INSTITUT FÜR ENERGIE- UND UMWELTFORSCHUNG HEIDELBERG

Fraunhofer IEE

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Agora Energiewende

The Importance of Efficiency in the Building Sector for the Achievement of long-term Climate Protection Targets

April 30th 2020

Peter Mellwig, ifeu

Agora Report on the Importance of Efficiency in the Building Sector (2018)

Client: Agora Energiewende | **Steering Committee:** BPIE, ECF, RAP
Contractors: ifeu, Fh-IEE, Consentec

Overarching question: What are the consequences for buildings, energy systems and networks if the planned savings measures for buildings are *not* implemented, but instead more heat pumps, synthetic fuels or other renewables are (have to be) used to achieve the climate target?

Methodical approach:

- National economic perspective,
  climate target of -87.5 % GHG compared to 1990
- Compliance with the building target for 2030
  of the climate protection plan (72 Mt CO2)
- Energy system optimisation with a realistically
  ambitious energy efficiency scenario as reference
  and four alternative scenarios

Current Discussion for the German Building Sector

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Thesis

The future is either "all electric" or „all gas“

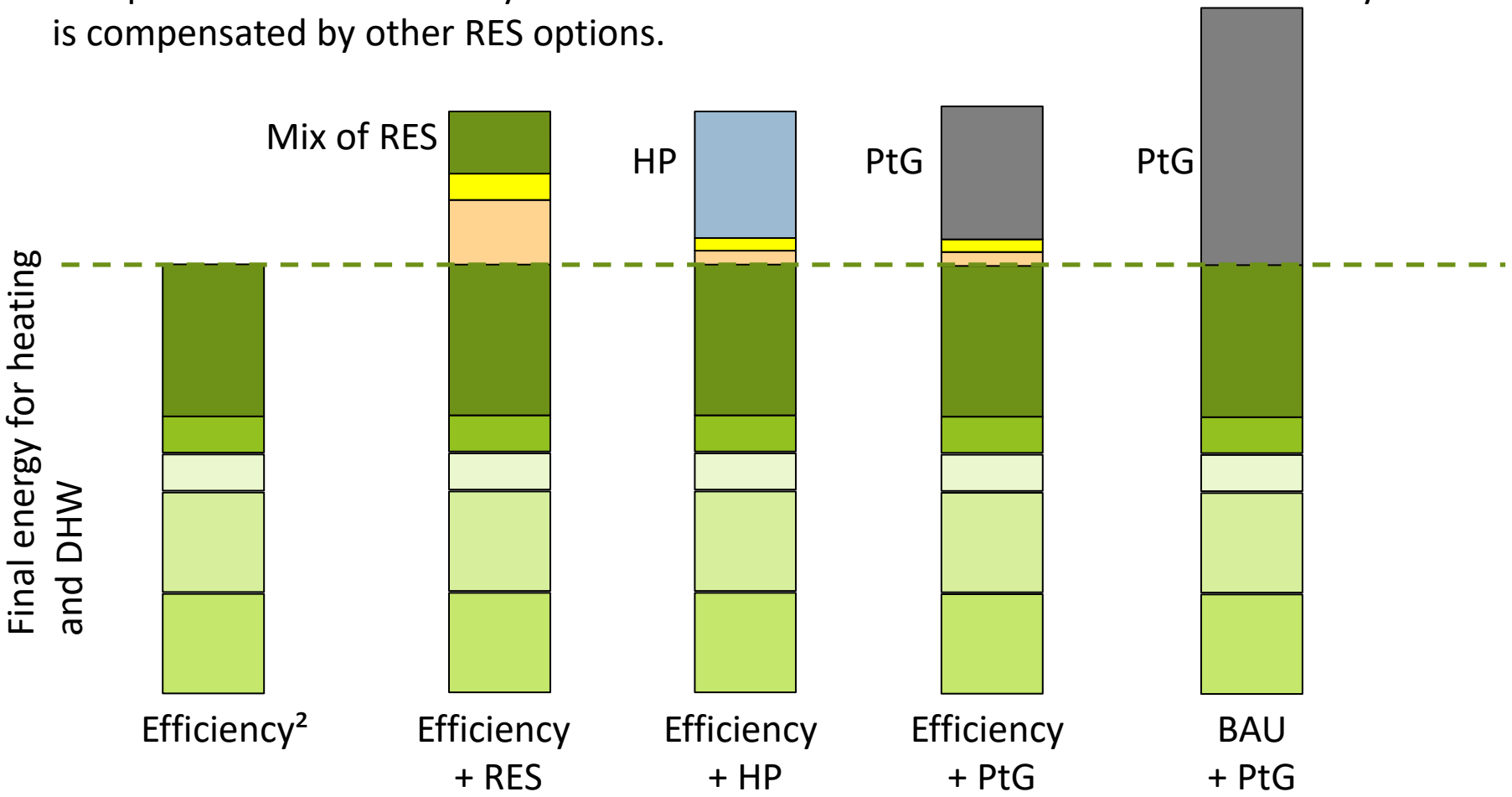
Technological openness enables less insulation

PtX enables us to use existing technologies

Today's incentives and requirements for buildings are sufficient

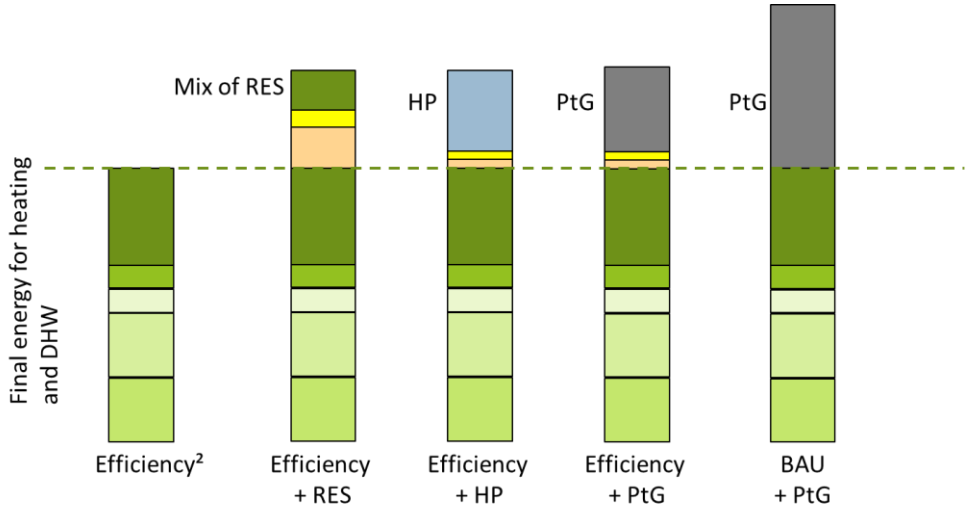
Schematic Approach

Comparison of the Efficiency² scenario with scenarios in which reduced efficiency is compensated by other RES options.



Schematic Approach

Evaluation of scenario modeling in two ways

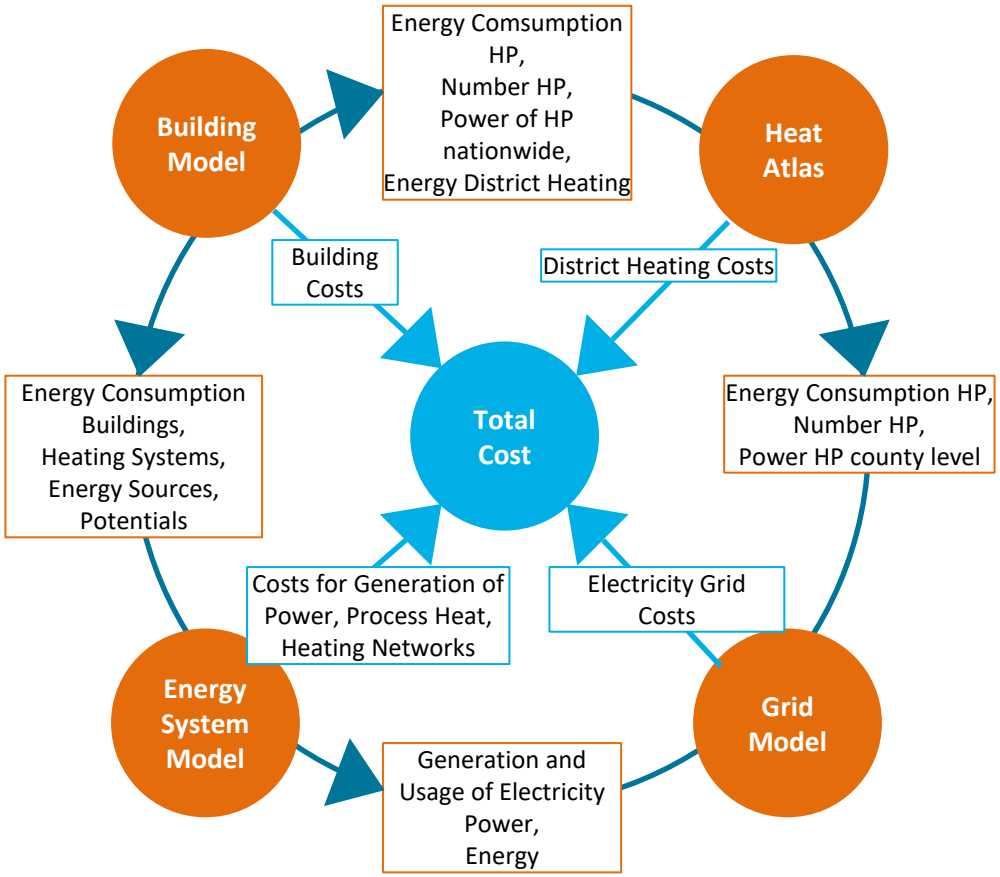


Macroeconomic Costs

Specific Opportunities and Risks

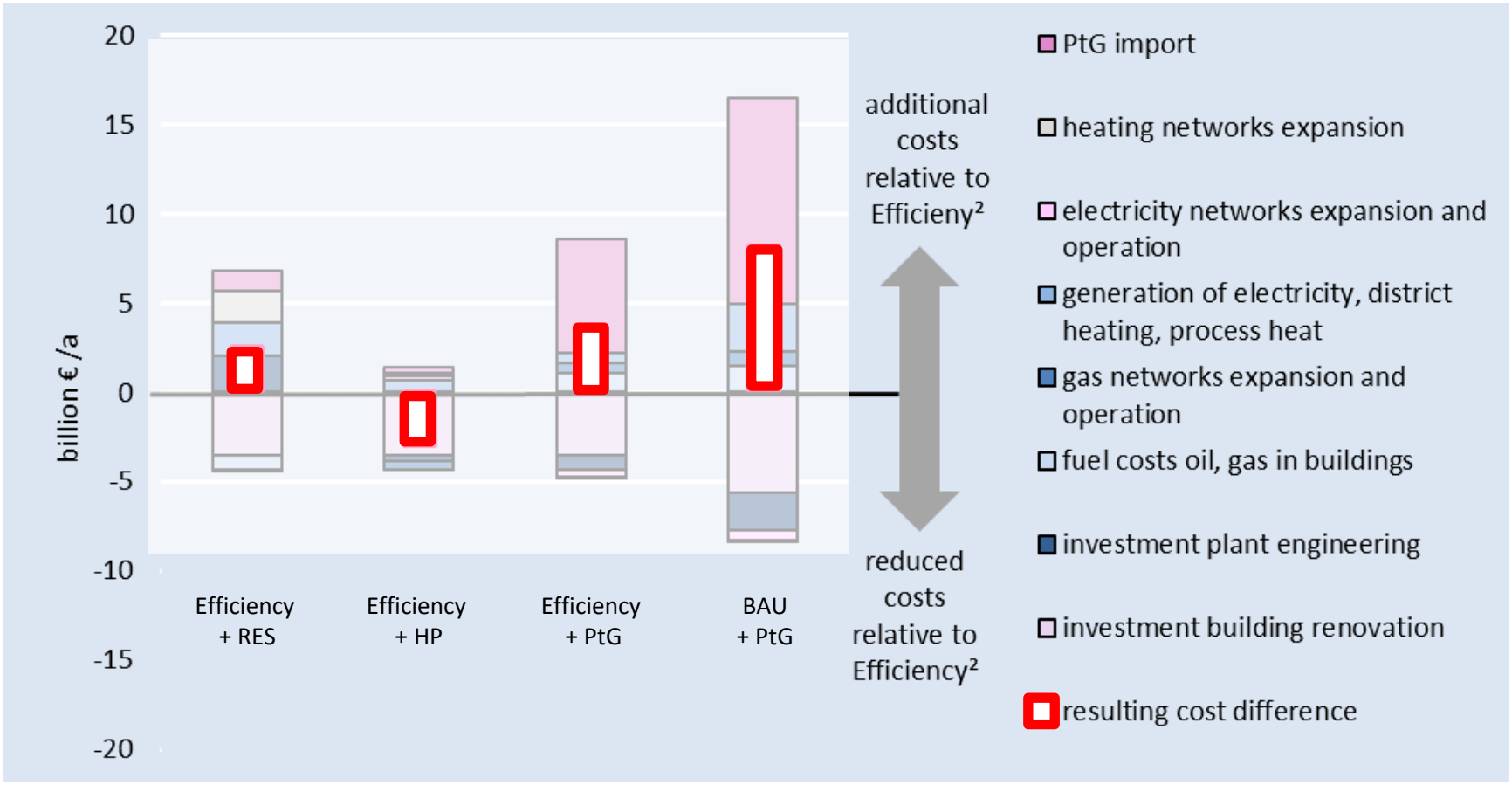
Modelling

Coupling of four models to calculate consistent and comparable scenarios.



Comparison of Scenarios

Total Cost Difference against Efficiency²



Difference of average annuities for the period 2017 bis 2050 at an interest rate of 1,5 %

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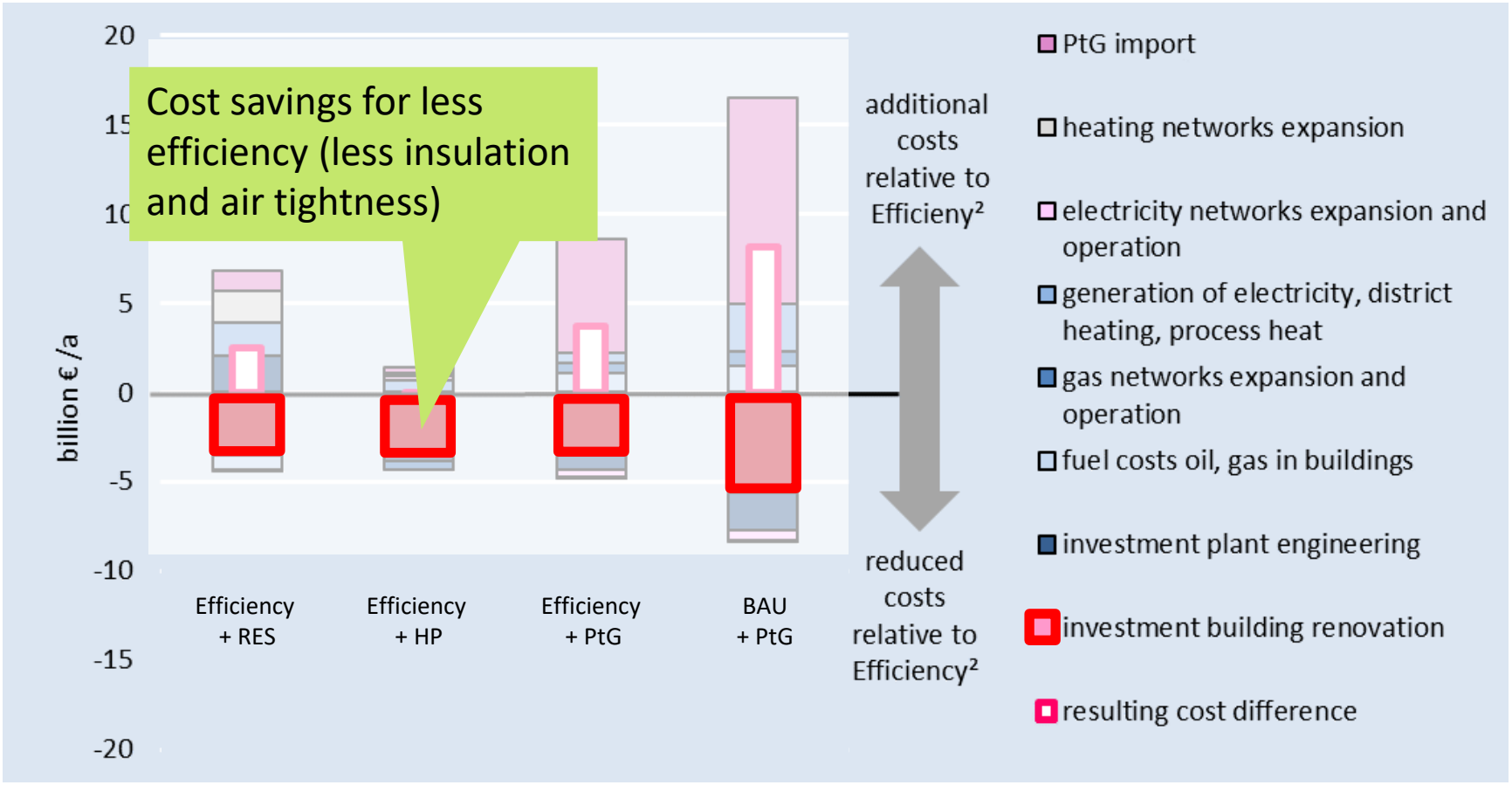

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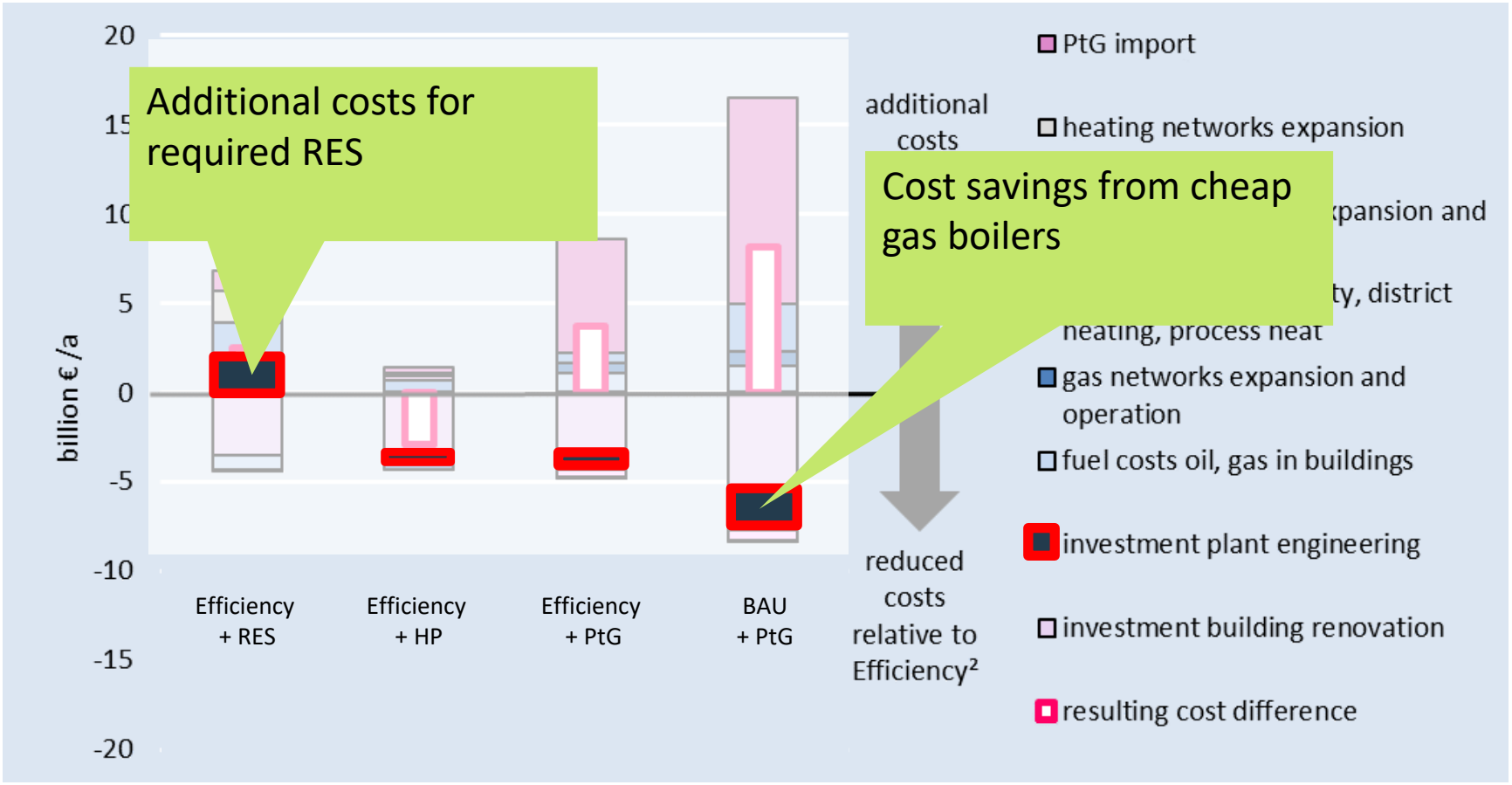

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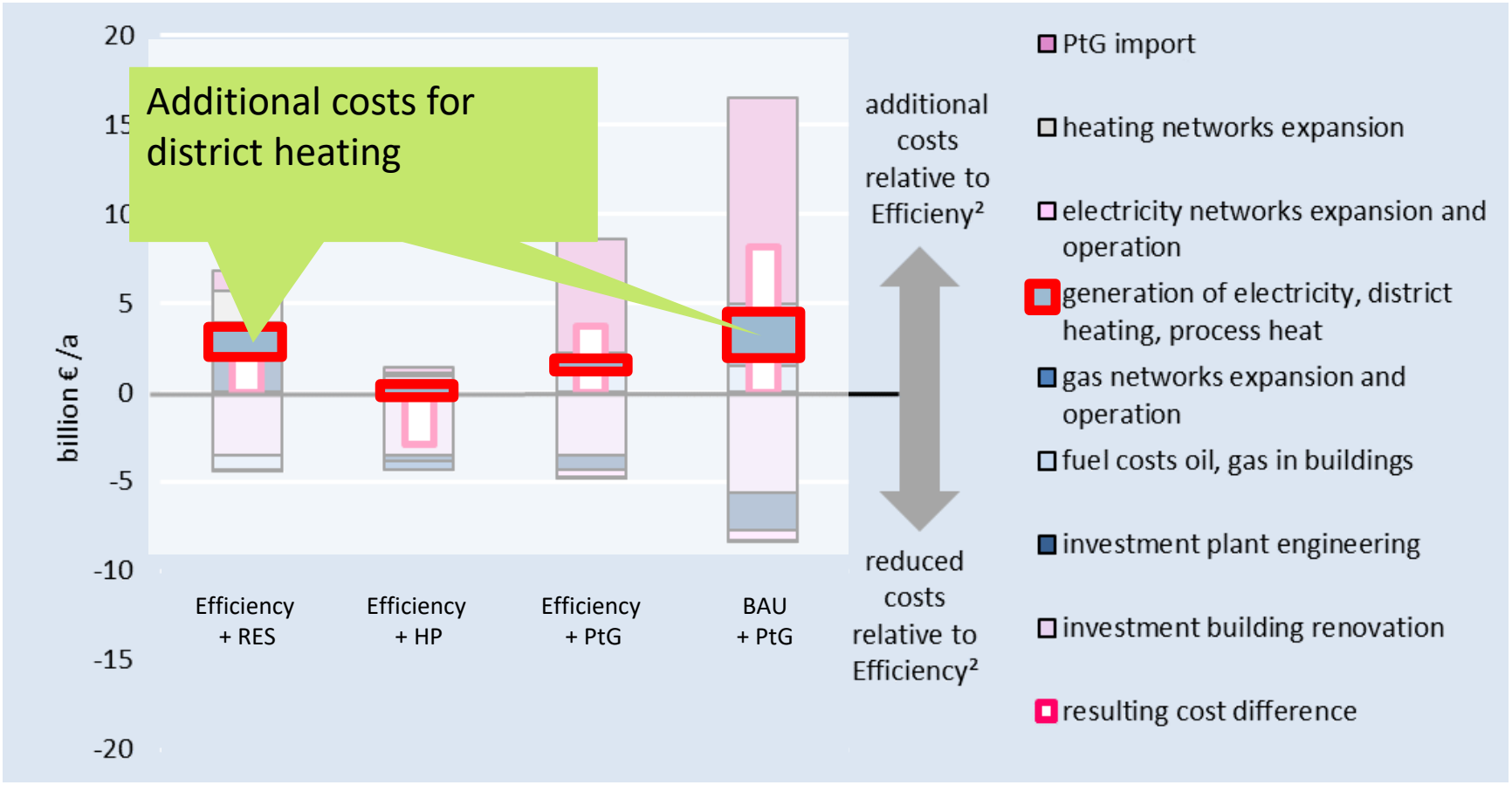

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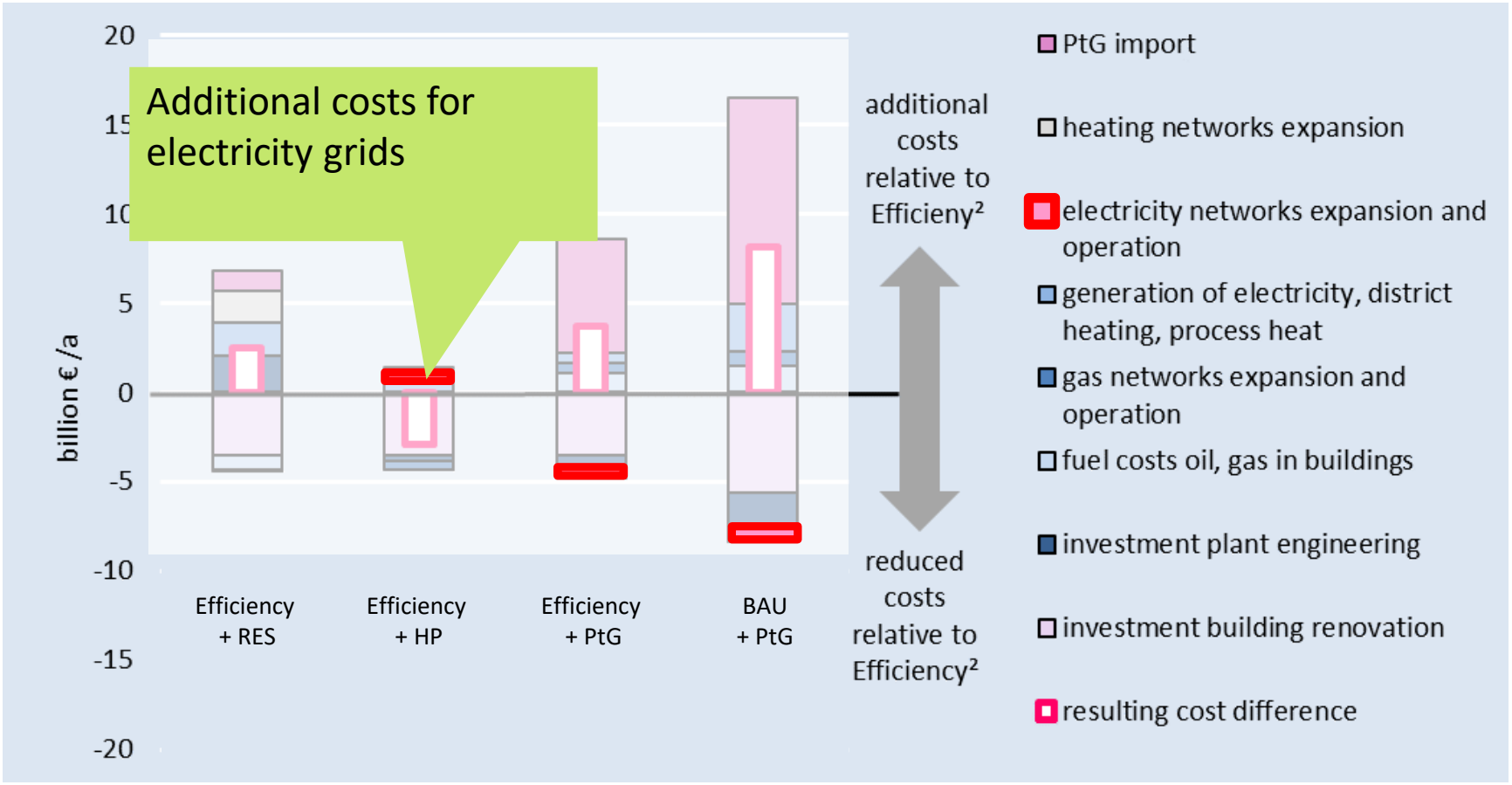

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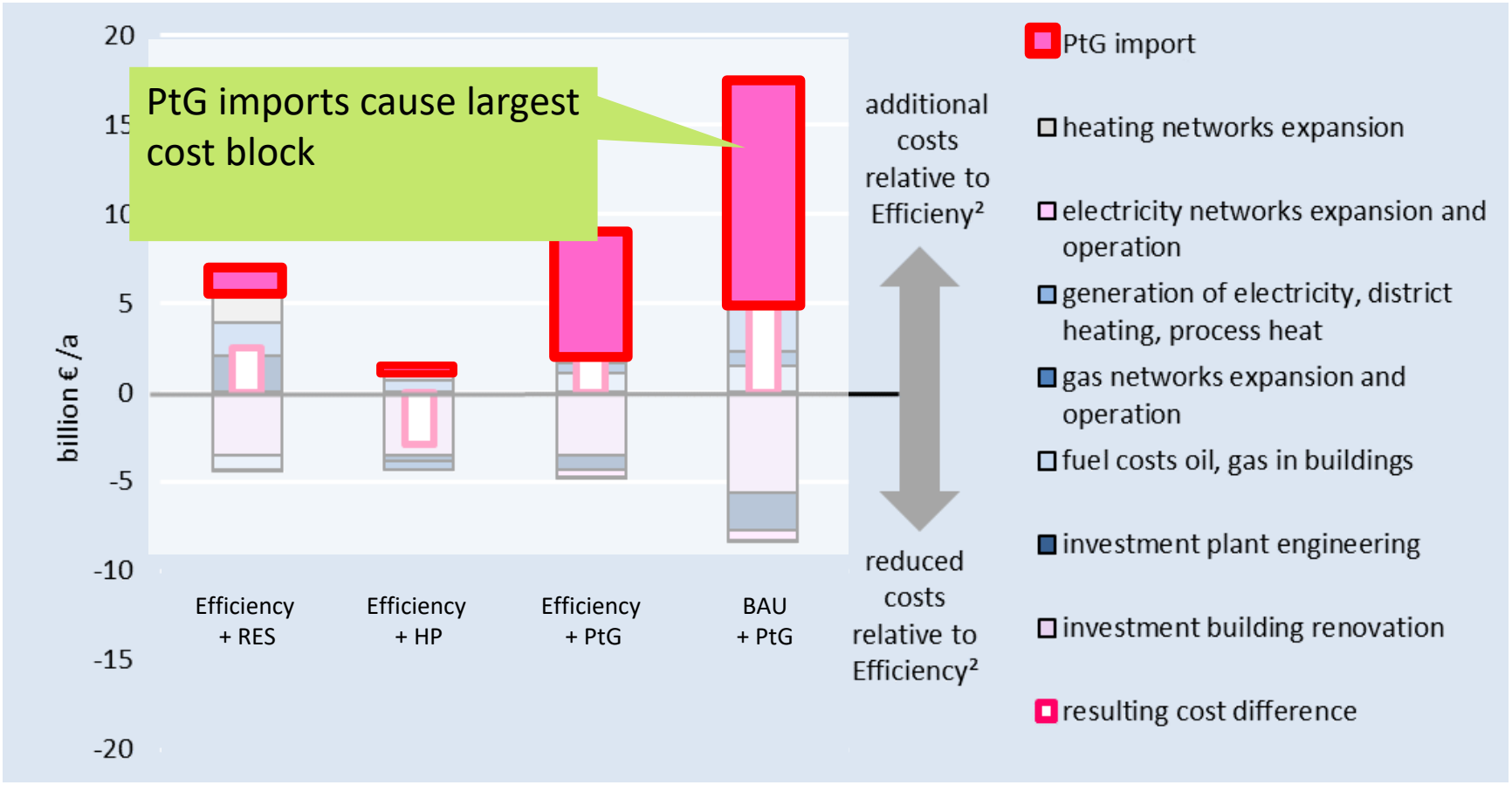

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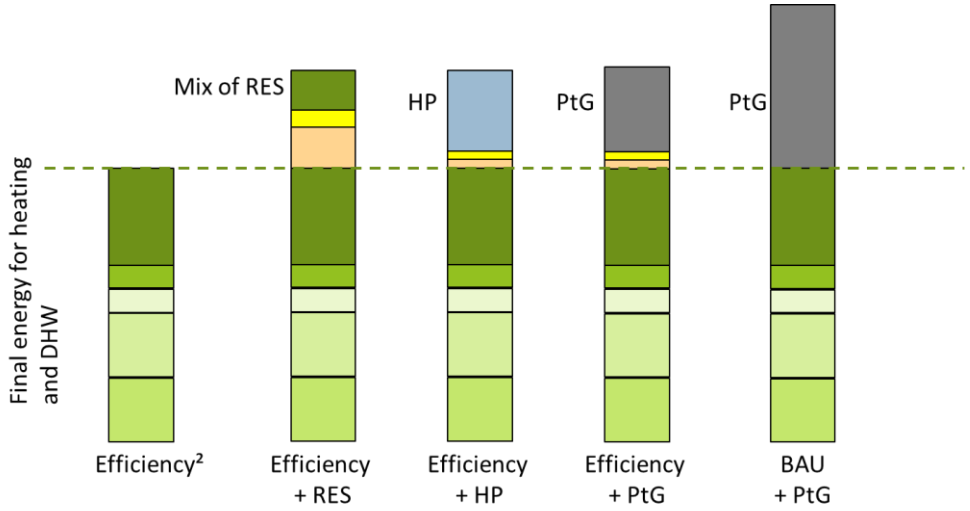
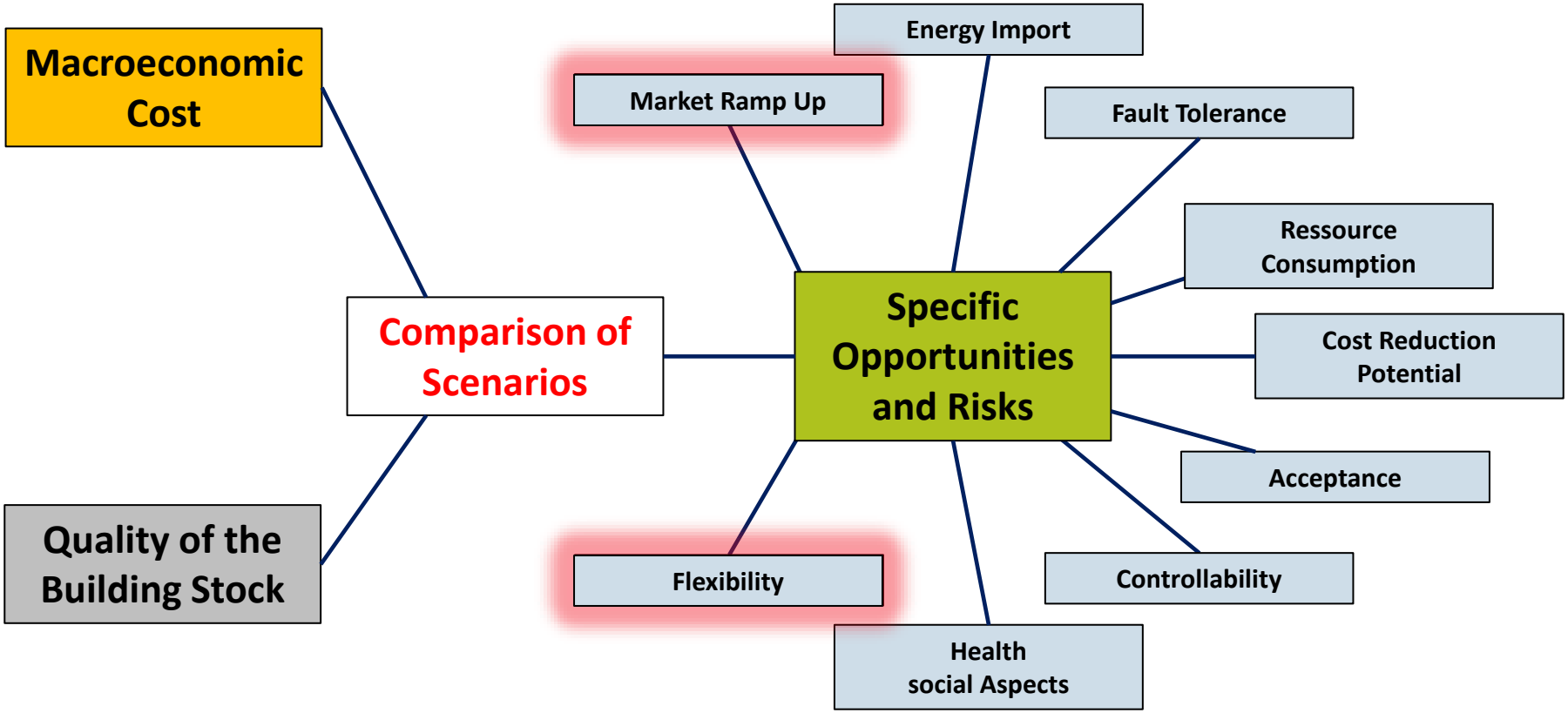
Evaluation of scenario modeling in two ways



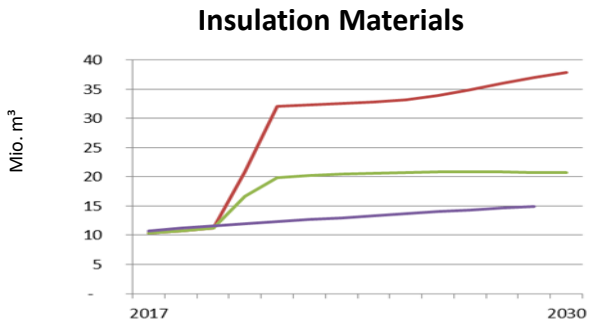
Macroeconomic Costs

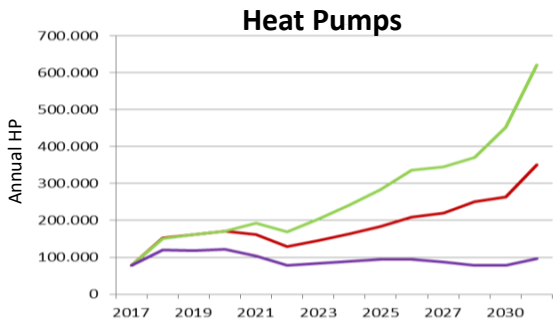
Specific Opportunities and Risks

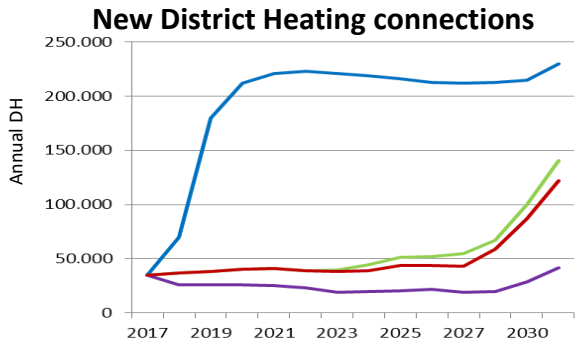
Evaluation Criteria

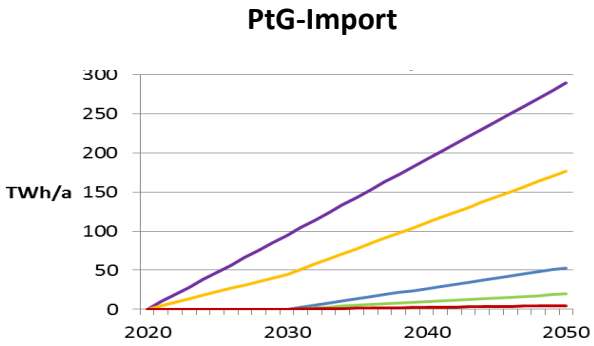


Market Ramp Up





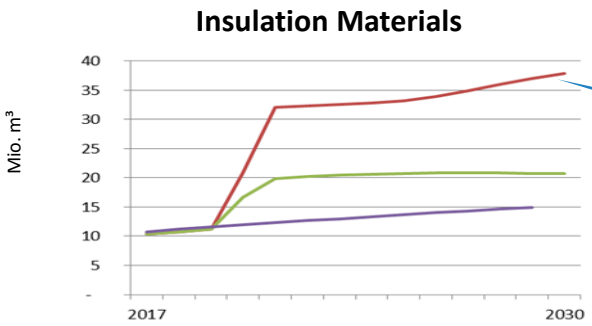


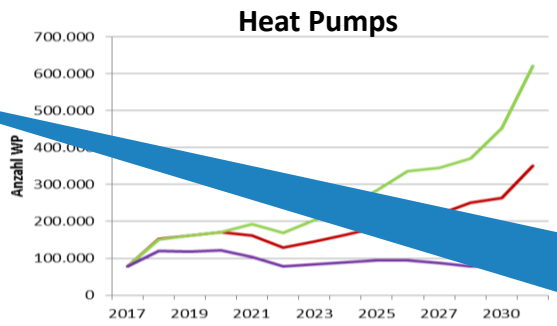


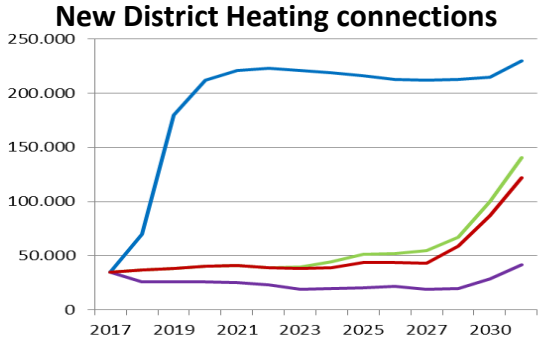
- BAU + PtG
- Efficiency + PtG
- Efficiency + RES
- Efficiency + HP
- Efficiency²

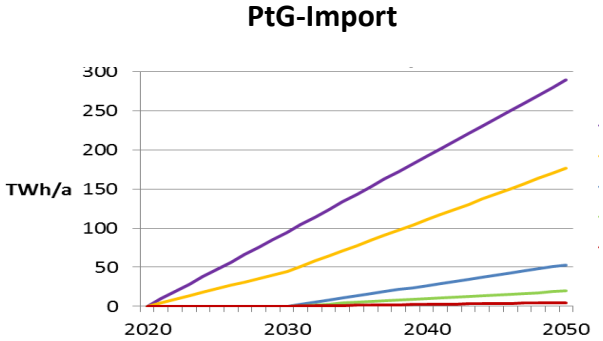
- Lower efficiency must always be compensated by an EVEN STEEPER growth in renewable energies.
- Efficiency AND renewables must be ambitiously implemented in the short term.
- The decisive factor is which technology meets the requirements with realistic effort.

Market Ramp Up









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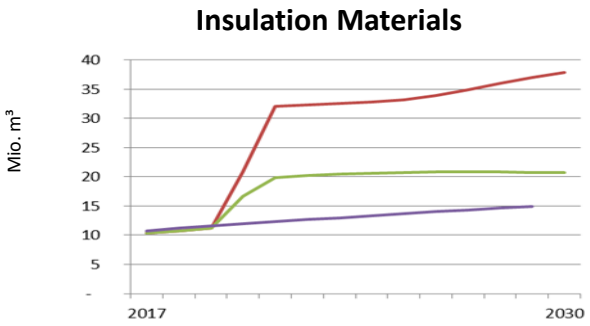
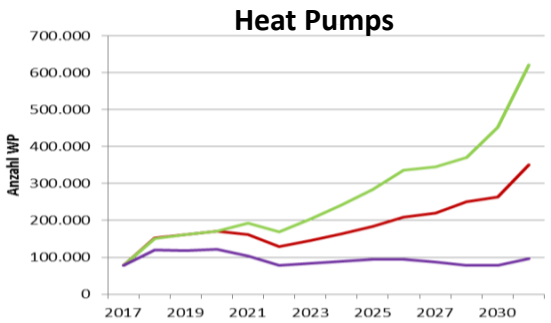
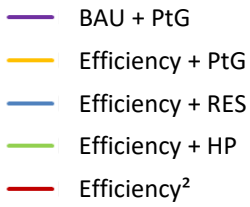
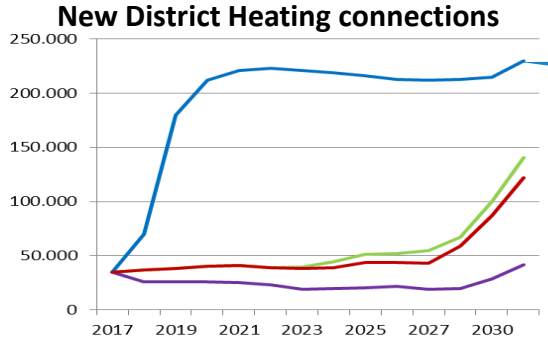
- **Efficiency²:** annually installed insulation volume in Germany must triple in short term

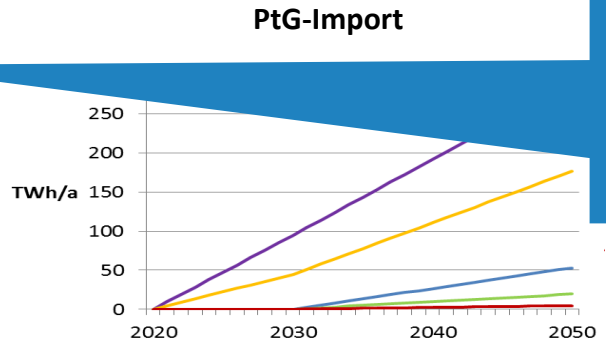
Market Ramp Up





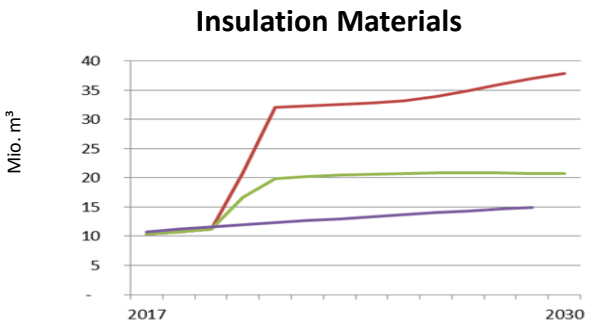


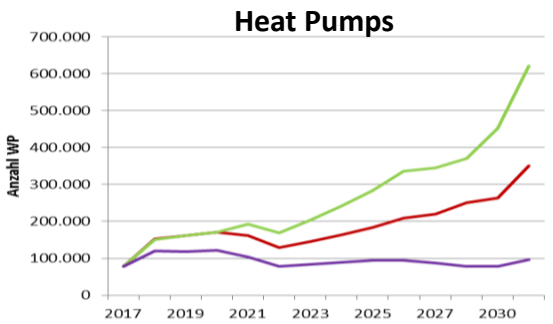


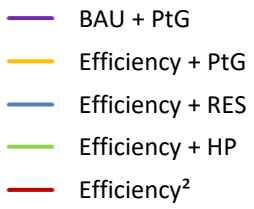


- **Effiziency + RES**: solar thermal systems must grow fifteenfold by 2030
- number of buildings supplied via heating networks must increase fourfold

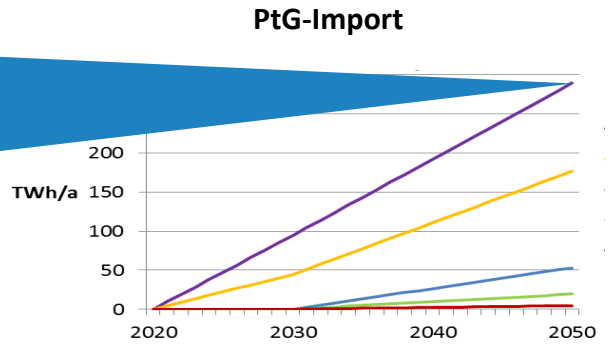
Market Ramp Up





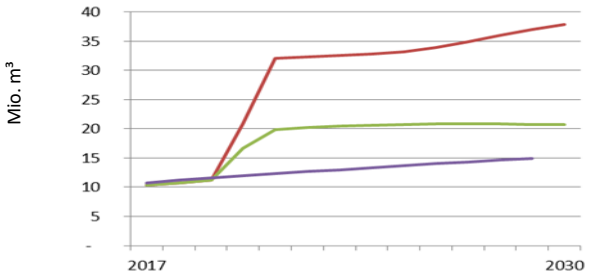


- **Efficiency + PtG:** 102 GW of generation capacity from renewable power plants by 2050
- **BAU + PtG:** 178 GW
- Current capacity in Germany: 118 GW

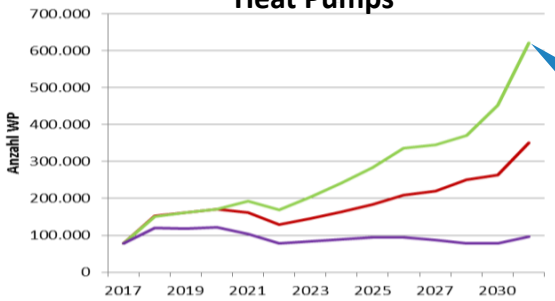


Market Ramp Up

Insulation Materials



Heat Pumps



BAU + PtG
Efficiency + PtG
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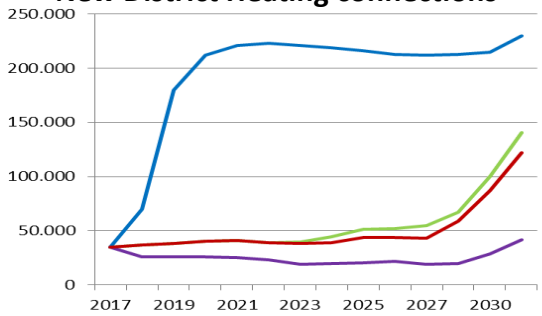
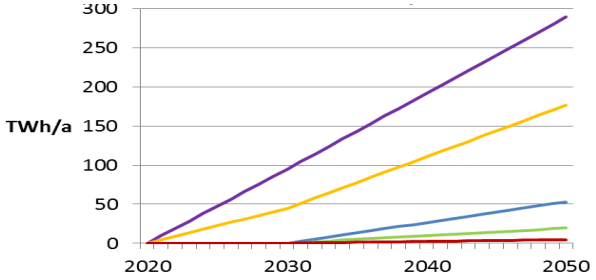
Efficiency²

- **Efficiency + HP:** annual sales must rise from 78,000 (2017) to 200,000 and by 2030 to 620,000

New District Heating connections



PtG-Import



Specific Opportunities and Risks

Fault Tolerance and Flexibility

- Scenario Efficiency² enables even more ambitious climate targets (-100% GHG).

- Efficiency² enables to react flexibly to unexpected changes
  - RES potentials are not fully exploited
  - efficiency raises RES potentials

Quelle: Kay Ploch