformation** of process heat supply
 - As far as possible based on electricity
 - Renewable methane as a energy source
- Substantial change of **CHP** application potential

UBA scenario – sustainable space heating supply



Conclusions from the UBA 2050 scenario

- **A GHG-neutral energy supply is technically feasible.**
- In the long run the final energy demand for electricity cannot be lowered substantially but will stabilise at today's level.
- If saving potentials are consistently exploited and efficiency is increased across sectors, final energy consumption can be halved.
- Sector coupling facilitates a substitution strategy for fossil energy carriers in all sectors in the long term.
- **PTG/PTL** Conversion of renewable electricity into chemical energy sources is the key technology for sector coupling in the long run, not just to ensure a stable supply of electricity, but mainly to supply industry with fuels and chemicals and the transport sector with fuel.

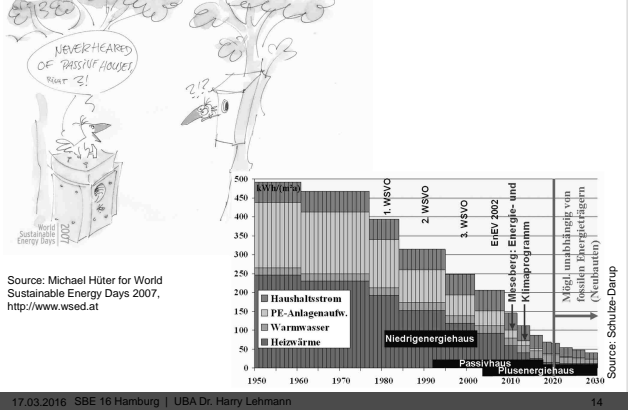
Outlook: Resource Efficiency and GHG Neutrality (RTD)

- In an ongoing study (publ. in 2017) we examine the **link** between GHG neutrality and resource demand.
- After 2050 target scenario we look at **viable transformation paths** towards a GHG neutral (-95%) and resource efficient (-80%) future for Germany.
- Deduction of possible transformation steps for 2030 and 2040 to reach the 2050 targets.
- Which key measures, technologies, societal developments are necessary at different points in time?
→ Economic and ecological assessment
- Conflicts of goal / interactions between emission reductions and resource protection → Optimization approaches

Final remark

- A greenhouse gas neutral society in 2050 is much more than 100 % renewable energy.
- It's a tremendous change.
- Therefore we need to foster public acceptance and a conjoint, well-coordinated collaboration throughout Europe.

Best technology: to be brought into the building stock

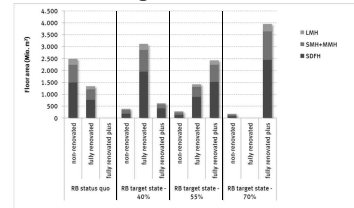


Proving examples by UBA

- „Haus 2019“, Berlin
 - Completed in 2013
 - Nearly Zero Energy Building
 - 31 offices, 2 meeting rooms
 - Wooden construction
- New Office Building, Dessau
 - To be completed in 2017
 - Zero Energy Building
 - 102 offices, 2 meeting rooms
 - Walls and windows with passive house quality
 - PV on roof and façade
 - Geothermal energy for heating and passive cooling

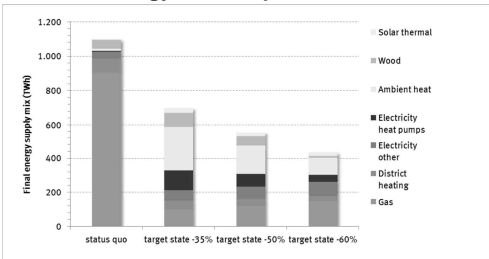


„Climate neutral building stock 2050“



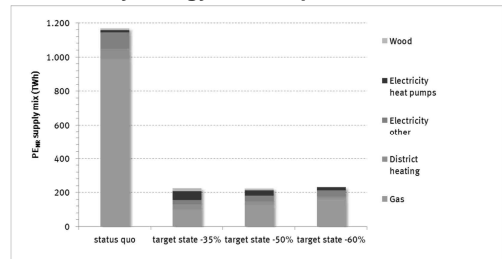
- Study conducted by Öko Institut and Fraunhofer ISE for UBA
- **Main task:** How to transform the building stock to reduce (non-renewable) primary energy consumption by 80%?
- Central boundary conditions:
 - renovation standard „fully renovated“: below recent legal requirements
 - renovation standard „fully renovated plus“: passive house quality
 - Annual refurbishment rate: increase from today 1 % to 1.6 % up to 2.6 %

Results: Final energy consumption



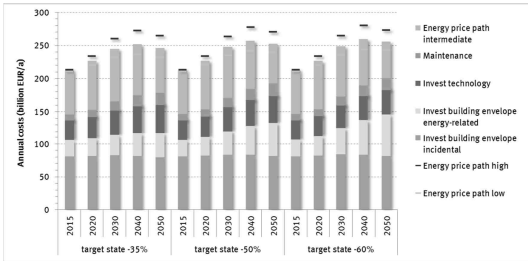
- Target states are derived from combinations of renovation standards and heating technologies
- Target states differ by
 - reduction of final energy consumption: -35% ... -60 %
 - energy supply mix: more renewables vs. more gas

Results: Primary energy consumption



- „Almost“ climate neutral: Consumption of non-renewable primary energy reduced by 80 %
- Filling the gap: Gas replaced by heat pumps, renewable sources for district heating

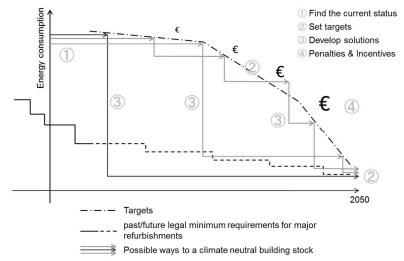
Results: Costs



- No significant difference in expected annual costs

→ Report to be published in March 2016
<http://www.umweltbundesamt.de/publikationen/klimaneutraler-gebäudebestand-2050>

The „long-term road map for transformation“



- Comprehensive strategy is needed for the conversion of the building stock

Thanks for your attention!
Do you have questions?

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