Federal Ministry
for Economic Affairs
and Energy

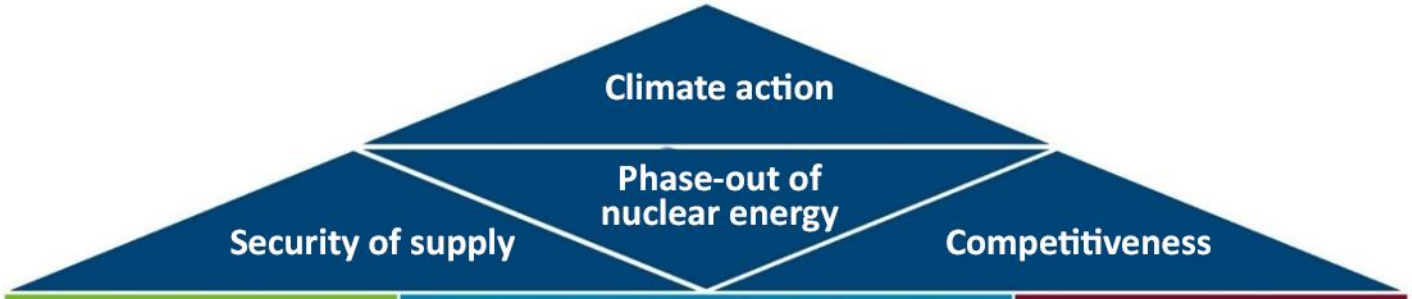
Energie wende
Switch to the Future

Long-term scenarios for the energy transition

Webinar, 13. December 2018

www.bmwi.de

Using scenarios for decision making in GER: Climate and energy targets based on scenarios



Policy targets	Reductions in greenhouse gas emissions	Renewable Energy		Energy Efficiency % primary energy consumption
		% gross final energy consumption	% gross final electricity consumption	
2020	40%	18%	35%	-20%
2030	55%	30%	65%	–
2040	70%	45%	–	–
2050	80–95%	60%	80%	-50%

Source: Energiekonzept (2010) and Beschlüsse des Bundeskabinetts 2011

Using scenarios for decision making in GER: Energy concept 2010 and 65% RES power target

Energy concept 2010

- GER introduced energy efficiency and renewable energy targets for the Energiewende
- Decision making based on energy scenarios by Prognos AG (https://www.prognos.com/uploads/tx_atwpubdb/110700_Prognos_BMWi_Energieszenarien.pdf)
    - Translates climate goals (e.g. -55% until 2030) into energy goals (e.g. overall RES share of 30% in 2030)
    - Sensitivities proved robustness of specific targets

“65% target “

- Meaning: 65% of electricity consumption shall be supplied by RES in 2030 (currently 36%)
- 65% target is part of the coalition agreement from spring 2018 (if grid capacities suffice)
- Decision making mainly based on energy scenario by Öko-Institut (https://www.oeko.de/oekodoc/2451/2015-608-de.pdf)
    - Scenario reaches a GHG-reduction of 95% in 2050 (vs. 1990)
    - Now a new scenario is analysing specific grid expansion and investment needs (next slides)

Using scenarios for decision making in GER: Volatile RES require grid expansion

Supply

Demand

solar
wind (installed)
wind (planned)
bottlenecks
transmission grid
distribution grid
high-demand areas

Source: DUH 2011

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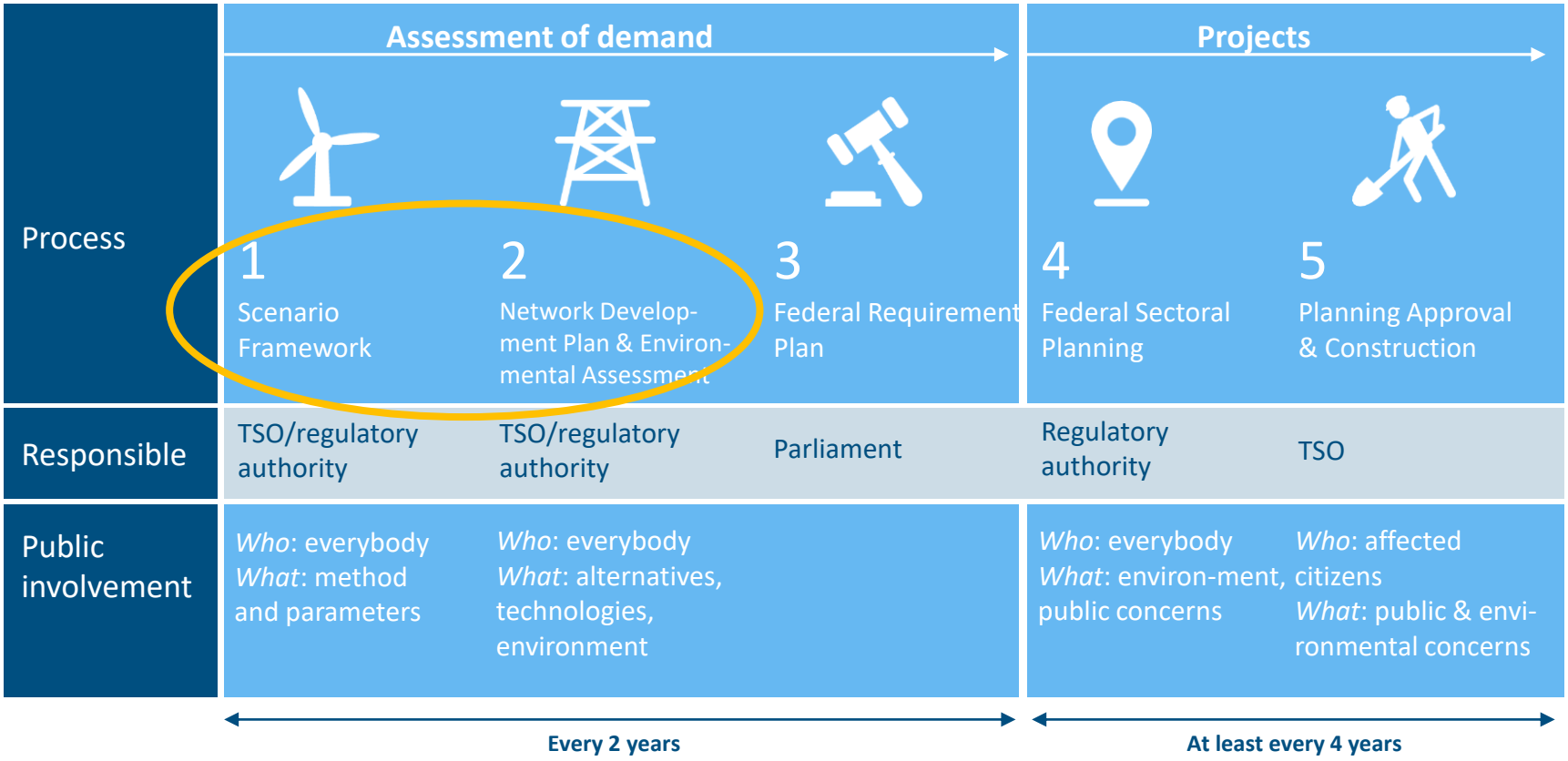
Using scenario for decision making in GER: German grid planning process



Source: Ecofys 2016, Bundesnetzagentur 2013

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Using scenarios for decision making in GER: Assessment of grid expansion demand

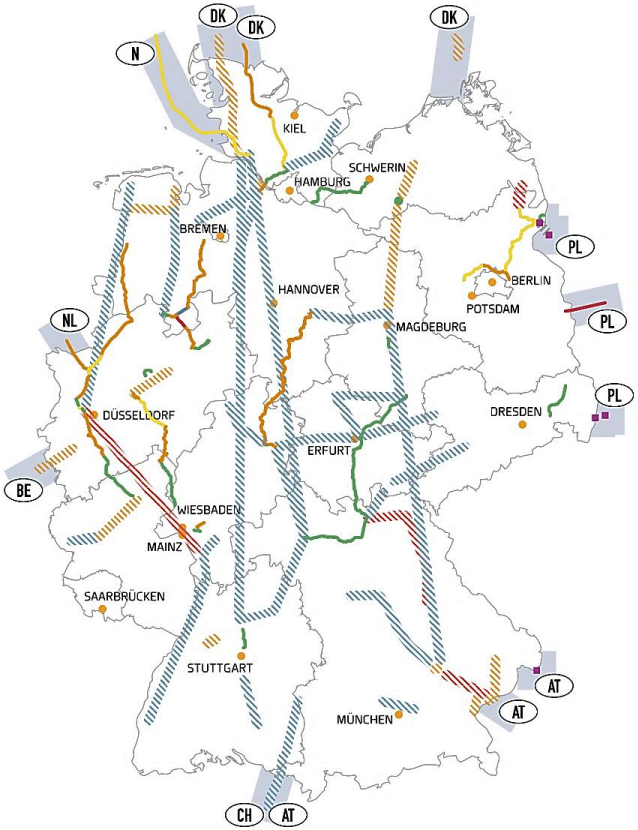
Scenario framework (1st step)

- Possible development of the electricity sector until 2030/2035
  - Assumptions of electricity demand and generation as well as technology mix and interconnector capacities to electric neighbours
  - 3 scenarios to cover the bandwidth of assumptions
  - Applied methods (regionalisation of RE capacities, allowed curtailment, redispatch)

Network development plan (2nd step)

- Energy-only-market modeling with invest-dispatch-model
  - Flow-based-market-coupling (EU single-market)
  - 3 scenarios with different transport demand between transmission network nodes
- Transmission Network modeling
  - Optimisation before reinforcement before extension (NOVA-Principle)
  - Provides grid expansion demand per transmission line

Using scenarios for decision making in GER: Latest approved energy line expansions



Federal Requirement Plan (3rd step)

(BBPIG) as of December 2016

- 6,100 km of priority lines planned
- 43 projects
- 3,050 km optimisation

- Realised
- Approved or under construction
- Other planned routes (under the Energy Line Extension Act)
- Other planned routes (under the Federal Requirement Plan Act)
- Project of common interest (EU)

Source: Bürgerdialog Stromnetz 2016

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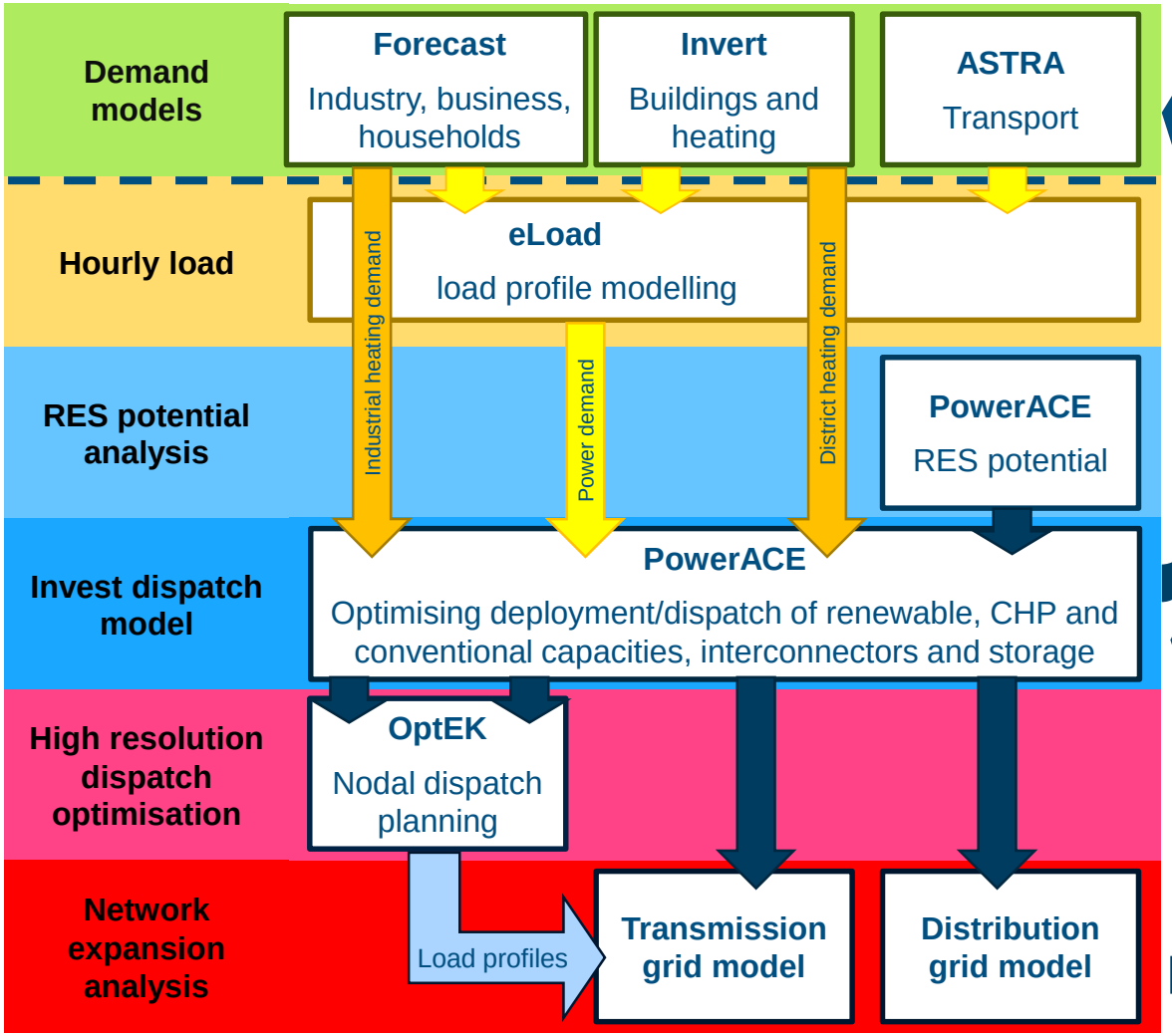
Current state of long-term energy scenarios: Cost-optimising integrated energy models

Simulation

Optimisation



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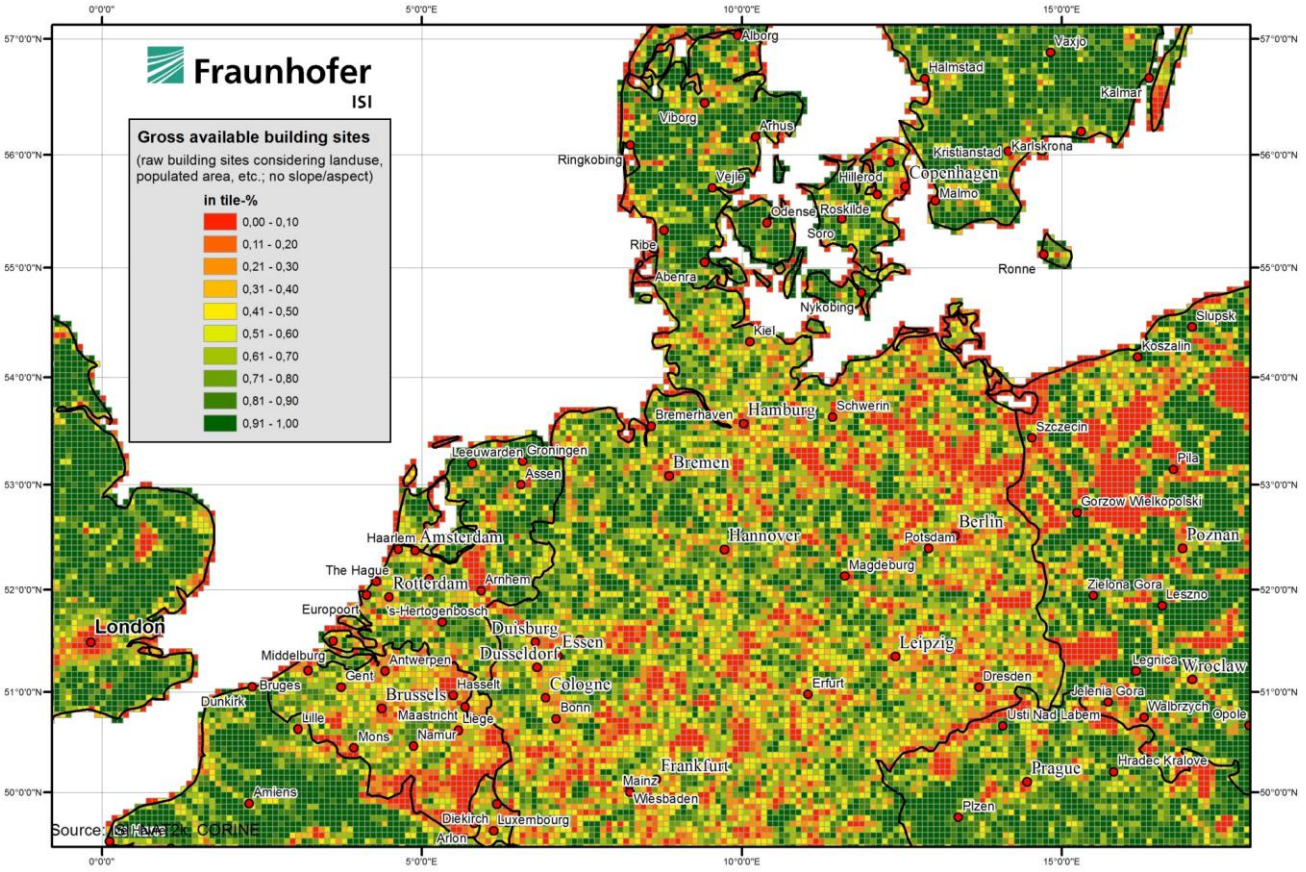
Fraunhofer ISI, Consentec (2017): Long-term scenarios

Current state of long-term energy scenarios: Spatial resolution of variable RES potential (6x6km)



Fraunhofer ISI, Consentec (2017): Long-term scenarios

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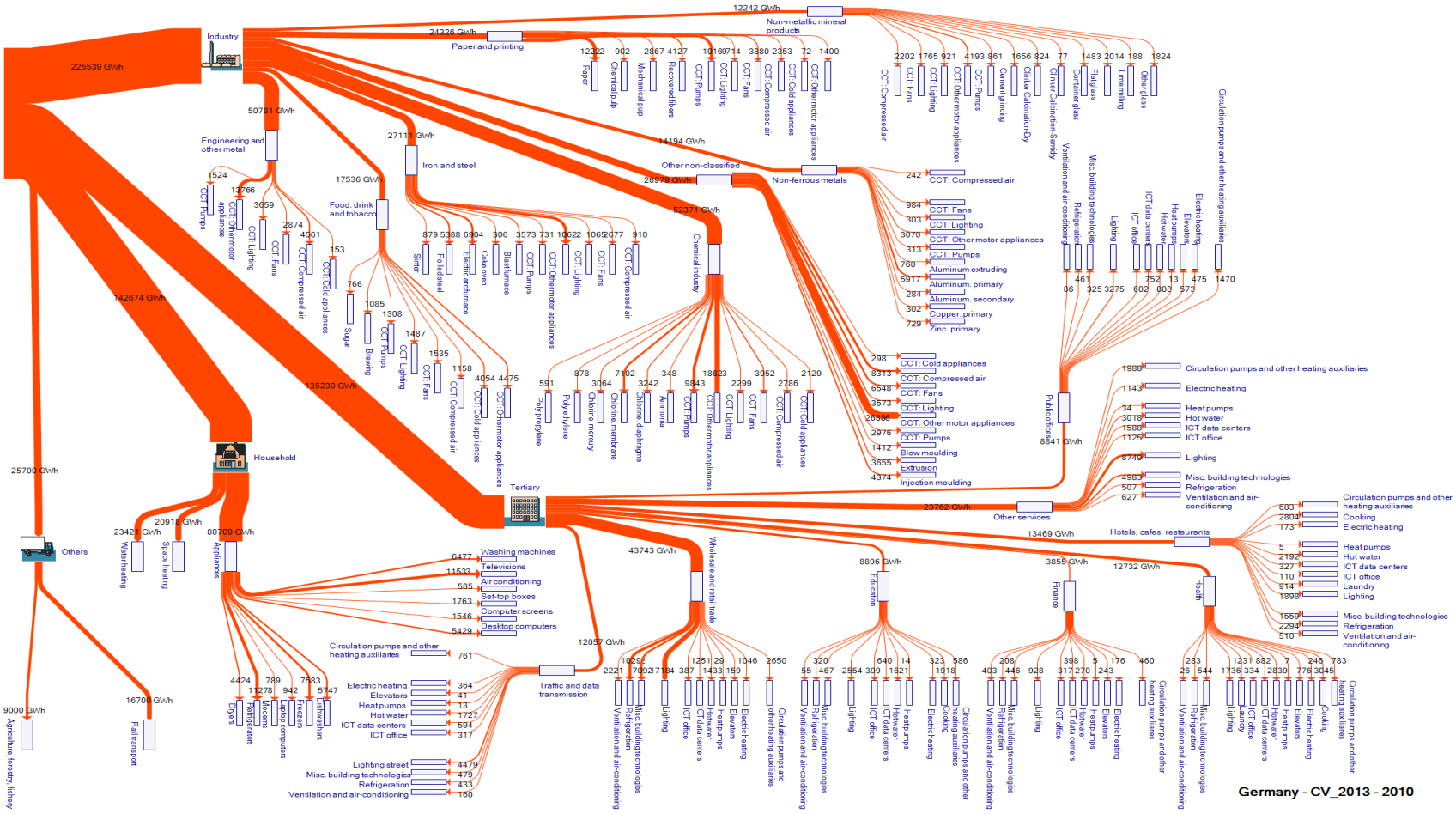
Current state of long-term energy scenarios: End-use sector demand simulation models



Fraunhofer ISI, Consentec (2017): Long-term scenarios

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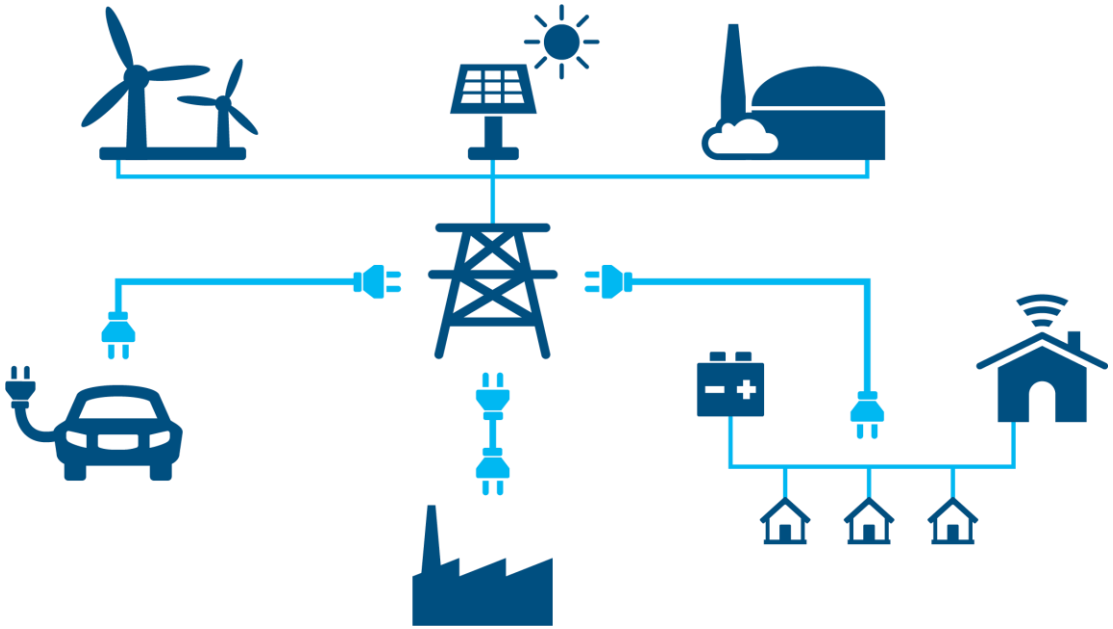
Improving long-term energy scenarios: Integrate infrastructure (power and heat)



- Today: Energy models can already optimise capacity and power grid investments
- Next step: integrate heating networks even better into the equation
- Sector coupling in combination with district heating is an underestimated potential in GER
- Low temperature heating networks are perfect match for variable RES (e.g. heat pumps)

Source: BMWi

Why long-term energy scenarios?

Long-term planning is crucial for successful energy policy:

- Energy sector is of strategic importance (security of supply, welfare)
- Foresighted energy policy can lower macroeconomic cost by
    - avoiding dead-ends and expensive lock-ins,
    - creating a good investment environment with low capital costs and
    - planning and adjusting infrastructure in a timely manner (power and gas grids),

Foresighted energy policy needs energy scenarios:

- Ambitious climate goals require a fundamental transformation of the energy system
- Energy scenarios provide a plan for the transformation process
- With energy scenario policy-makers can take an informed decision

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Thank you for your kind attention!

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