# Investments in renewable energy
## support or market based?

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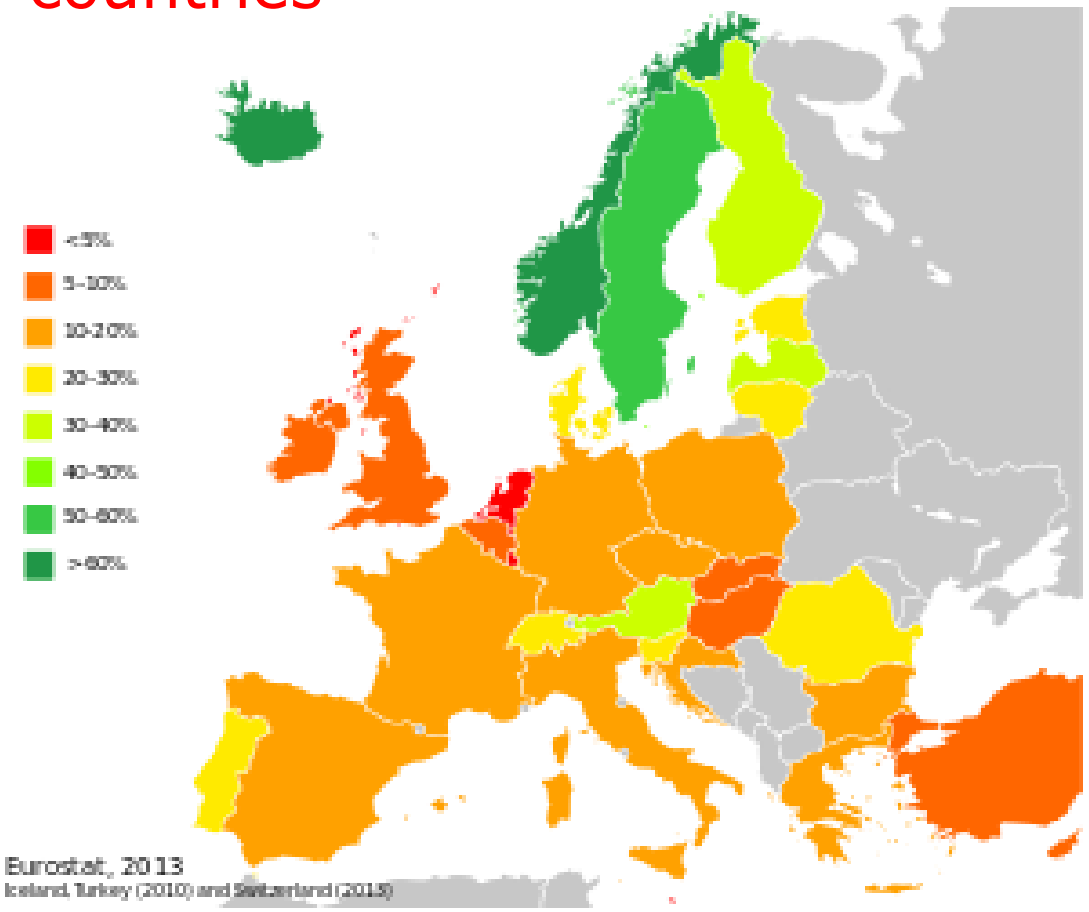
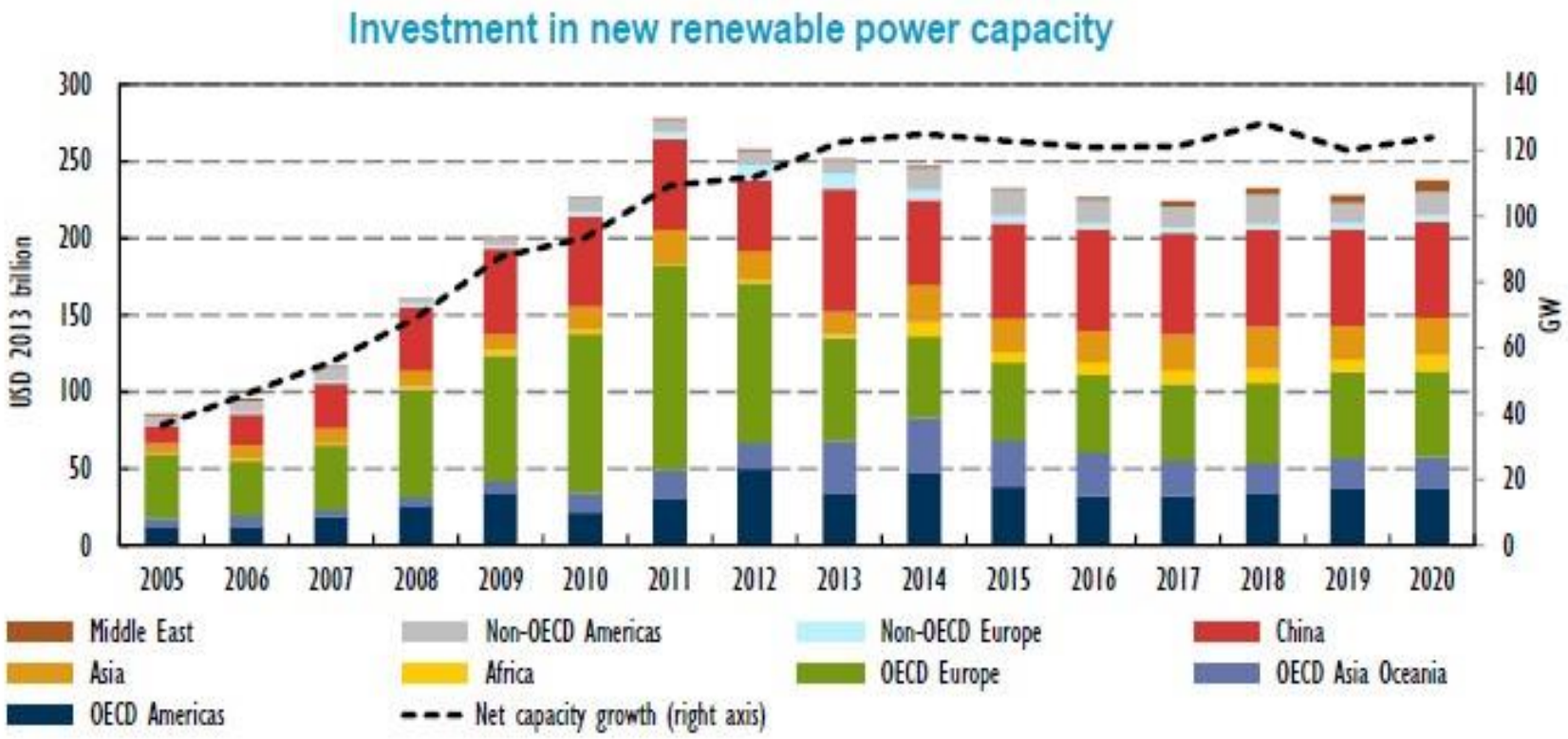
## Outline

- Why support for RES?
- Designing support schemes
- Prospect of market-based investments

# EU policy objective: share RES should be 20% in 2020 huge differences in targets and performance among EU countries



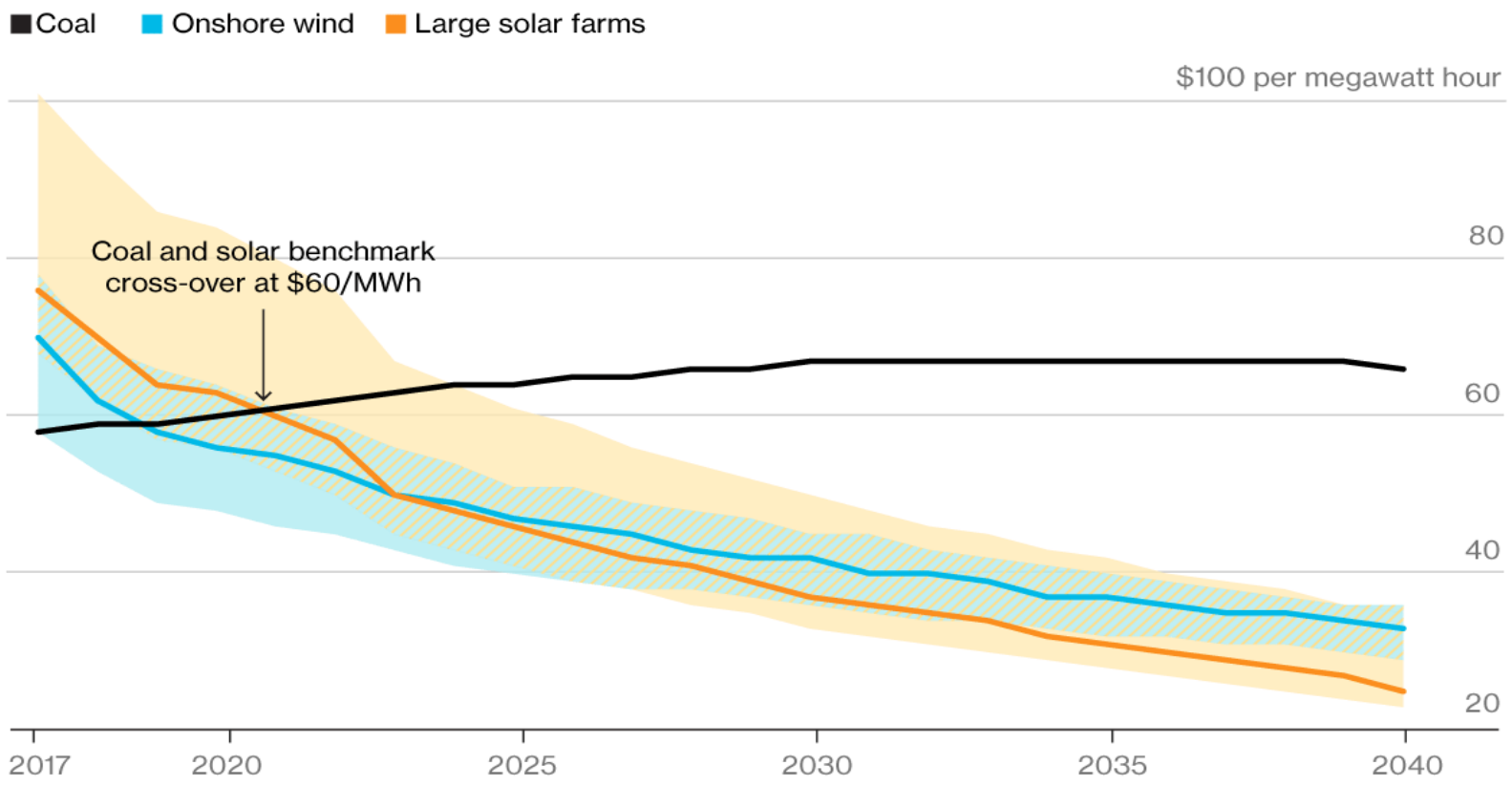
# RES investment levels
## Billions of euro's of investments needed




Source: globe-net.com

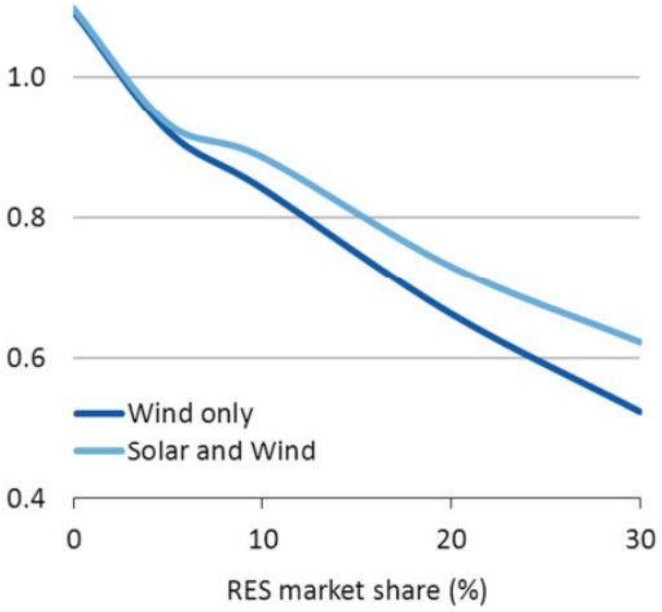
# Power market: why is support for RES needed?

Levelized costs of energy (LCOE) of RES will be competitive soon



# Power market: why is support for RES needed?

Comparision of levelized costs (LCOE) does not tell the full story: average price RES is lower than conventional (market value effect)

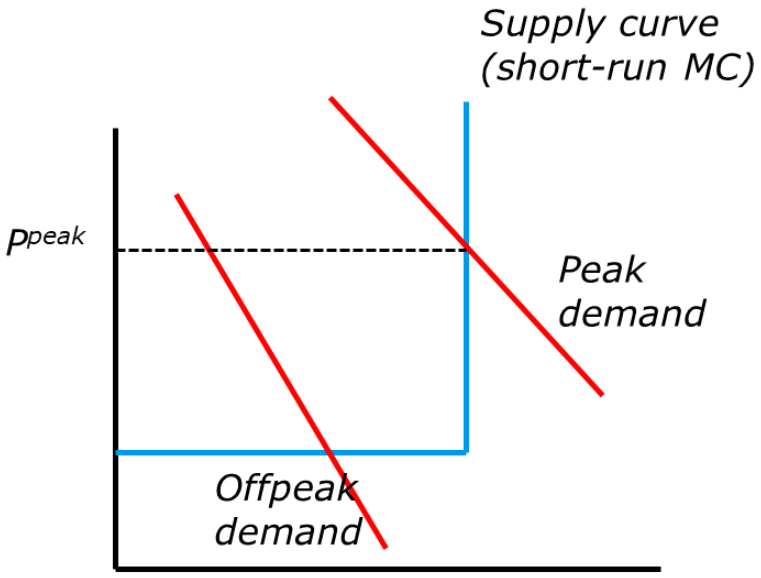



Nevertheless:

In the near future, investments in RES will become more attractive than investments in conventional plants

# Power market: why is support for RES needed?

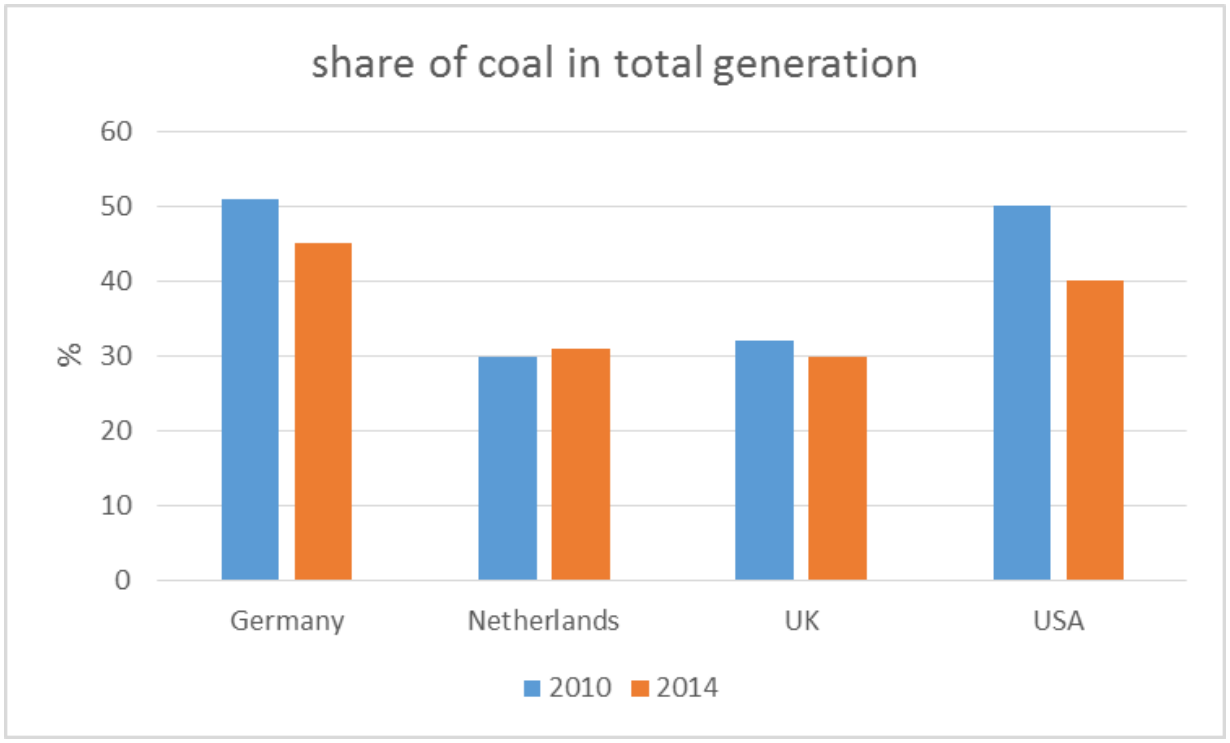
- Energy Transition: replacement of existing fossil-fuel plants by RES
- in energy-only market only higher price in case of scarcity
- power market does not give reward for such replacement investments




*Investments in new capacity*
*if $P^{peak}$ > long-run marginal costs*

# Most current systems are dominated by conventionial plants

- for the dispatch decisions, the investment costs do not count
- overcapacity: current power prices are only related to short-term marginal costs
- hence: subsidies needed to realise transition




Source: www.iea.org/statistics

# Support schemes

Challenge:
*Triggering investments in RES at lowest costs for society*

Relevant elements:

- risk/return for investor *(financeability)*
  - support scheme should give at least same return for same level of risk
- risk for society: supranormal profits *(distribution of welfare)*
  - support scheme should give not an higher return for same level of risk
- incentives to reduce costs *(productive efficiency)*
  - firm level
  - industry level
- incentives to look at market value of power *(allocative efficiency)*
  - firms should not produce when market price < marginal costs

# Many different types of support schemes

- FiT: fixed subsidy/MWh, only based on costs
- FiP: fixed subsidy/MWh, based on costs and expected power price
- Sliding FiP: flexible subsidy/MWh, depending on actual price
- Auction for subsidy
- Renewable energy obligations
- Netting (for prosumers)

# Feed-in-Tariff: scores well on 1 dimension

Incentives productive efficiency

Investment in RES is financeable

Incentives for allocative efficiency

Low risk of supranormal profits

# To reduce risk of supranormal profits:
# make fee depending on power price and other benefits (e.g. green certificates)

Incentives productive efficiency

Investment in RES is financeable

Incentives for allocative efficiency

Low risk of supranormal profits

# For incentives for allocative efficiency: no reward if power price is negative

Incentives productive efficiency

Investment in RES is financeable

Incentives for allocative efficiency

Low risk of supranormal profits

# For incentives for productive efficiency: techniques should compete with each other

Incentives productive efficiency

Investment in RES is financeable

Incentives for allocative efficiency

Low risk of supranormal profits

# How to perform well on all dimensions?
## introduce competition for subsidies

Incentives productive efficiency

Investment in RES is financeable

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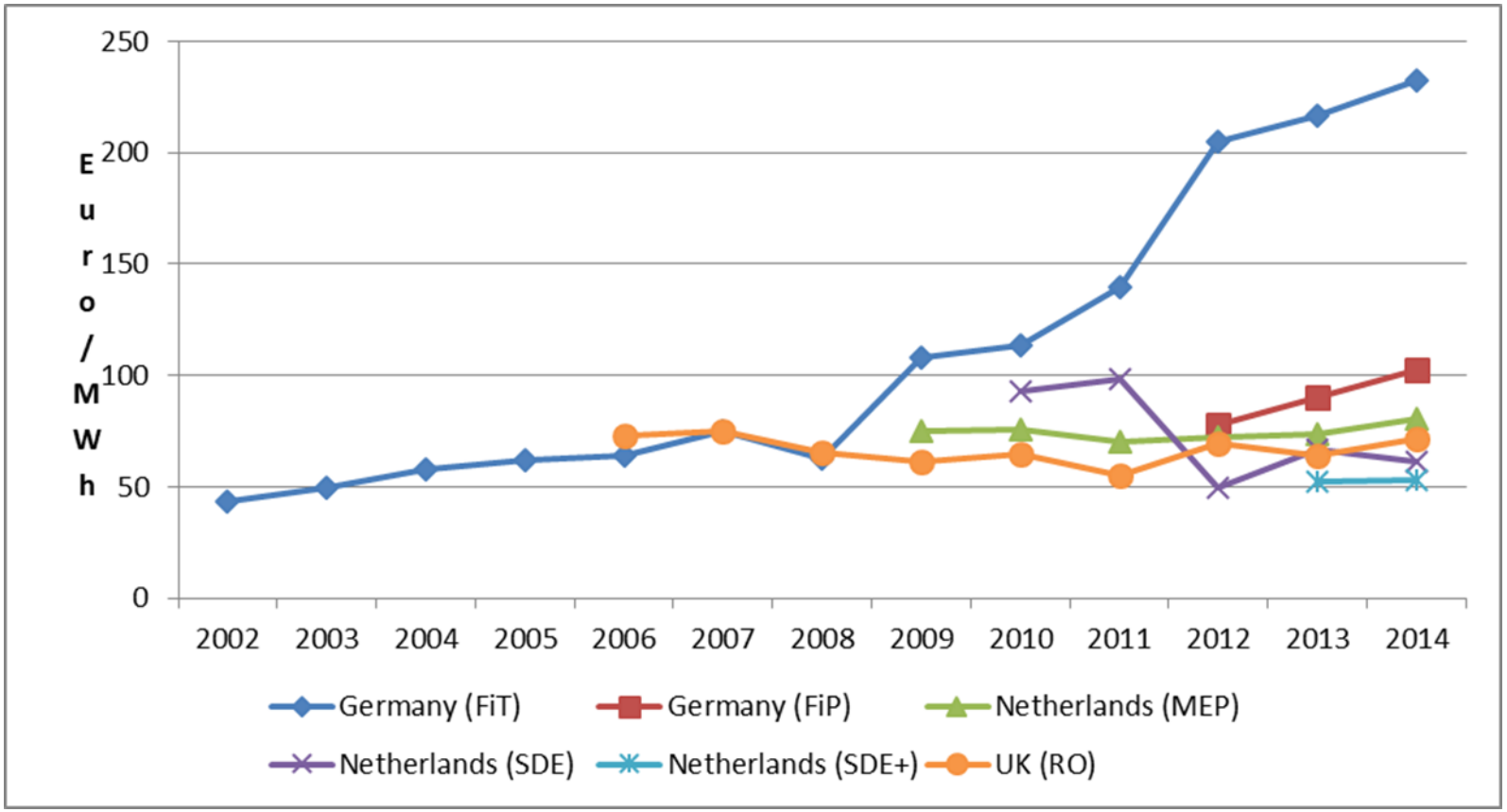
# Examples of succesful schemes with competition

- UK renewable energy obligation
- Dutch SDE+
- Auctions of subsidies for offshore wind parks (Denmark, Netherlands)




Source: Rooks and Mulder (2016)

# Competition for subsidies

Limited budget or limited number of slots

Technology neutral

System with cap on subsidy and floor regarding power price
- reduces the risk for society (no extra rents to be earned),
- gives also incentive to firm not to produce when electricity has no value

Firms take other benefits into account
- such as green energy certificates, strategic value of green energy

# A future for RES without subsidies?

RES suffers from double market-value effect

1. low prices are for RES, high prices for flexibility providers

2. value of green energy (green certificates)

   the larger the share of RES, the marginal WTP for green energy declines, so lower extra revenues

Investment outlook depends on baseload scarcity prices, and they will only emerge when conventionel plants have been phased out

# Conclusions

- even when LCOE of RES will be lower, subsidies are needed because of energy transition
- market-based design of subsidies lowers costs and risks for society
- without any support, investments in RES will remain problematic because of
  - double market value effect (value of both power and green)
  - and the existing base of conventional plants