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# Iterations for heat savings, electrification, and district heating.

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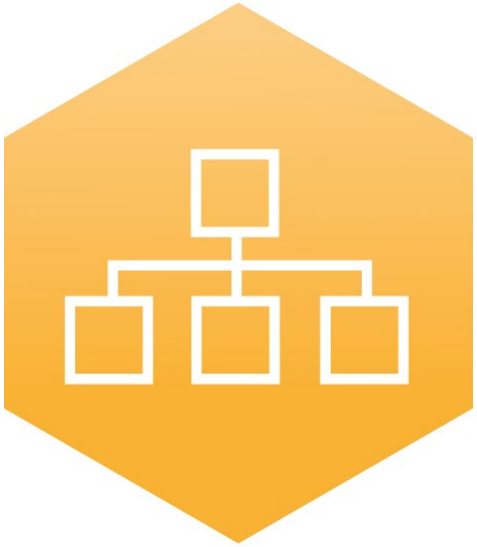

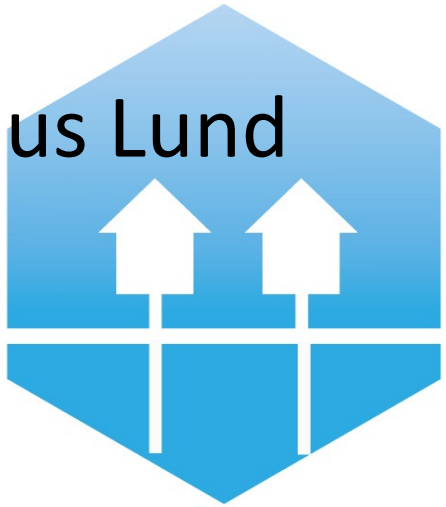

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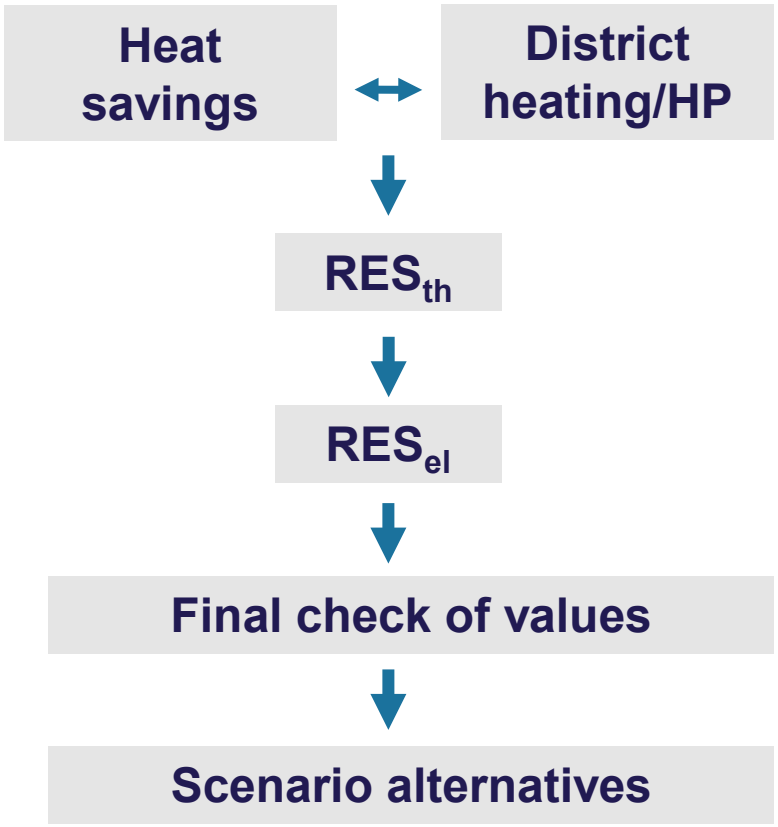
# Heat Roadmap Europe projects

- Study 1 (2012): will district heating play a role in the decarbonisation of the European energy system?
- Study 2 (2013): what is the balance between heat savings and heat supply at an EU level?
- Study 3 (2015, STRATEGO WP2): low-carbon heating and cooling strategies for 5 member states
- Study 4 (2016-2019): integrated low-carbon heating and cooling strategies for 14 member states

# Motivation

**Move from balance to interplay**

- **Does it make a difference?**
- **Is it possible to use the resulting trends to understand the scenarios better?**
- **Treating them sequentially in the context of a Roadmap can be a confusing message.**
- **Represents a less exploratory approach**



# Methodology

- **Repetitive simultation of systems with different levels (5 and 10% increases) in EnergyPLAN**
- **Transport and electricity; taken from Conventionally Decarbonised scenario**
- **Heuristics: merit order**
  - **Boiler capacity to cover peak + 10%**
  - **Excess heat; maximum**
  - **PP/CHP to cover that demand +10%**
- **700 combinations with corresponding scenarios**

- **Heat Roadmap Europe: background reports on website**

# Methodology: heuristics

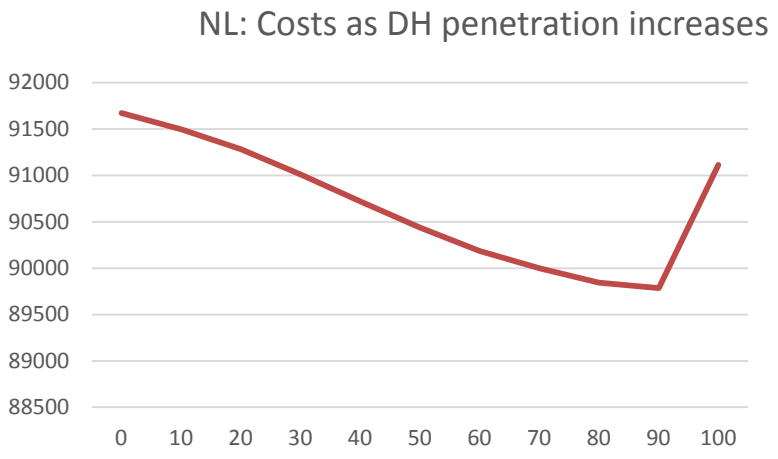
Ceteris paribus approach over trying to achieve a certain objective.

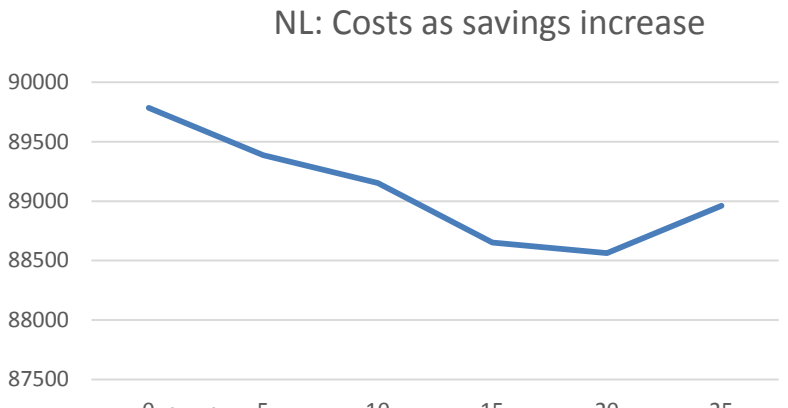
- Boiler capacity to cover peak + 10%
- Excess heat; maximum based
  - Spatial constraints, temporal constraints (baseload), temp.
- Geothermal: maximum based on spatial constraints
- Solar thermal: capped at 5% of the DH production
- CHPth capacity: average hour demand
- LSHPth: low peak demand
- PP: peak demand (incl. demand for small and large HPs) +10%

# Results: matrices

## Costs and PES: Netherlands

| Total energy system costs (M€/year) | | Residential sector savings additional to the Baseline | | | | | |
|---|---|---|---|---|---|---|---|
| | | 0 | 5% | 10% | 15% | 20% | 25% |
| Percentage of market share covered by DH | 0% | 55251 | 55230 | 55237 | 55207 | 55267 | 55759 |
| | 5% | 55178 | 55153 | 55156 | 55121 | 55176 | 55665 |
| | 11% | 55069 | 55040 | 55038 | 55001 | 55050 | 55534 |
| | 19% | 54896 | 54864 | 54857 | 54816 | 54860 | 55340 |
| | 28% | 54702 | 54665 | 54655 | 54609 | 54649 | 55125 |
| | 38% | 54514 | 54473 | 54458 | 54408 | 54444 | 54916 |
| | 47% | 54362 | 54318 | 54298 | 54245 | 54276 | 54743 |
| | 56% | 54286 | 54236 | 54212 | 54154 | 54180 | 54643 |
| | 66% | 54242 | 54188 | 54159 | 54097 | 54117 | 54576 |
| | 76% | 54302 | 54244 | 54210 | 54142 | 54158 | 54612 |
| | 86% | 55865 | 55802 | 55764 | 55691 | 55702 | 56151 |

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# Results: where do costs change?

| Annualised Costs(M€/year) | S0 DH0 | S20 D90 | Difference |
|---|---|---|---|
| Savings | 9260 | 10040 | 780 |
| Indiv. HP | 5094 | 532 | -4562 |
| PP and CHP | 3330 | 2885 | -445 |
| Electric grid costs | 37023 | 37023 | 0 |
| RES electricity | 1531 | 1531 | 0 |
| DH infrastructure | 0 | 1816 | 1816 |
| Boilers | 0 | 1297 | 1297 |
| Heat pumps | 0 | 197 | 197 |
| Solar thermal | 0 | 92 | 92 |
| Geothermal | 0 | 21 | 21 |
| Excess heat | 0 | 10 | 10 |
| Other | 1530 | 1499 | -31 |
| | | | |
| Coal | 0 | 0 | 0 |
| Oil | 511 | 511 | 0 |
| Gas | 10704 | 9675 | -1029 |
| Biomass | 12812 | 12754 | -58 |
| | | | |
| O&M | 6075 | 5137 | -938 |
| | | | |
| Balance | | | -3112 |
| | | | |
| Total | 91674 | 88562 | |
| | | 97% | |

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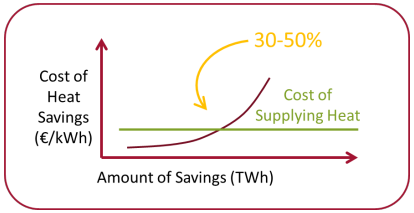
# Next steps

1. **Describe scenarios more precisely**
2. **Extract heat/cooling costs from total system costs**
3. **Exemplify/explain the trends better (what kind of investment costs rise, etc)**
4. **Discuss country variations**
5. **(minimising cost and PES here – but no hard biomass constraint**

# Conclusions

- **The balance is more complex than the traditional positive exponential curve visualisation.**
  - **There are almost always cut-off points, also for DH**
  - **Fuel savings and economic savings do not always run hand in hand**
- **The results differ per country, but there are trends**
  - **Eastern Europe: more savings than within the scope**
  - **DH: much more driven by urban/rural nexus than climate or current level of DH**
- **What are the implications if we achieve more or less of this efficiency?**

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# Thank you!

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Heat Roadmap Europe: www.heatroadmap.eu

Pan-European Thermal Atlas: www.heatroadmap.eu/maps

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