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

eceee, June 04th 2019

Peter Mellwig, ifeu

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# Current Discussion for the German Building Sector

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Agora  
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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.*

# Projektpartner



Alexandra Langenheld

Project Management

## Technical Steering Committee

Huy Tran (ECF)  
Andreas Jahn (RAP)  
Sibyl Steuwer, Oliver Rapf (BPIE)

## Advisory Committee

Experts  
Stakeholders  
Associations



Norman Gerhardt  
Irina Ganal  
Dr. Dietrich Schmidt



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Peter Mellwig  
Dr. Martin Pehnt  
Dr. Amany von Oehsen  
Sebastian Blömer



Christian Linke  
Dr. Alexander Ladermann

- Modelling System
- Cross-Sectoral Optimisation and District Heating Feeding

- Lead Consortium
- Modelling Buildings
- Modelling District Heating

- Modelling Electricity Distribution Grids

## Method: What is the „Value of Efficiency“?

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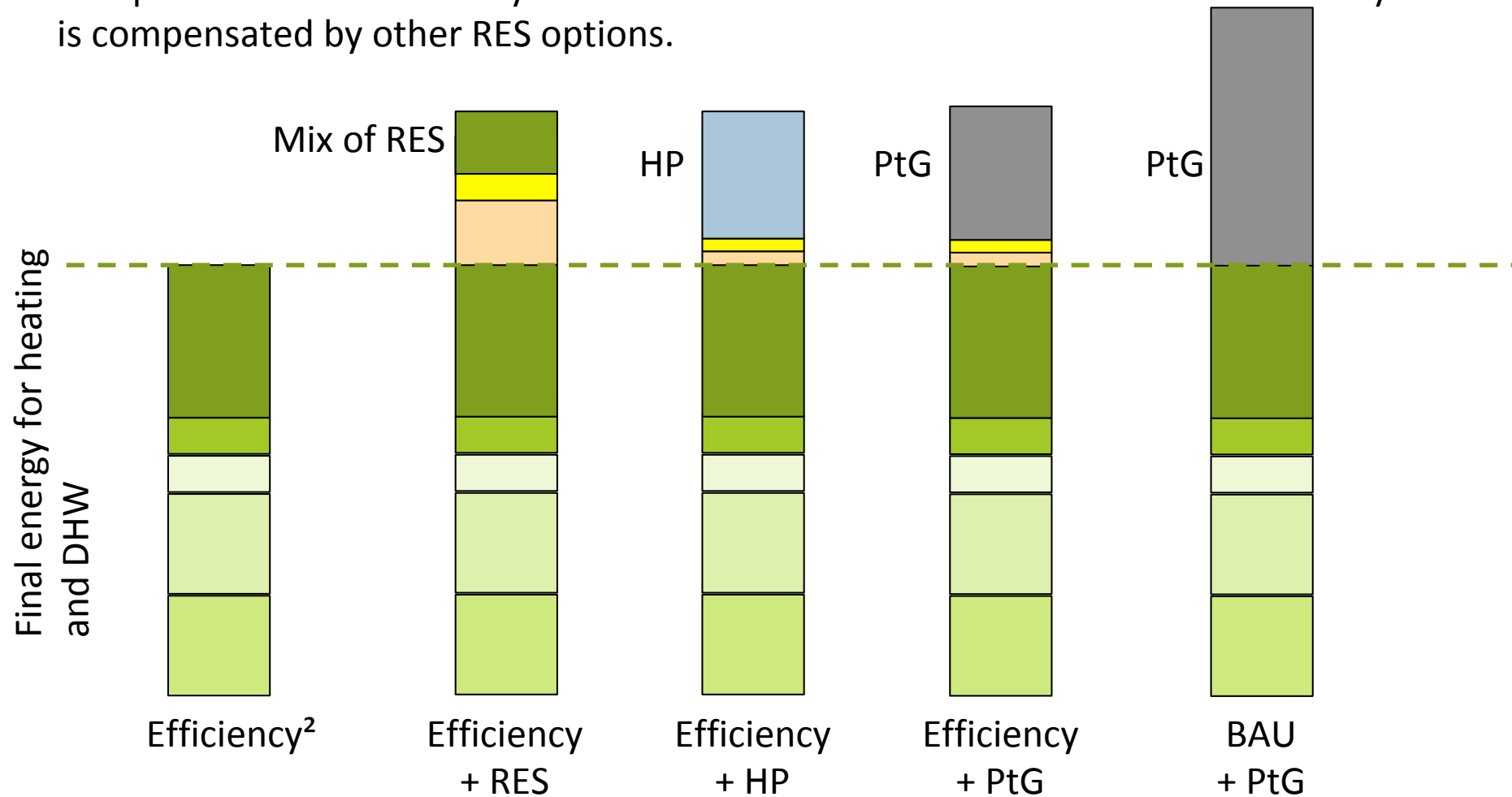
- What value/role does energy efficiency have in achieving the climate protection targets in the building heating sector?
- What are the consequences for buildings, energy systems and networks if the energy-saving measures in buildings are not implemented, but instead even more heat pumps, synthetic fuels or other renewables have to be used?

### Frame

- Reduce GHG emissions of all sectors by 87.5% by 2050
- Meeting the 2030 building sector target
- Macroeconomic perspective
- Overall conservative modelling for efficiency: population development incl. immigration, price development of fossil fuels falling in the long term

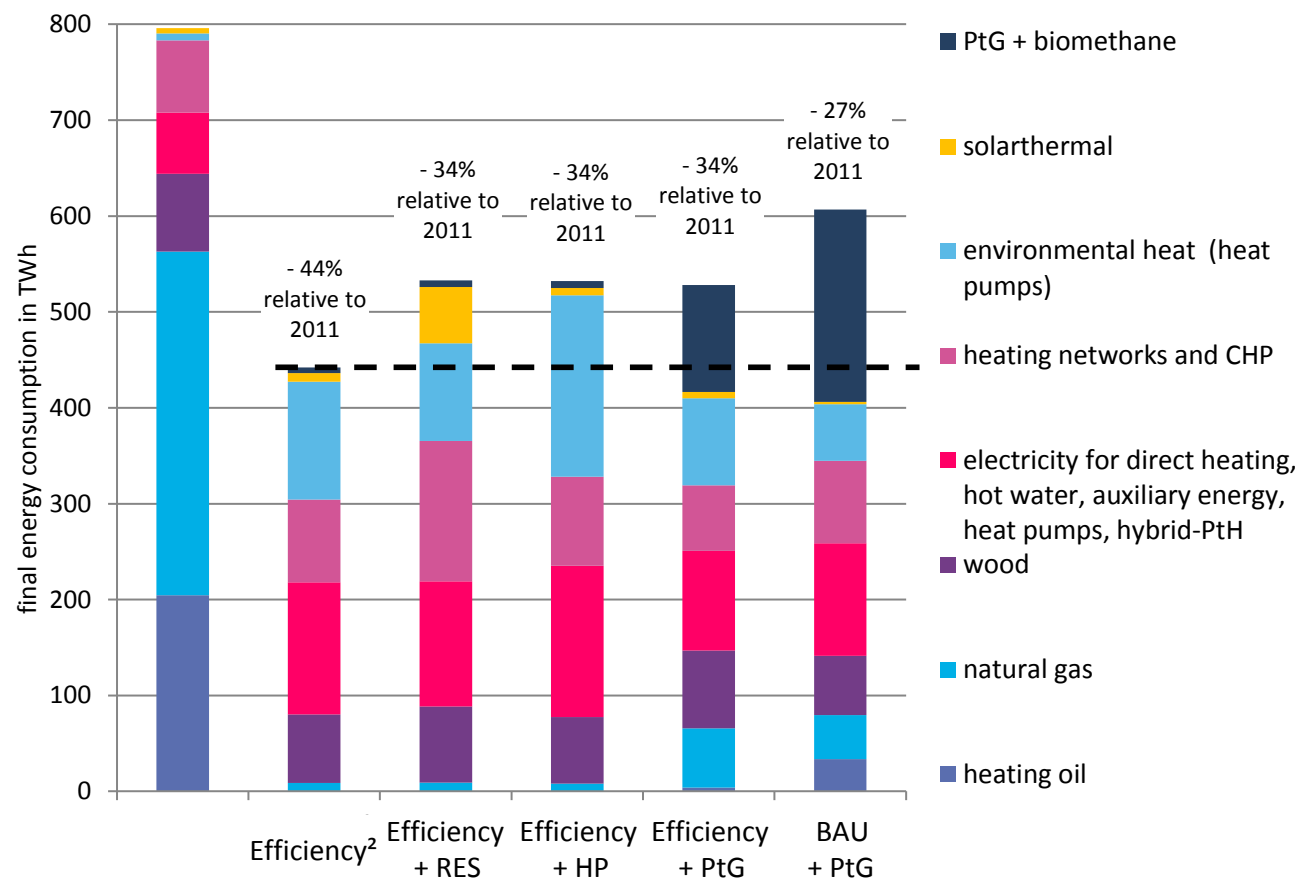
# Schematic Approach

Comparison of the Efficiency<sup>2</sup> scenario with scenarios in which reduced efficiency is compensated by other RES options.



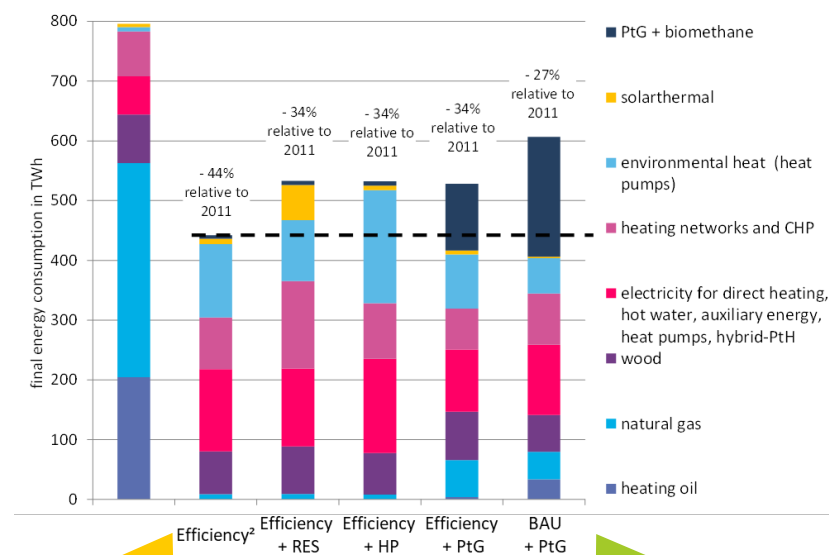
# Schematic Approach

Calculation results of the building model.



# Schematic Approach

## Evaluation of scenario modeling in two ways

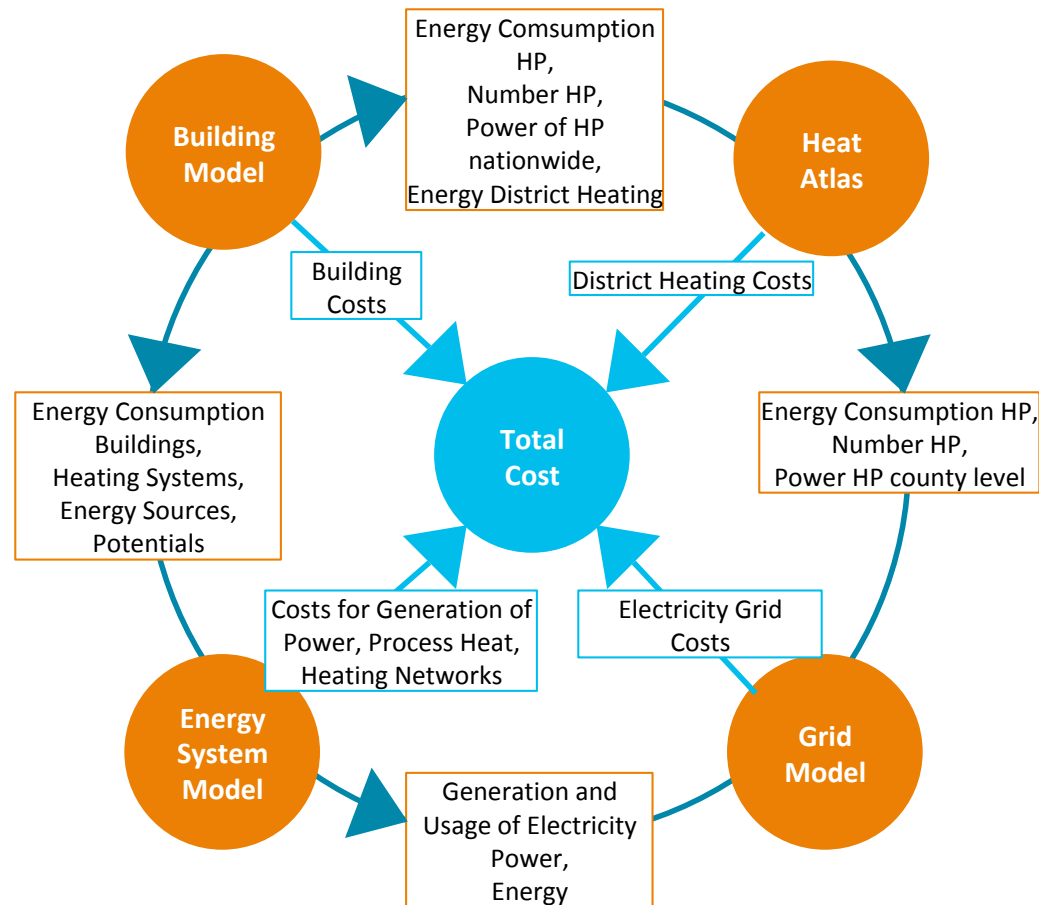


Macroeconomic Costs

Specific Opportunities  
and Risks

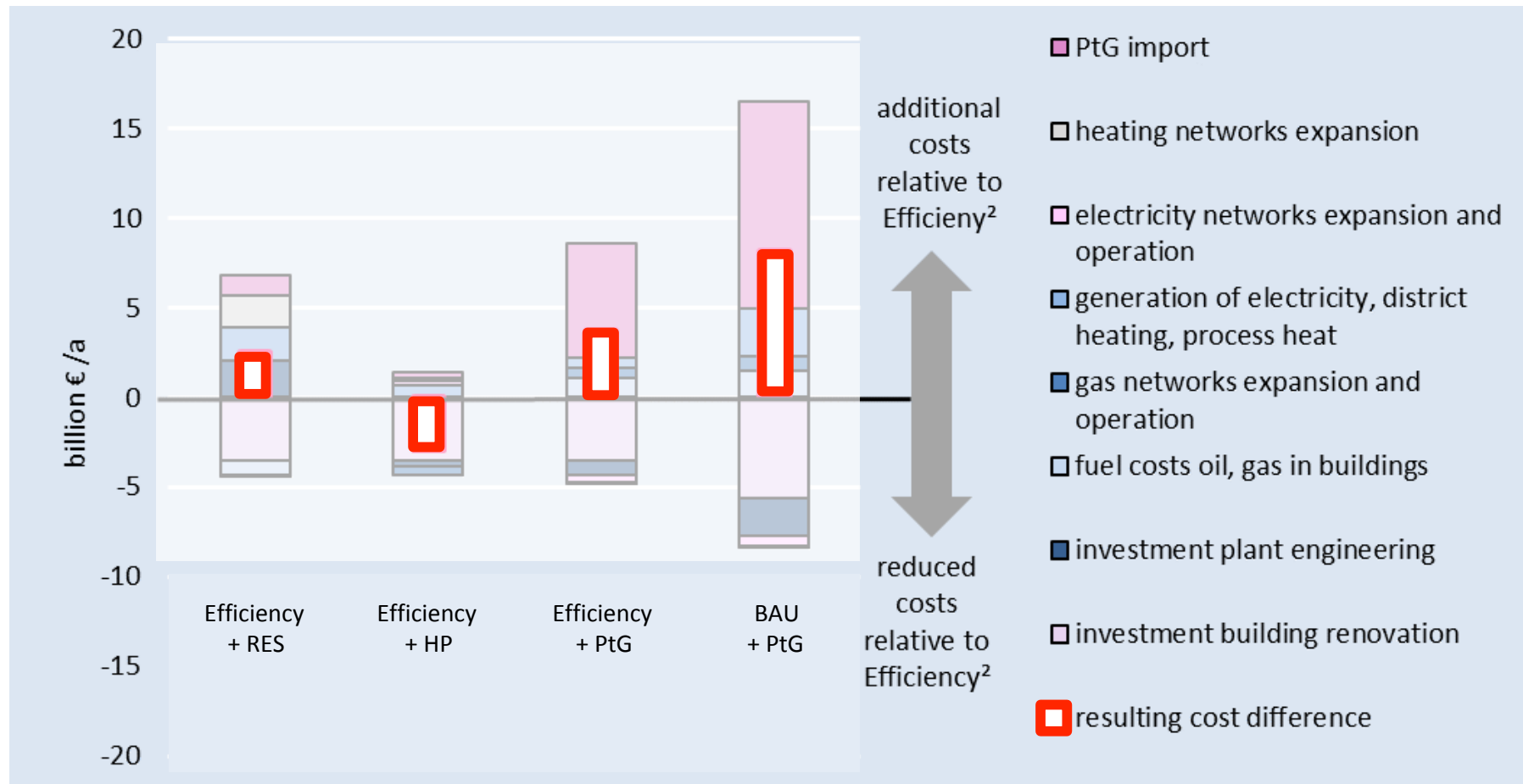
# Modelling

Coupling of four models to calculate consistent and comparable scenarios.



# Comparison of Scenarios

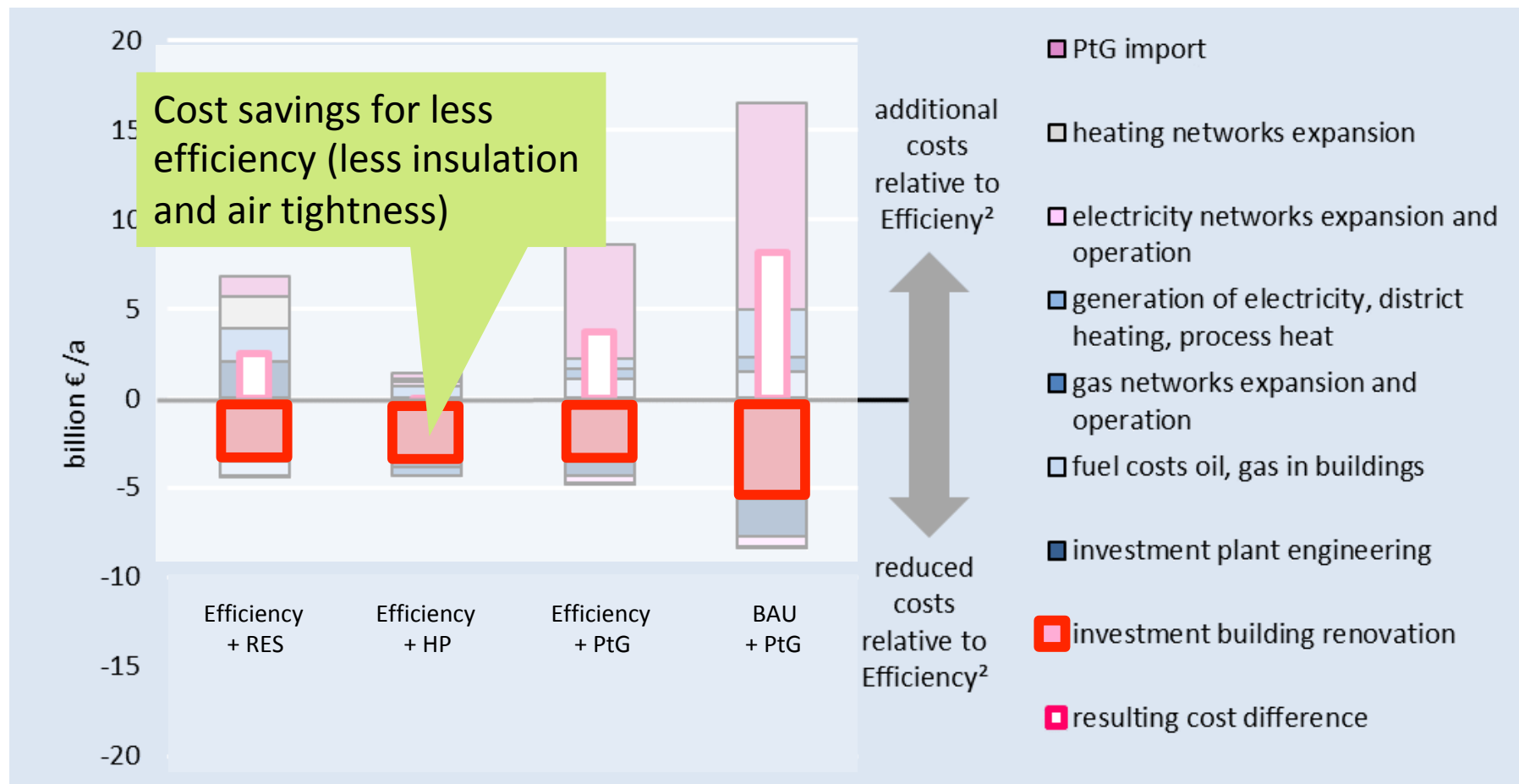
Total Cost Difference against Efficiency<sup>2</sup>



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

# Comparison of Scenarios

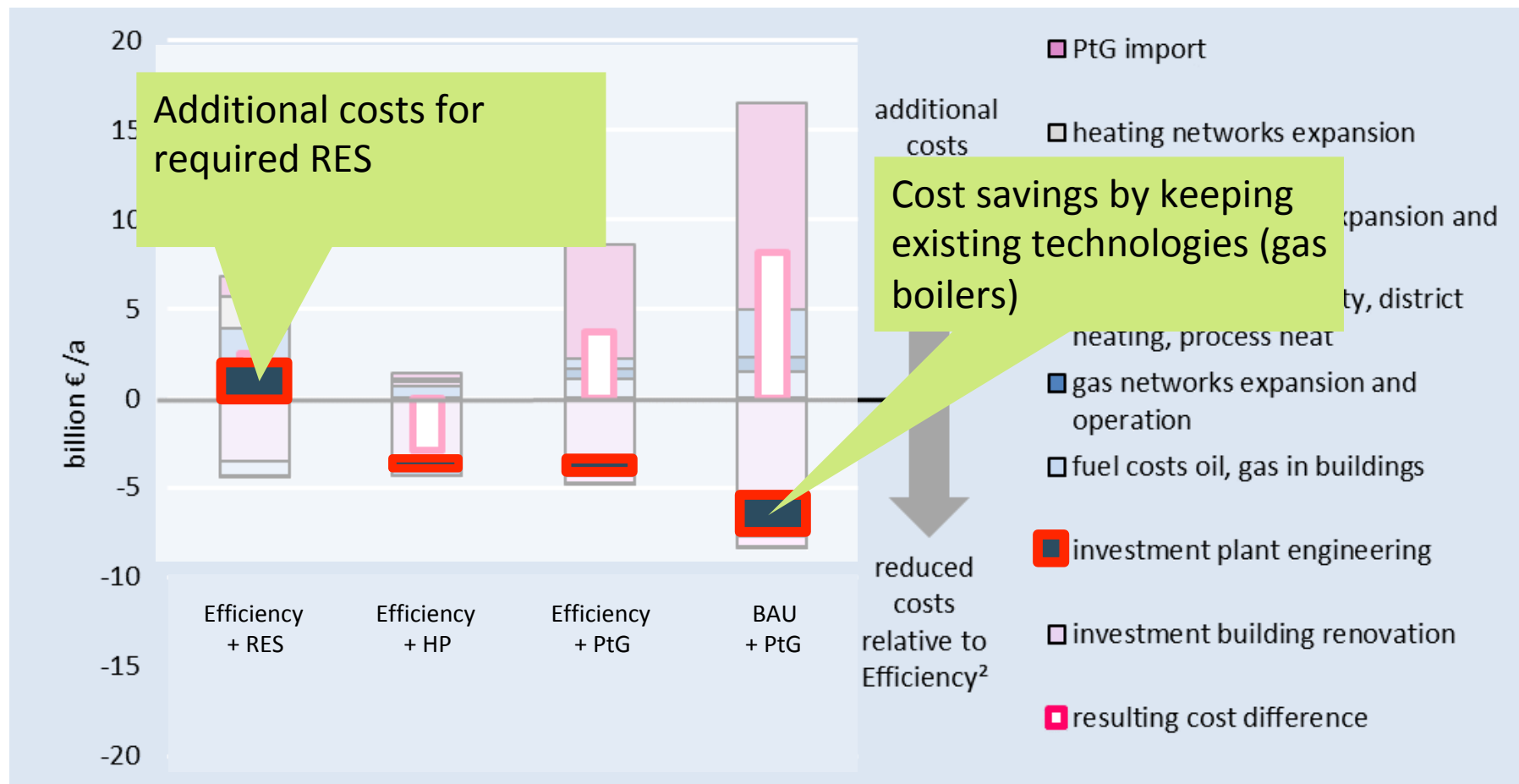
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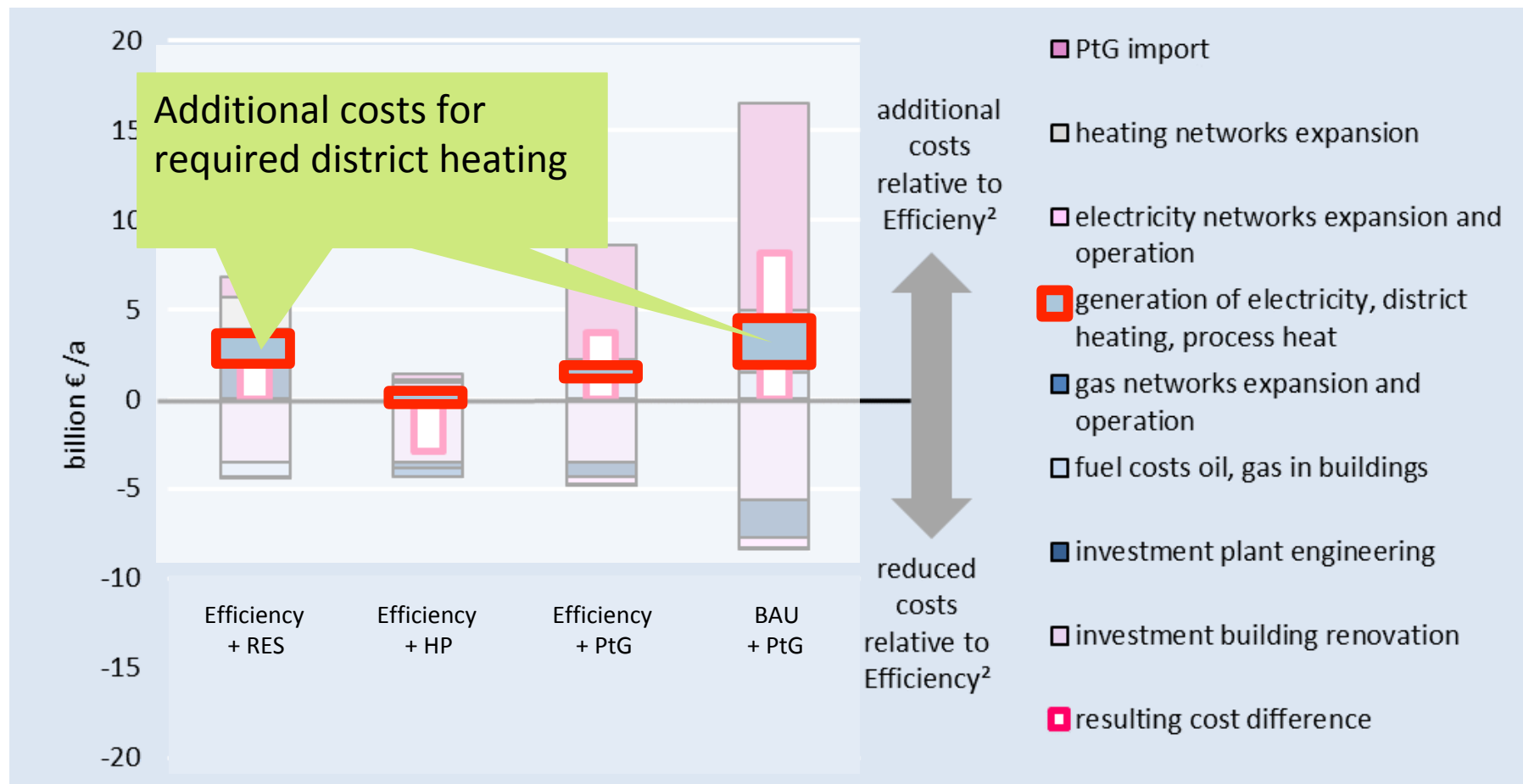
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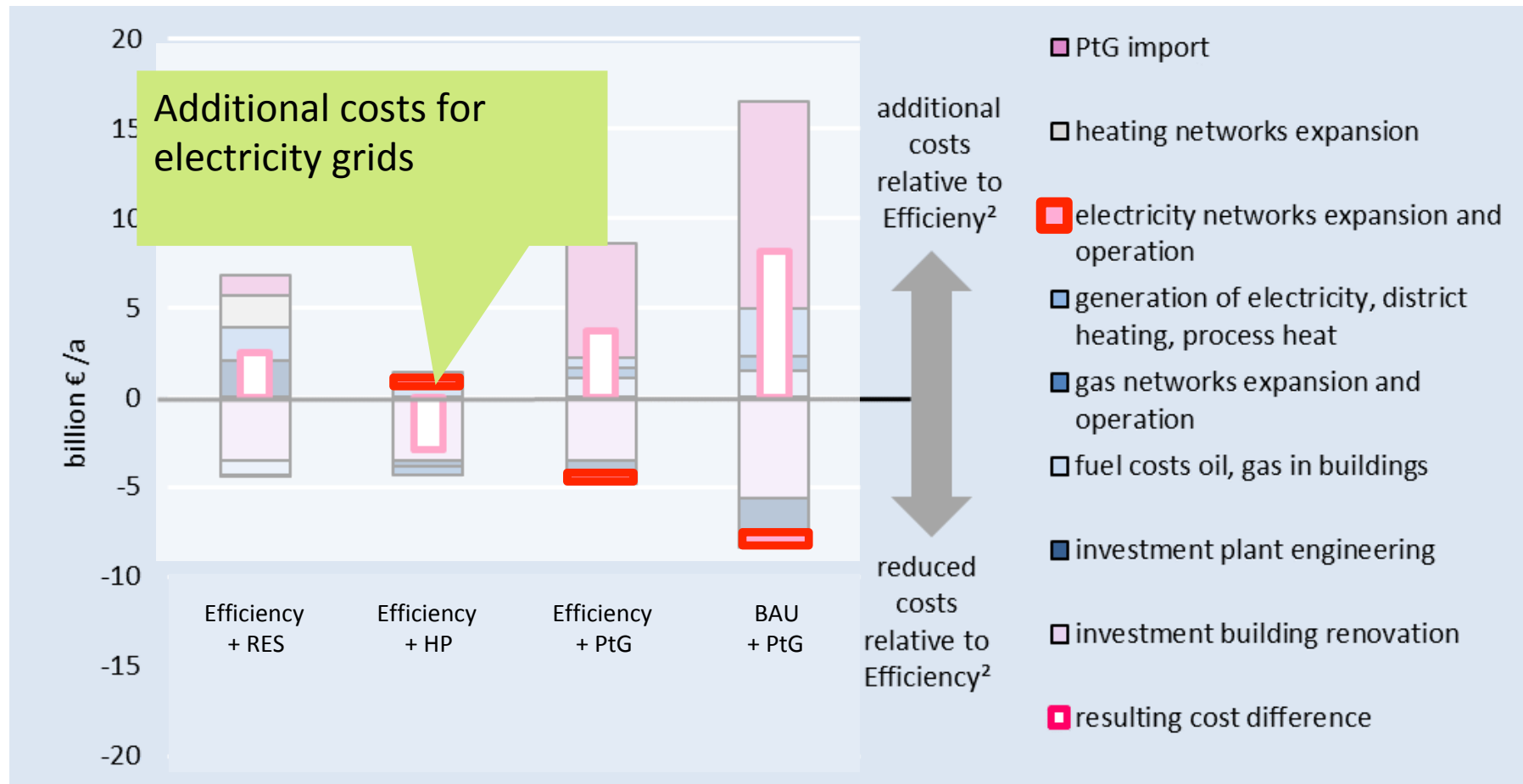
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# Comparison of Scenarios

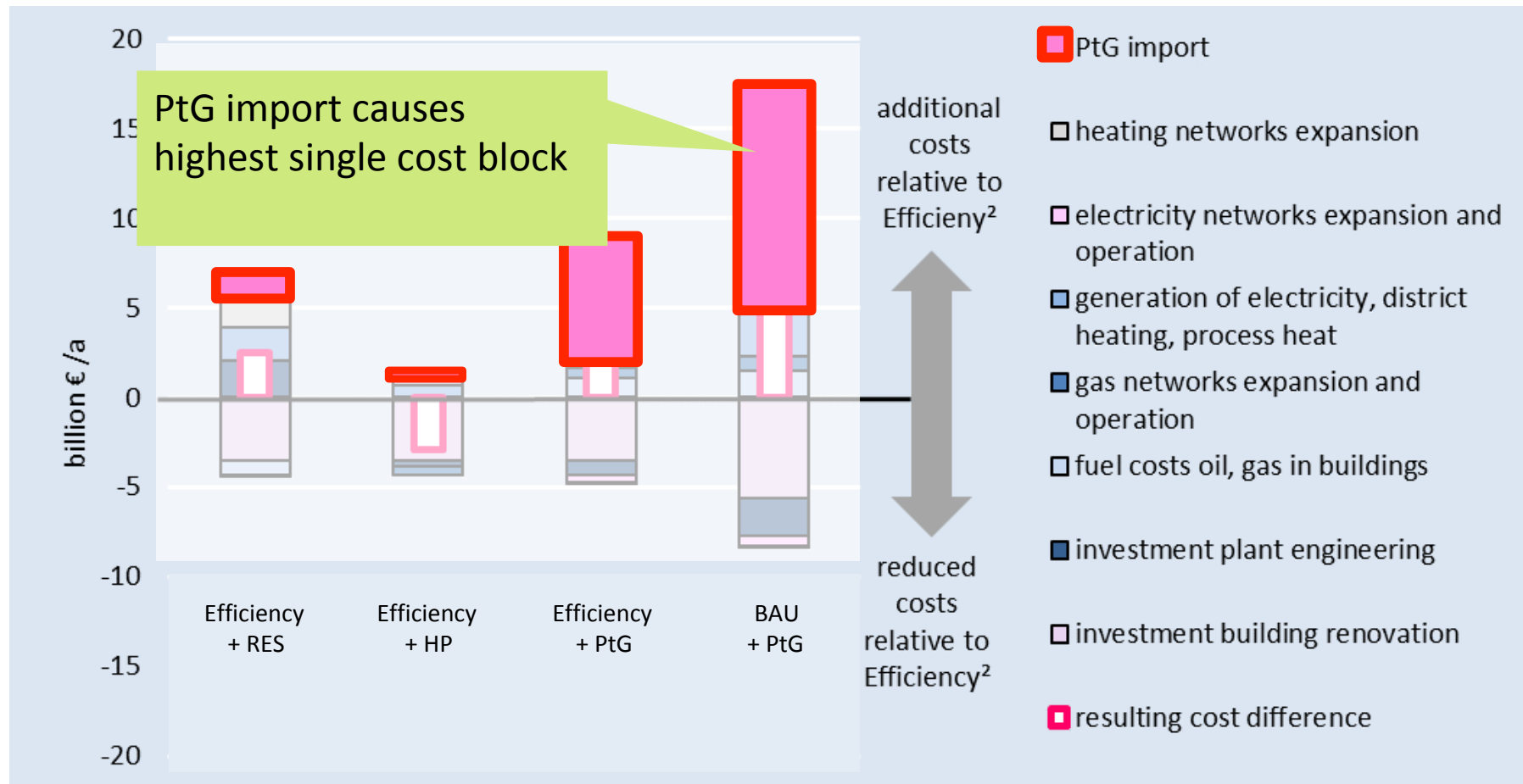
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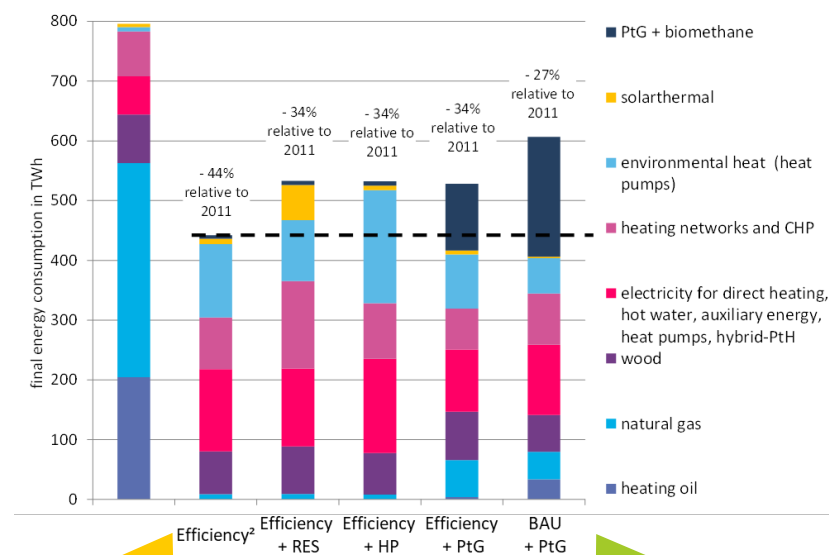
Total Cost Difference against Efficiency<sup>2</sup>



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# Evaluation Criteria

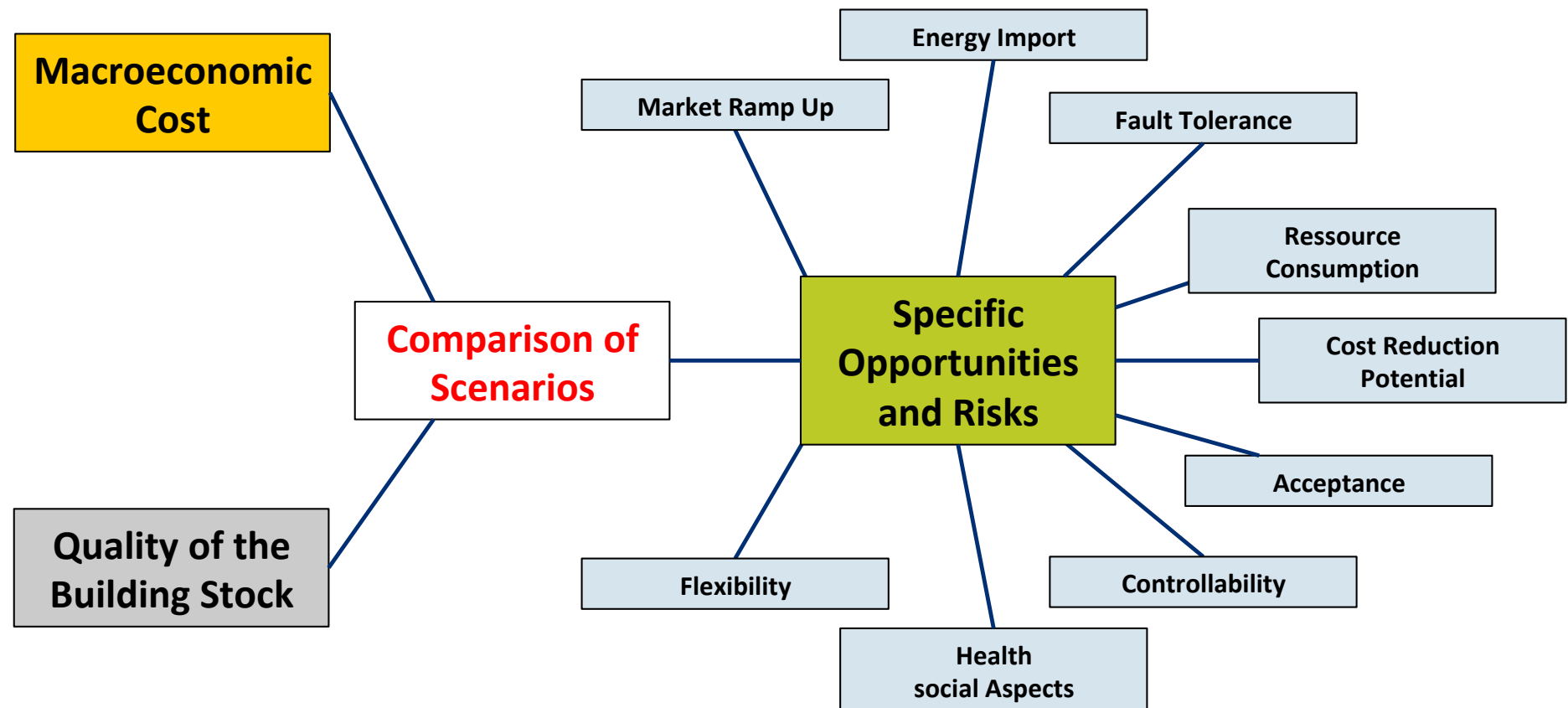
## Evaluation of scenario modeling in two ways



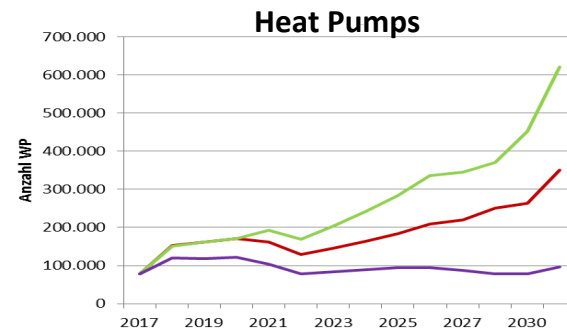
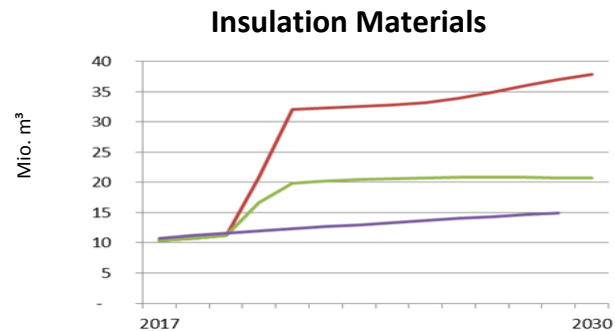
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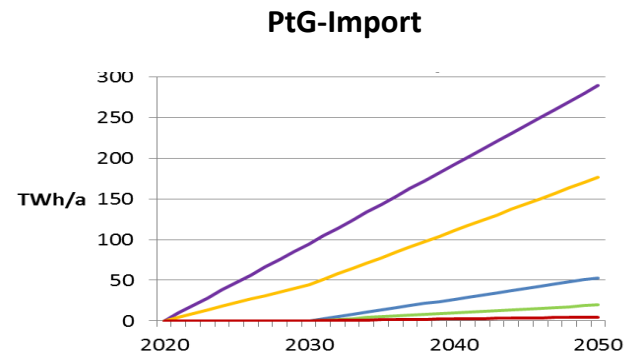
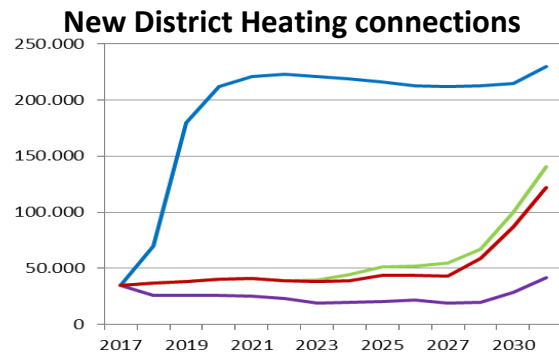
# Evaluation Criteria



# Market Ramp Up

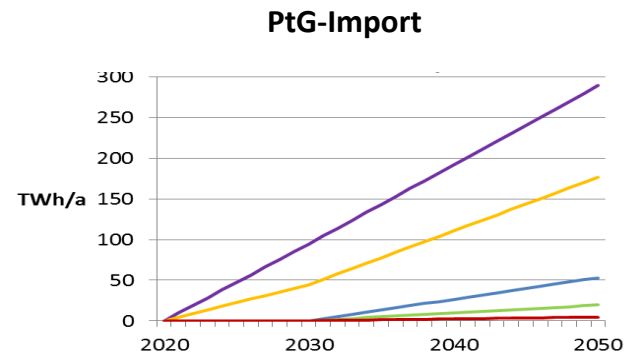
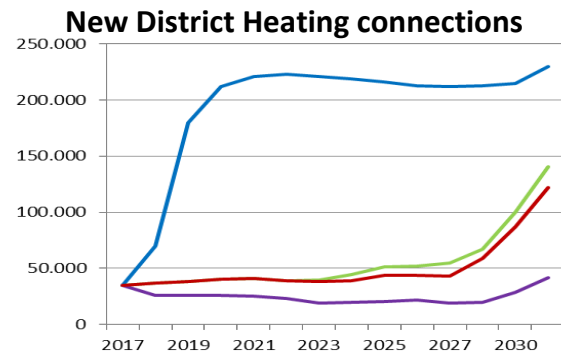
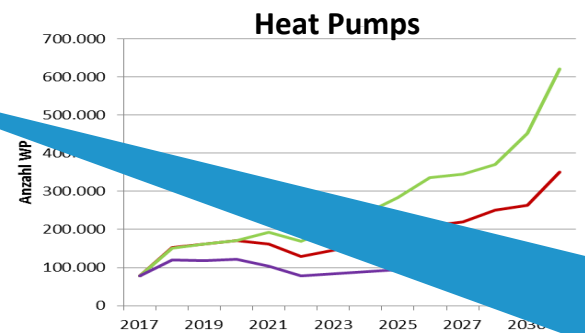
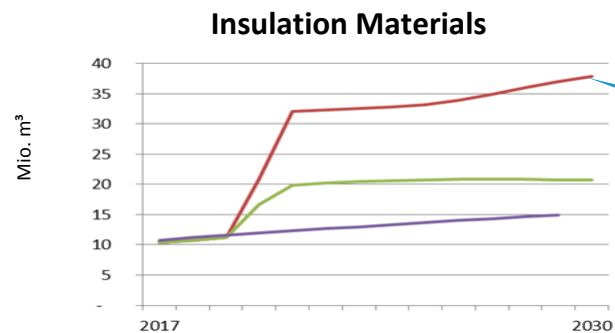


- BAU + PtG
- Efficiency + PtG
- Efficiency + RES
- Efficiency + HP
- Efficiency²



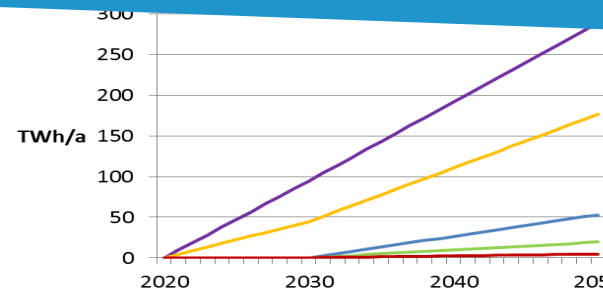
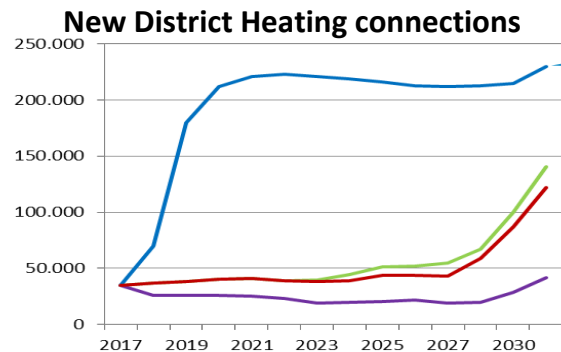
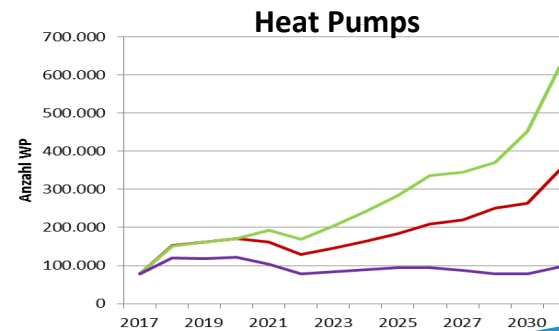
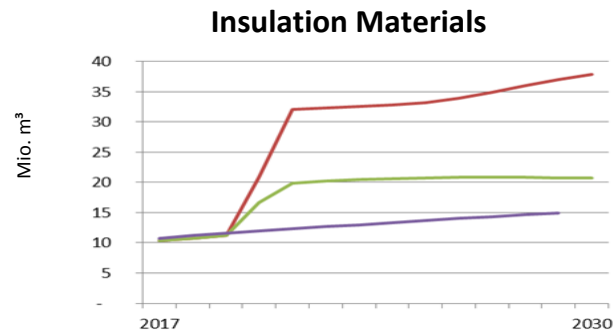
- In the alternative scenarios, lower efficiency must always be compensated by an **EVEN STEEPER** growth in renewable energies.
- Efficiency **AND** renewables must be ambitiously implemented in the short term.
- The decisive factor is which technology meets the requirements with realistic effort.

# Market Ramp Up



- **Efficiency²:** annually installed insulation volume in Germany must be tripled in the short term

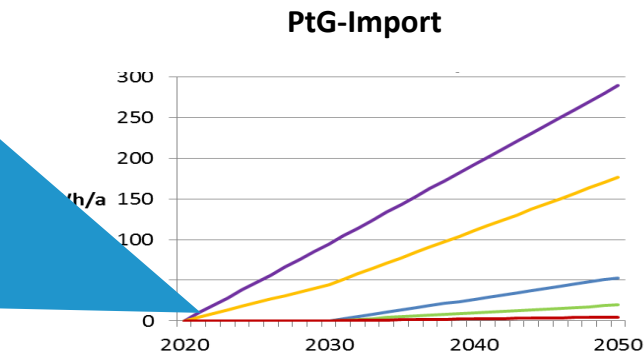
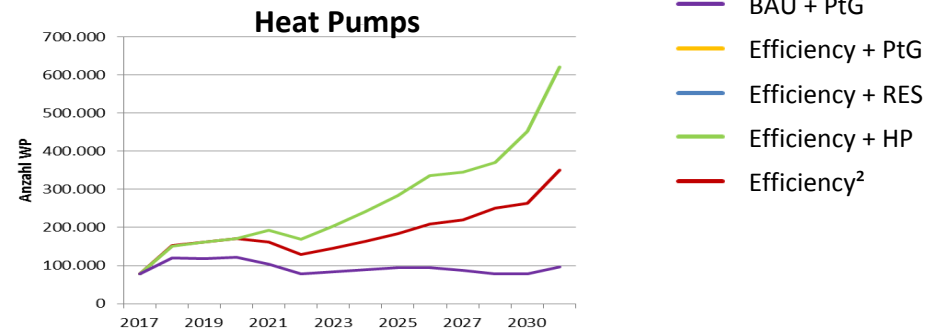
# Market Ramp Up



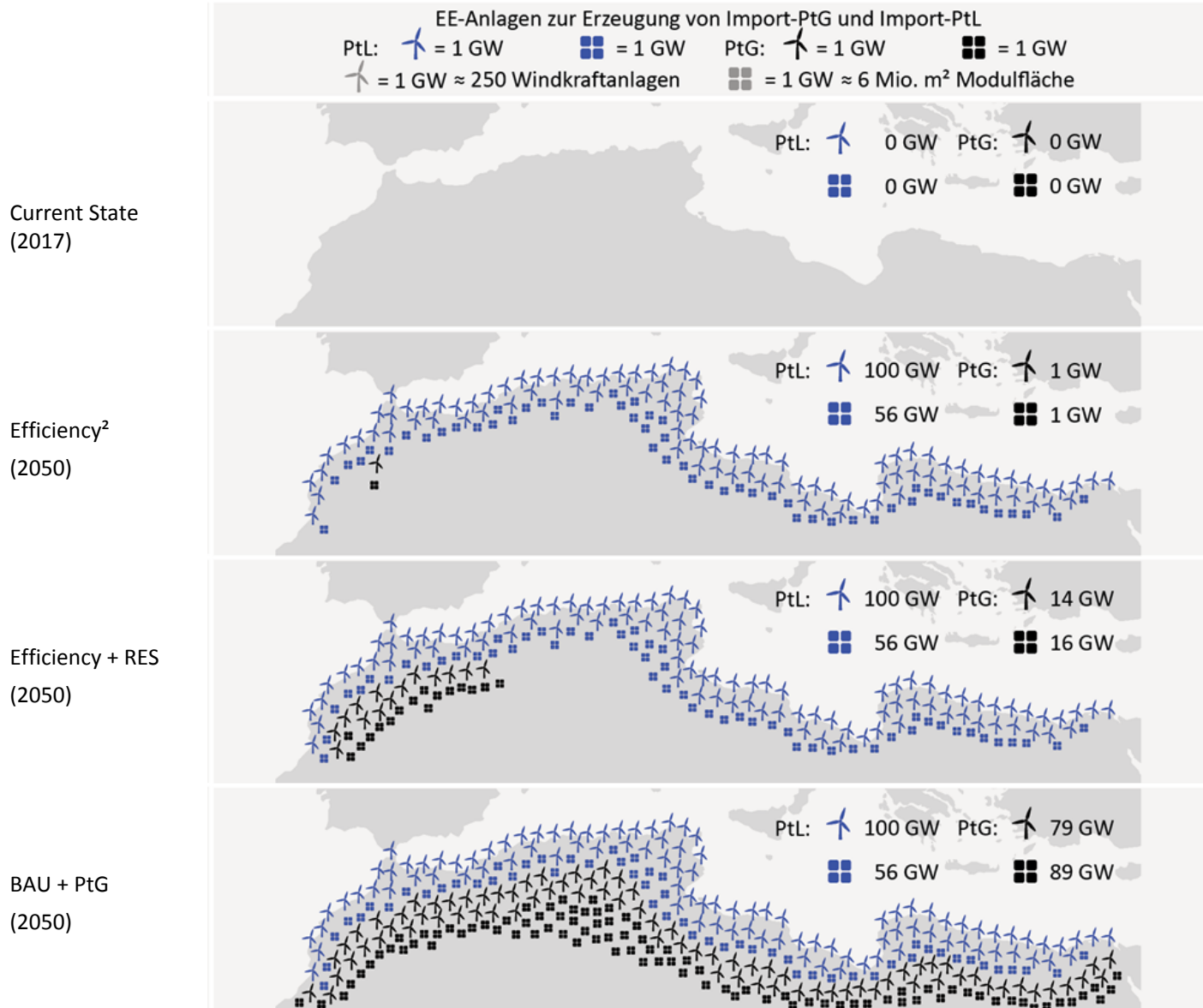
- **Effizienz + EE:** solar thermal systems must grow fifteenfold by 2030 compared to 2017, number of buildings supplied via heating networks must increase fourfold
- The potential of renewable energies for heat generation is thus almost fully exploited.

# Market Ramp Up

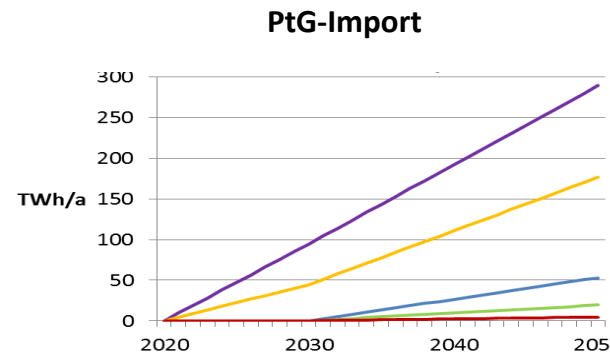
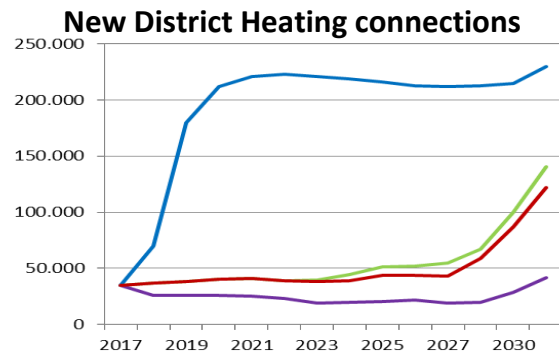
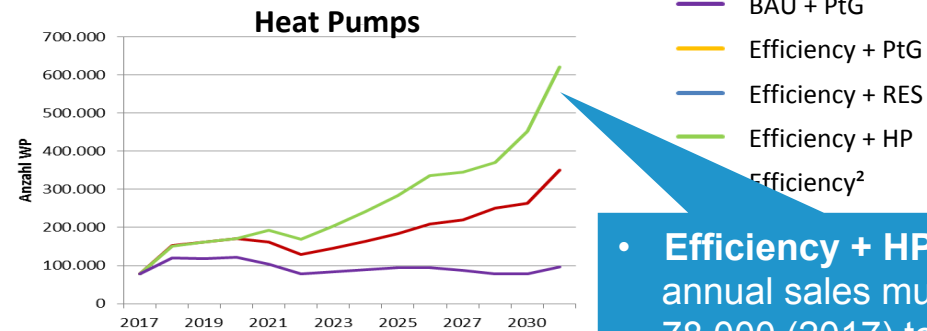
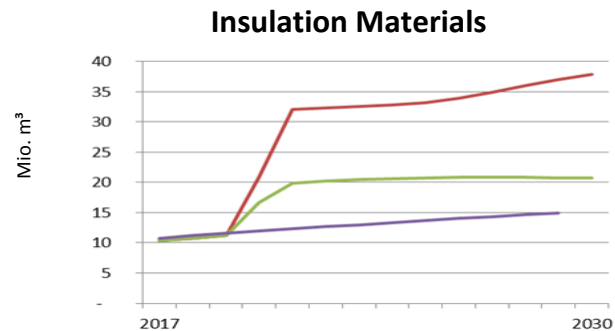
- **Efficiency + PtG/ BAU + PtG:**  
the majority of synthetic methane must be imported
- **Efficiency + PtG:**  
for production in North Africa,  
102 GW of generation capacity would  
have to be installed in wind and PV  
plants by 2050
- **BAU + PtG:** 178 GW
- For comparison in Germany 2016  
installed capacity of all renewable  
electricity producers: 103.6 GW ->  
long stretches of the African  
Mediterranean coast would be  
required for water supply for  
electrolysis



# Market Ramp Up



# Market Ramp Up

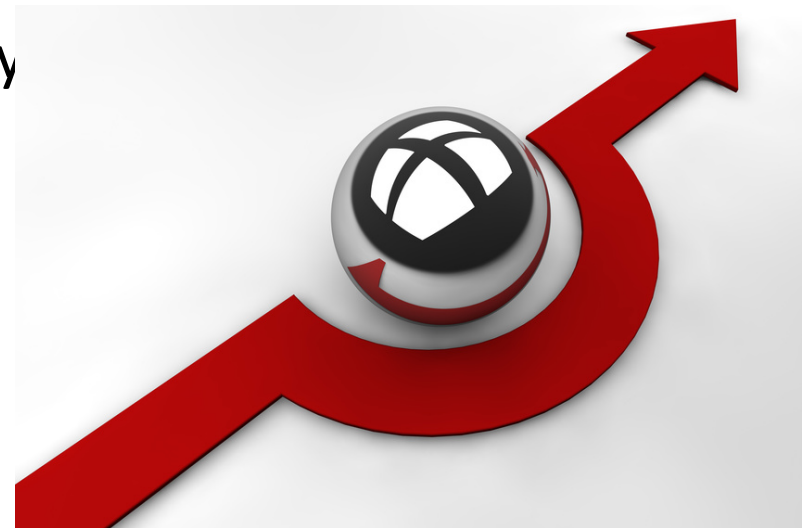


- **Efficiency + HP:** annual sales must rise from 78,000 (2017) to 200,000 and by 2030 to 620,000 (80% market share)
- Use predominantly in existing buildings
- In the year 2030 a stock of 4.7 million heat pumps will be reached.

# Specific Opportunities and Risks

## Fault Tolerance and Flexibility

- In scenario Efficiency<sup>2</sup>, more ambitious climate targets (e.g. -95% GHG) can also be achieved.
- In Efficiency<sup>2</sup>, you can react flexibly to unexpected changes or unanticipated preconditions
  - because renewable heat potentials are not fully exploited
  - efficiency enables the use of RES heat
- Lower efficiency makes it increasingly difficult to switch to alternative technologies



# Specific Opportunities and Risks

## Controllability

- Better predictability for technologies that are broadly established on the market
- In the PtG scenarios, preconditions have to be fulfilled at multi-national level which Germany can influence only to a limited extent.
- Preconditions for Efficiency + WP
  - Sufficiently suitable buildings
  - All suitable buildings must install HP
  - how to regulate?



# Specific Opportunities and Risks

## Acceptance

- Generally little willingness to invest in energy renovation - fear of financial losses
- Acceptance of building insulation is subject to strong fluctuations
  - Discussion partly shaped by myths
  - can be influenced by appropriate instruments



# Conclusions

## Thesis

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

*Technological openness  
enables less insulation*

*PtX enables us to use  
existing technologies*

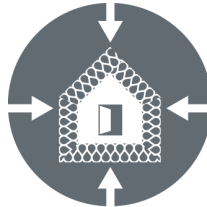
*Today's incentives and  
requirements for buildings  
are sufficient.*

## The most important at a glance



**„Technology-either/or“  
will not meet the target:**

Pursuing all options with  
determination and planning  
in order to move towards  
the target course.



**Efficient Buildings are  
the door openers for  
technological openness:**

They preserve renewable  
energy potential and  
flexibility; without insulation  
there is no reasonable use of  
RES.



**PtX is expected to stay  
expensive and  
continues dependence  
on imports:**

PtX as a supplement in the  
building sector; no  
replacement for efficiency;  
required in other sectors.



**„Roadmap efficiency  
2030“ required:**

Align incentives and  
requirements with the target;  
best possible use of  
renovation occasions; flanking  
measures.

## Thank you for your Attention

