Roadmaps are ready
Exploring the realities of the heat transition

Brussels, February 13, 2019
Methods - A clear methodology for using data, tools and a structured state-of-the-art science-based approach

Concrete results - The heating and cooling sector can effectively be completely decarbonised using known technology on the demand and supply side

Policy - Stronger focus on implementation of energy efficiency (not just policy targets)
- Stronger support for thermal infrastructure
- Stronger connection between climate policy, security of supply policy and industrial policies

Opening the black box(es) of heating and cooling
Our Purpose in HRE4

The overall objective in this HRE project is to provide new capacity and skills for lead-users in the heating and cooling sector, including policymakers, industry, and researchers at local, national, and EU level, by developing the data, tools, methodologies, and results necessary to quantify the impact of implementing more energy efficiency measures on both the demand and supply side of the sector.
The next steps....

Methods
- A clear methodology for using data, tools and a structured state-of-the-art science-based approach
- Open set of data, methods, tools and maps

Concrete results

Policy

The next actions should be taken by
- Energy Union (EU Commission, DG Energy)
- National governments and agencies
- Regional and local stakeholders
- Businesses and Industry

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- A clear methodology for using data, tools and a structured state-of-the-art science-based approach
- Open set of data, methods, tools and maps

**Concrete results**
- The heating and cooling sector can cost-effectively be completely decarbonised using known technology on the demand and supply side
- Targeted communication channels

**Policy**

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- Energy Union (EU Commission, DG Energy)
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This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 695989.
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Policy
- Stronger focus on implementation of energy efficiency (not just policy targets)
- Stronger support for thermal infrastructure
- Stronger connection between climate policy, security of supply policy and industrial policies
- Better planning procedures
- etc...

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<table>
<thead>
<tr>
<th>Positives</th>
<th>Scenario problems</th>
<th>Tool problems</th>
</tr>
</thead>
<tbody>
<tr>
<td>A large variety of scenarios</td>
<td>Very high ambition in all scenarios with regards to energy efficiency in buildings</td>
<td>5 year time steps</td>
</tr>
<tr>
<td>Two net zero emission scenario</td>
<td>No district heating implemented</td>
<td>partial equilibrium modelling system that simulates an energy market</td>
</tr>
<tr>
<td>More details within buildings and industry</td>
<td>Politically driven scenarios for gas</td>
<td>Investment optimisation (with limits e.g. wind and nuclear)</td>
</tr>
</tbody>
</table>
<pre><code>                                                                                                     | Claim to make “optimal systems”                                                    | No clear distinction between private/business economy and socio-economy. |
</code></pre>
Buildings in the Energy Union in 2050

**Highlights**
- Gas for heating dominates
- Stagnating district heating
- High ambition on EE in buildings due to tool)
- Higher costs than today

*Source: PRIMES.*
### Scenarios for EU2050

- with GHG reductions driven by decarbonised energy carriers:
  - Electricity
  - Hydrogen
  - Power 2 X
- with demand driven GHG reductions:
  - Energy efficiency
  - Circular economy
- combination
  - Combo (below 2°C)
- net zero GHG emissions (COMBO+)
  - Negative Emissions Technologies
  - Sustainable Lifestyles

#### Long Term Strategy Options

<table>
<thead>
<tr>
<th>Main Drivers</th>
<th>Hydrogen (H2)</th>
<th>Power-to-X (P2X)</th>
<th>Energy Efficiency (EE)</th>
<th>Circular Economy (CIRC)</th>
<th>Combination (COMBO)</th>
<th>1.5°C Sustainable Lifestyles (1.5LIFE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrification in all sectors</td>
<td>Hydrogen in industry, transport and buildings</td>
<td>E-fuels in industry, transport and buildings</td>
<td>Pursuing deep energy efficiency in all sectors</td>
<td>Increased resource and material efficiency</td>
<td>Cost-efficient combination of options from 2°C scenarios</td>
<td>Based on COMBO with more BECCS, CCS Based on COMBO and CIRC with lifestyle changes</td>
</tr>
<tr>
<td>GHG target in 2050</td>
<td>-80% GHG (excluding sinks)</td>
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<tr>
<td>Major Common Assumptions</td>
<td>Higher energy efficiency post-2030</td>
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<tr>
<td></td>
<td>Deployment of sustainable, advanced biofuels</td>
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<td></td>
<td>Modifying circular economy measures</td>
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<td></td>
<td>Digitisation</td>
<td></td>
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<tr>
<td>Power sector</td>
<td>Power is nearly decarbonised by 2050</td>
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</tr>
<tr>
<td>Industry</td>
<td>Electrification of processes</td>
<td>Use of H2 in targeted applications</td>
<td>Use of e-gas in targeted applications</td>
<td>Reducing energy demand via Energy Efficiency</td>
<td>Higher-resource, material substitution, circular measures</td>
<td>Combination of most Cost-efficient options from “well below 2°C” scenarios with targeted application (excluding CIRC) COMBO but stronger CIRC+COMBO but stronger</td>
</tr>
<tr>
<td>Buildings</td>
<td>Increased deployment of heat pumps</td>
<td>Deployment of H2 for heating</td>
<td>Deployment of e-gas for heating</td>
<td>Increased renovation rates and depth</td>
<td>Sustainable buildings</td>
<td></td>
</tr>
<tr>
<td>Transport sector</td>
<td>Faster electrification for all transport modes</td>
<td>H2 deployment for hot water and some for LVH</td>
<td>E-fuels deployment for all modes</td>
<td>Increased modal shift</td>
<td>Mobility as a service</td>
<td></td>
</tr>
<tr>
<td>Other Drivers</td>
<td>H2 in gas distribution grid</td>
<td>E-gas in gas distribution grid</td>
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[Heat Roadmap Europe](www.heatroadmap.eu)
Constrained equilibrium 5 year plank by plank from today does not:

- Current investments has an effect on the future possible investments
- Radical technological change NOT possible (has to be independent of current market and system design)
- Identify synergies across sectors
- Ensure a cost-effective energy system design in 2050

Renewable energy system modelling needs:

- Ability to look into the hour for the electricity system
- Ability to understand the temporal differences between heat/electricity demands and heat/electricity supply (capacities)
- Ability to analyse the use of waste heat and heat storages (and other storages)
- Explore and identify synergies across sectors (e.g. CHP, heat pumps, electrolysers)
Why isn’t it happening?

• Heating is complex
• Heating is local
• Heating requires long term planning
• Heat savings and district heating have large investment costs
• Heating is cultural, ownership problems and profit margins!
We have 28 regulatory experiments in Europe to learn from!
What has worked?

• Hypothesis: Trust!
  • Ownership
  • Cost-real prices (more than Non-Profit)
Concrete ideas

**General:**
- Better planning and data collection procedure needed from local level to regional, national and EU level. (including zoning)
- Stronger spreading of best practises of energy efficiency and better enforcement of existing policy (not just higher targets)
- Change the wording on use for DHC i.e. truly consider district heating grids a public asset that should be governed as a natural monopoly (If use of waste heat and renewable energy for heat is the goal)

**EU level:**
- Make a task force to investigate building the two levels of trust on a member state level in the multilevel governance structure.
- Continue to push better comprehensive assessments (HRE methods) (democratize knowledge – pinch grip)
- Tighten EE measures in e.g. EPBD – but focus on the building envelope and do not mix RE and EE
- Make a support framework for district heating with mandatory demand to have local ownership and governance models and to use of state-of-the-art technology for EE and DH under which conditions a small EU investment support mechanism is possible. (Could be released over the first 10 years and 15% of investment)

**National level:**
- Tighten building regulation and support system solutions (don’t mix RE and EE)
- Demand assessments should be based on socio-economic cost
- Create mandatory planning procedure and private economic conditions that favour long-term investments (in EE and DH)
- Funding – we have plenty. Don’t put out obstacles
- Access to low interest rate public loans if ownership is local and no profit is taken out of the system
- A subsidy (national or EU) should be based on local-valuation and ownership
- Ensure cost-real prices for consumers (Not a non-profit model but more than that)
- Demand full disclosure of financial elements in tariff structure (democratic infrastructure)
- Cost-real means a system where you have to invest in the cheapest option as a utility.
- Make heat producers compete to supply into the grids only where it makes sense (in large systems) – otherwise promote full local ownership.

**Local and Regional level:**
- Use the overall framework (above)
- Allocate resources for local heat planning and coordinate local stakeholders.
Other measures?

- A ban on new boilers in EU at the latest from 2030?
- A FULL stop for new fossil infrastructure?
- A full stop for infrastructure (also electricity) that does not have a clear potential in net zero emission scenarios?
- A district heating directive and clear investment strategy?
- A clear zoning with concrete technology recommendations for urban and rural areas?
- Stronger use of energy labelling with mandatory changes in change of ownership or with stronger tax incentives?
- Make new scenarios every second year and PUBLISH THE DATA from Primes?