Perspectives for the Energy Transition

End-use Sectors & Heat Pumps

Michael Taylor, 16 May 2017
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Business-as-Usual is not an option

- Climate change effects will be huge
  - Impacts on food supply, migration
  - The world has agreed at COP21 to fix the problem “well below 2 degrees climate change”
- Rising air pollution problems in China, India etc. caused by fossil fuel combustion
- Nuclear uncompetitive in most countries, renewables competitiveness is rapidly improving. CCS development is lagging
- Rising energy demand in emerging economies, that will seek to max. independence, manage import bills
- Rapid technological change is driving energy transition
- Increasing attention for national economic activity, jobs, social and development aspects of renewables
Renewables and energy efficiency account for 90% of emission reduction potential
The end-use sectors transformation is lagging

By 2050, total energy-related CO₂ emissions will need to decrease to below 10 Gt/yr

CO₂ emissions from the power and buildings sectors will be almost eliminated
Improved health, reduced climate change

Savings due to reduced externalities exceed the costs by a factor between two and six in 2050. Outdoor air pollution health benefits alone exceed the costs.
Decarbonising the energy sector in line with REmap increases global GDP by around 0.8% by 2050 compared to the Reference Case.

That is the equivalent of almost 19 trillion USD in increased economic activity between today and 2050.
The end-use sectors transition: untapped area

**Transport**
- Will traditional car makers able to catch up?
- Significant biofuel trade
- Materials needs (e.g. rare earth for EVs)

**Industry**
- Industry is the most challenging sector

**Buildings**
- Significant acceleration of buildings renovation

**Power**
- Growing equipment industries
- Materials needs (e.g. for batteries, inverters)
HEAT PUMPS IN EUROPE
REmap EU – developments in total RE use to 2030
DRAFT findings

- **Reference Case**
  - In 2015, 16.7% RE share
  - 25% RE share in GFEC by 2030, lower than the 27% target

- **REmap case** and the **assessment of “cost-effective options”**
  - Different cost saving pathways identified to close the gap from 25% to 27%
    - All cost-effective options in buildings and transport
    - Only wind power and solar PV power
  - Considering cost effective options, up to 31% makes economic sense based on “levelised cost of energy”
    - Requires deployment of cost-effective options in all sectors
    - Breakdown of RE use: 65% RE power consumption, 20% heating/cooling, 15% transport biofuels
  - More expensive RE options in the industry and DH sectors allow for 33% RE share in GFEC
EU building energy consumption and stock

Figure 1C1 - Historical final energy consumption in the building sector since 1990s for the EU27 Switzerland and Norway
Source: Eurostat database

Limited stock turnover
Relatively low renovation rates
The role and benefits of heat pumps in the Energy Transition

Attention shifting to end-use sectors

Heat pumps are one of just four major supply side decarbonisation options for heat in buildings (HP, DH, SWH, biomass)

• 18% EU market volume share heat pumps + solar thermal (2015)
• 2.66 mln units sold (2015) incl. 2.33 mln ASHP
• 8% of EU heating systems installed/sold (2015), 30% of water heating market (2015)

Heat pumps and low-cost thermal energy storage, integrated into grid, could provide system flexibility to increase share of VRE

Challenges remain in retrofits and scale of transition required for sustainable energy future

Important collaboration with EHPA on cost data collection
IRENA Renewable Costing Alliance: Collaboration with EHPA

**Member countries:**
- Steering group for costing analysis focus
- One workshop a year
- Must nominate institution to deliver data
- Quarterly newsletter

**Alliance Members:**
- Provide data, confidentially
- One workshop a year
- Ability to query the database in detail
- Quarterly newsletter

**Observers:**
- Quarterly newsletter
- Mailing list for new publications/analysis
Little difference in ASHP costs vs Residential

Small-scale W- or GSHP more expensive than residential
Significant difference in cost for residential heat pumps above 4 kW
Small-scale heat pump installed costs in Germany

Source: Bundesamt für Wirtschaft und Ausfuhrkontrolle (BAFA) / Federal Office for Economic Affairs and Export Control (BAFA)
Small-scale heat pump installed costs in Germany

Higher average costs:
More than compensated by higher SPF
Average costs fell as average capacity of systems increased

But all system size classes also saw reductions 2013-2015
Large-scale heat pump prices in Europe

Significant economies of scale above 100 kW but data not conclusive

More data needed to draw statistically robust conclusions
Breakdown of REmap Europe options by sector and technology

- Shares based on TFEC
- Contribution of heat pumps is 3-4 times higher in useful energy terms, given their very high efficiency
Heat pumps are part of the solution!