

# Keeping the lights on: Is a Coal exit by 2030 still feasible?

Montel German Energy Day 2024

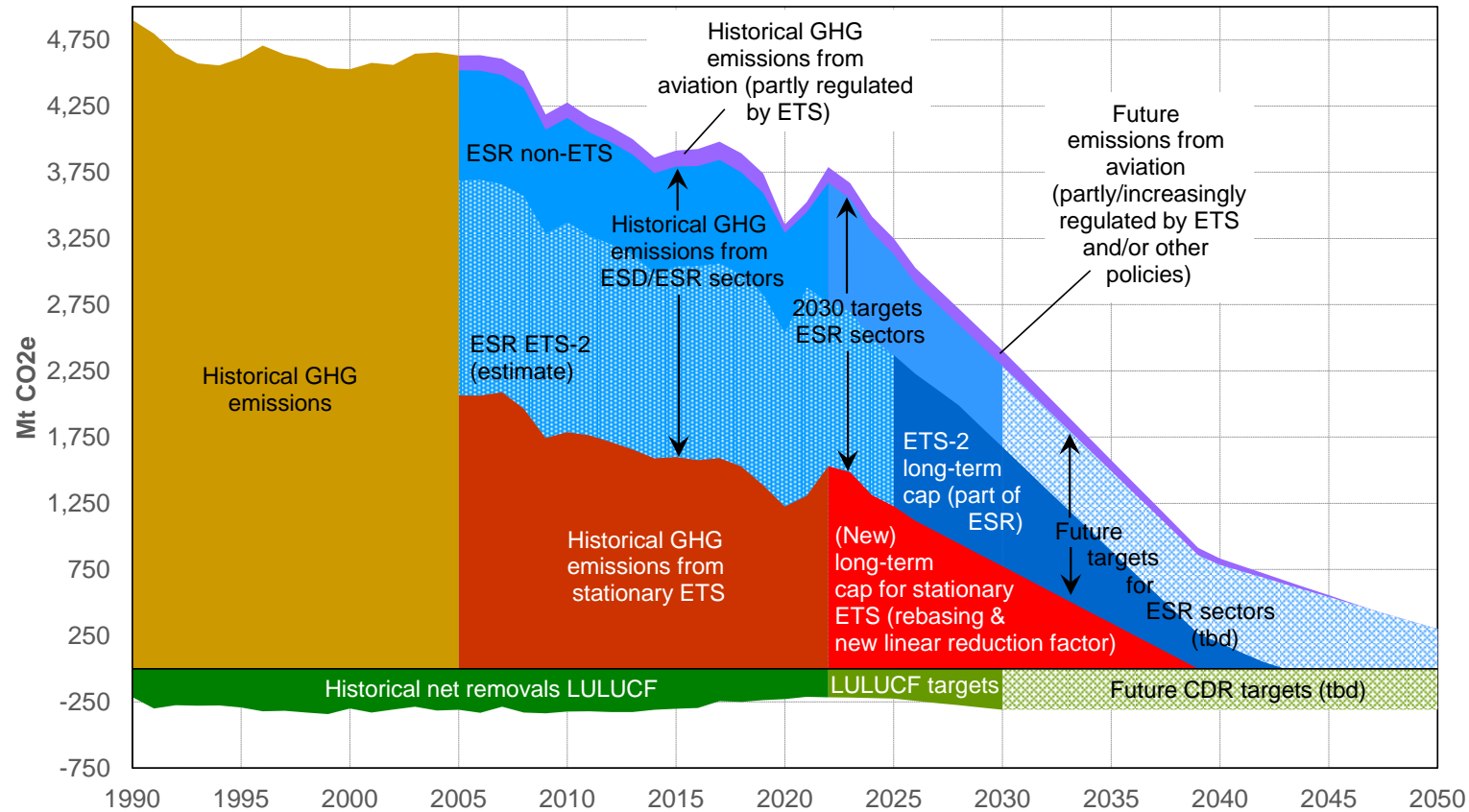
**Dr. Felix Chr. Matthes**

Berlin, 24<sup>th</sup> April 2024

# European Union climate policy architecture

## Implications for coal-fired power generation

EU-27 historical emissions and legally binding reduction targets

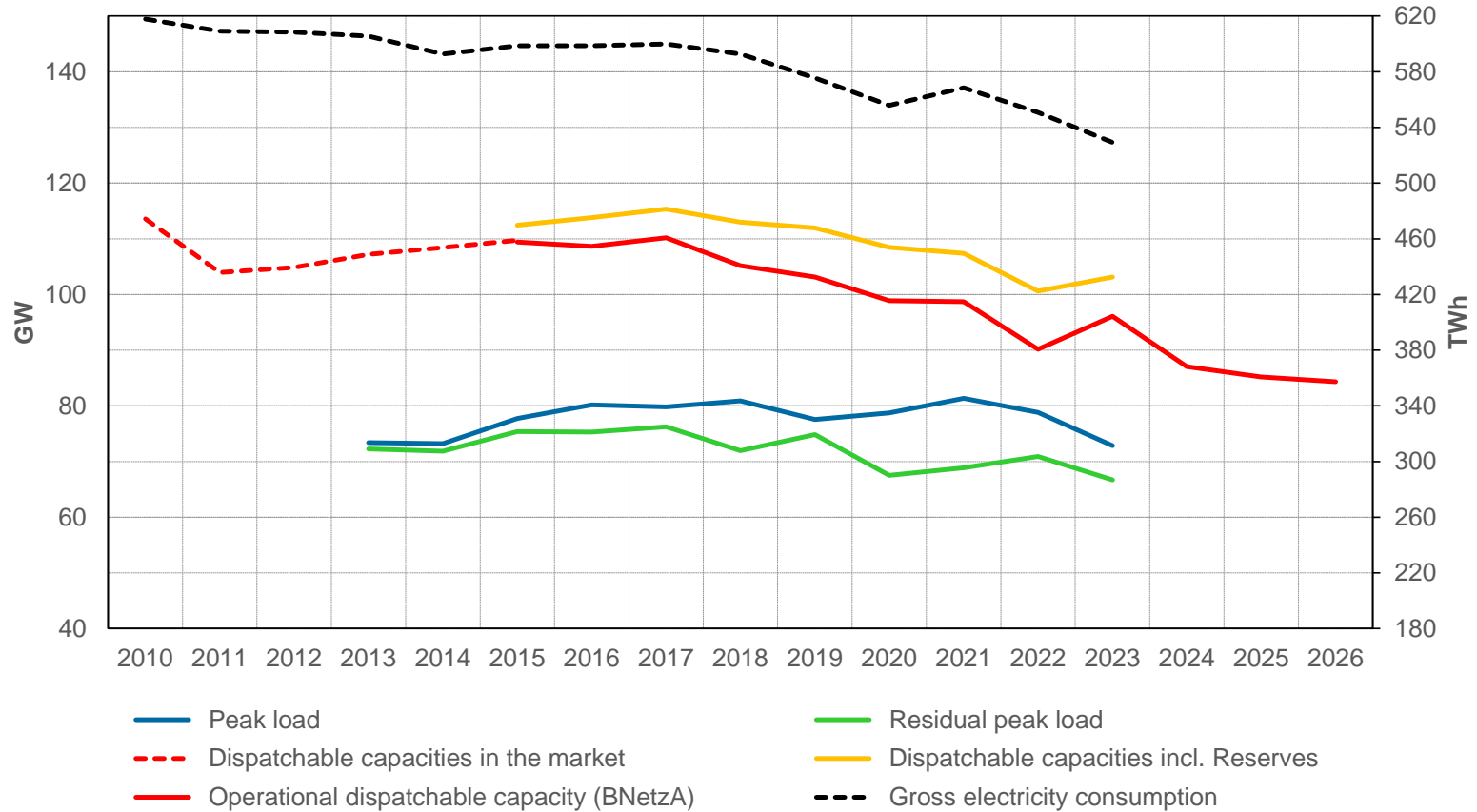


- Revision of the EU ETS
  - in 2038 for the last time emission allowances will be brought to the market for energy and energy-intensive industries (EU ETS)
  - even with some left-overs from the Market Stability Reserve (MSR) the industry must reach climate neutrality before 2040
  - no (new) emission allowances for ETS-2 (road transport, buildings etc.) will be made available after 2042
- What does that mean for coal phase-out (in DE and EU)
  - regulatory- and market-driven
  - power plants inside and outside (reserves) the market

# German power system

## Peak load, residual peak load, dispatchable capacity and electricity consumption

Key determinants for system adequacy

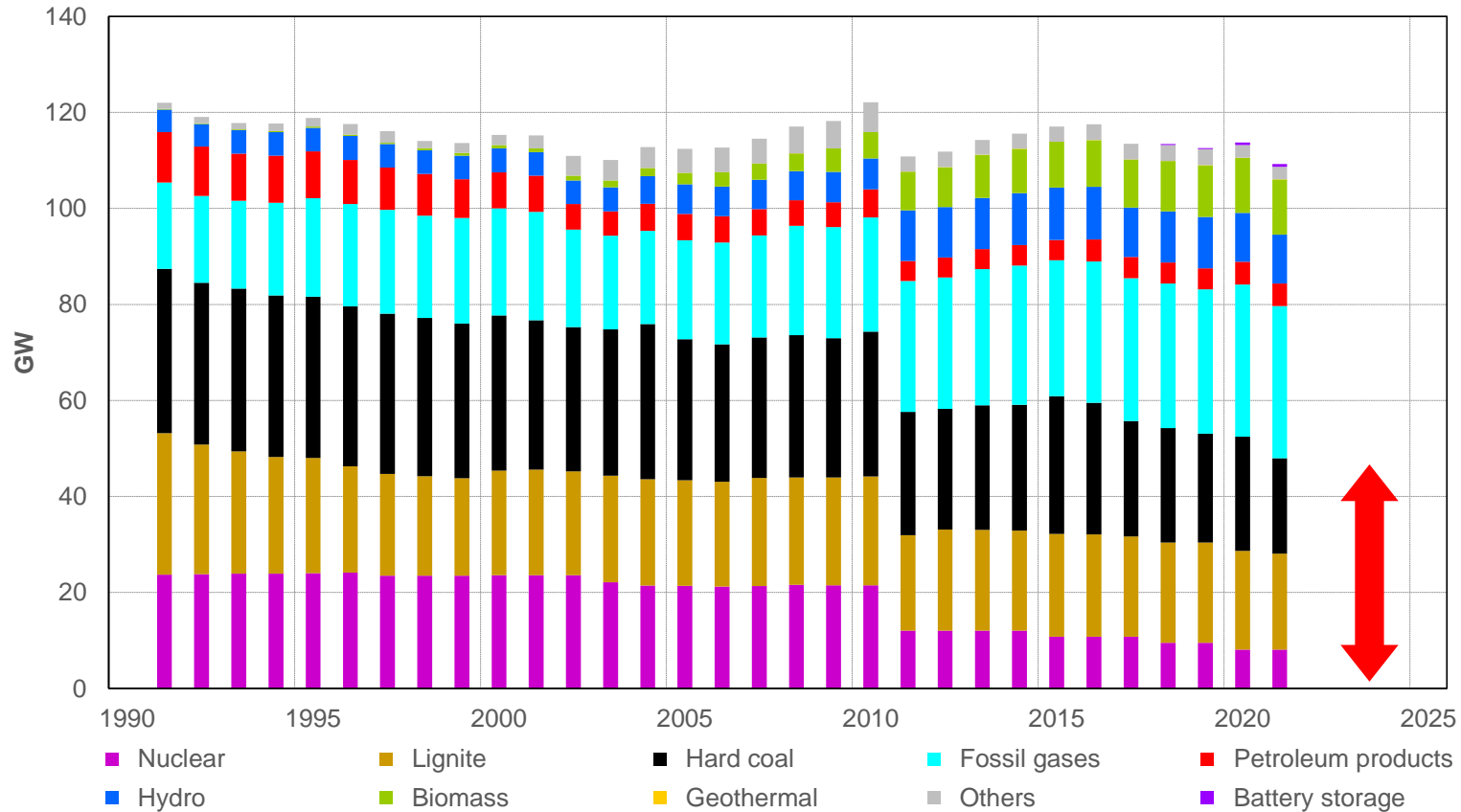


- Historical trends (by now) ...
  - Decreasing electricity consumption trends in general
  - Increasing peak load (except crisis periods)
  - Slightly decreasing residual peak load
  - Major decrease of dispatchable capacity (cushioned by reserves outside the market)
- ... but different patterns to come
  - Increasing electricity consumption, peak load and residual peak load
  - Massive decrease of dispatchable capacity
  - Significant uncertainties on timing

# German power system

## Dispatchable generation capacity

Dispatchable generation capacities in Germany

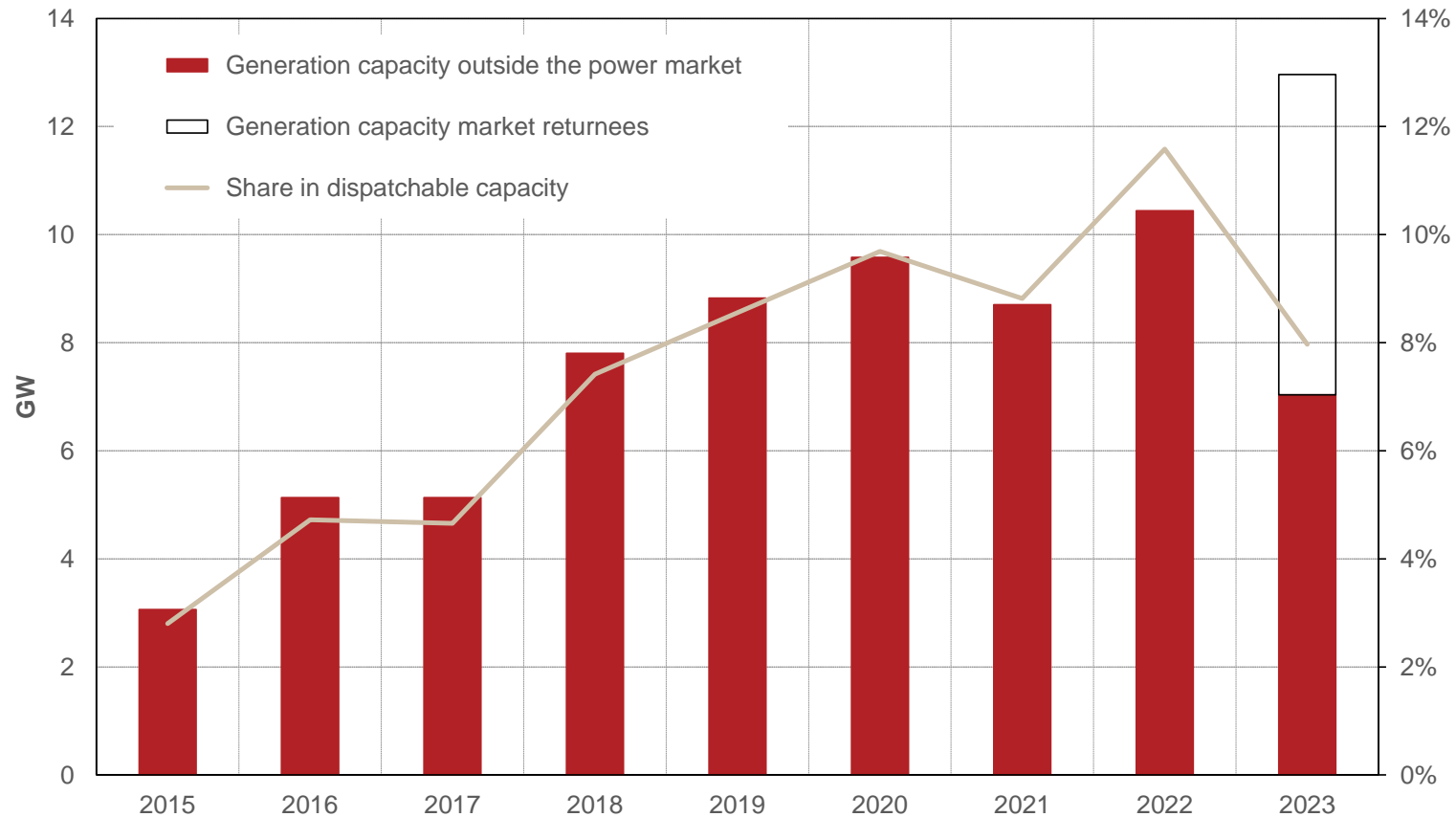


- Rather small changes in dispatchable capacities in the past
  - Relatively slow decommissioning of coal
  - Stepwise shut-down of nuclear
  - Some increase in natural gas (CHP) and biomass
- Major changes in 2022/2023/2024
  - Last phase of nuclear phase out (by 15<sup>th</sup> April 2023)
  - First major coal shut-downs (after a phase of regulatory enabled returns to the market)
- Major changes to come
  - Legally forced & market-driven shut-downs of coal plants
- Significant capacities hold in reserves (outside the market)

# German power system

## Dispatchable generation capacity outside the market

Dispatchable generation capacity outside the market

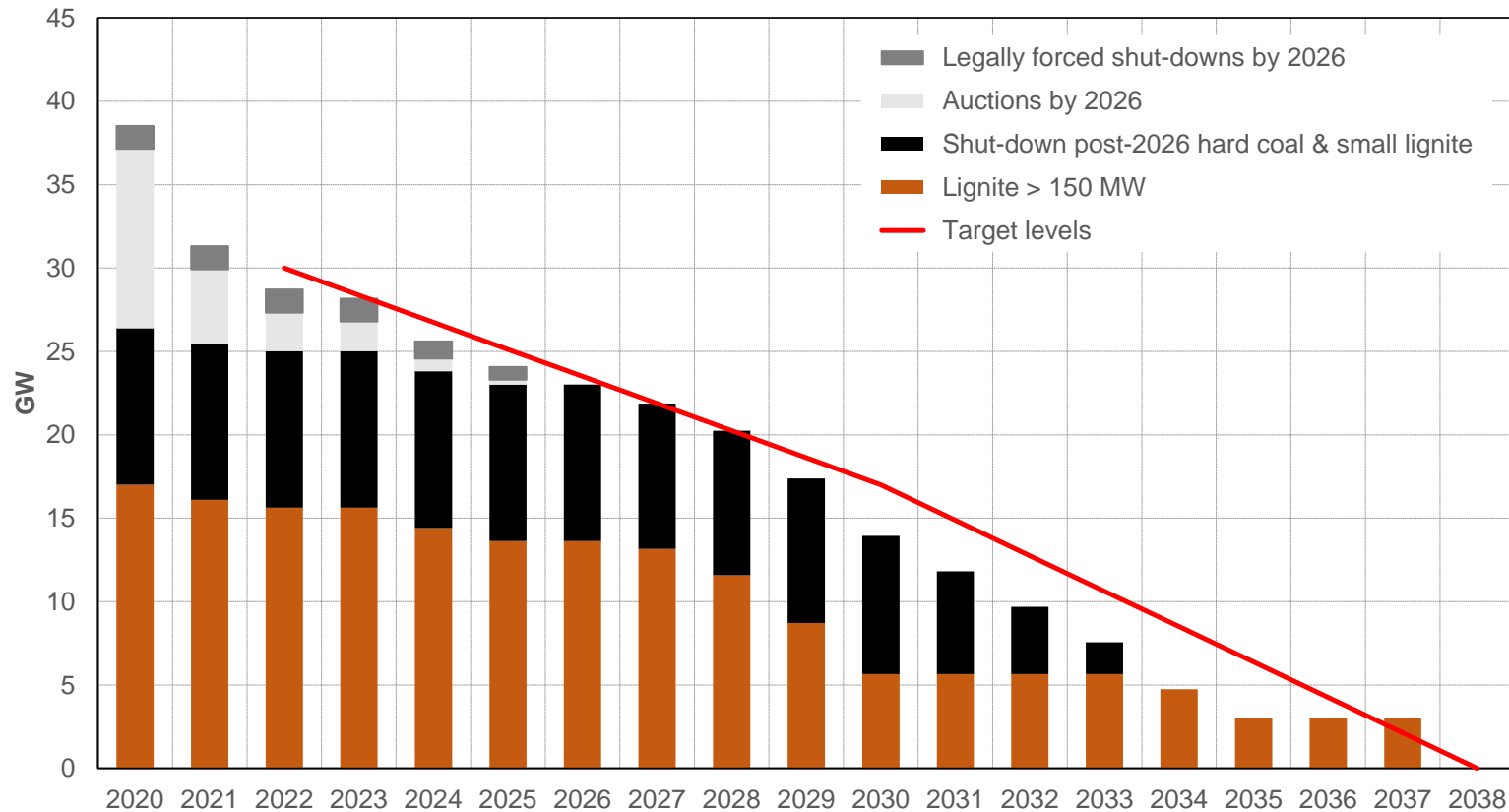


- (Still) existing market design paradigm in Germany
  - Energy-only market 2.0
  - Safeguarded by reserves outside the market (planned to never come back)
  - Total capacity of reserves amounts to approx. 13 GW (13% of dispatchable capacities)
  - Never come back promise was broken (for a certain period of time)
- Fresh look on market design and capacity remuneration mechanisms since 2023/2024
  - Power plant strategy
  - Some CRM from 2028 onwards

# German power system

## Coal phase-out trajectory by law

Coal phase-out trajectory according to coal phase-out law

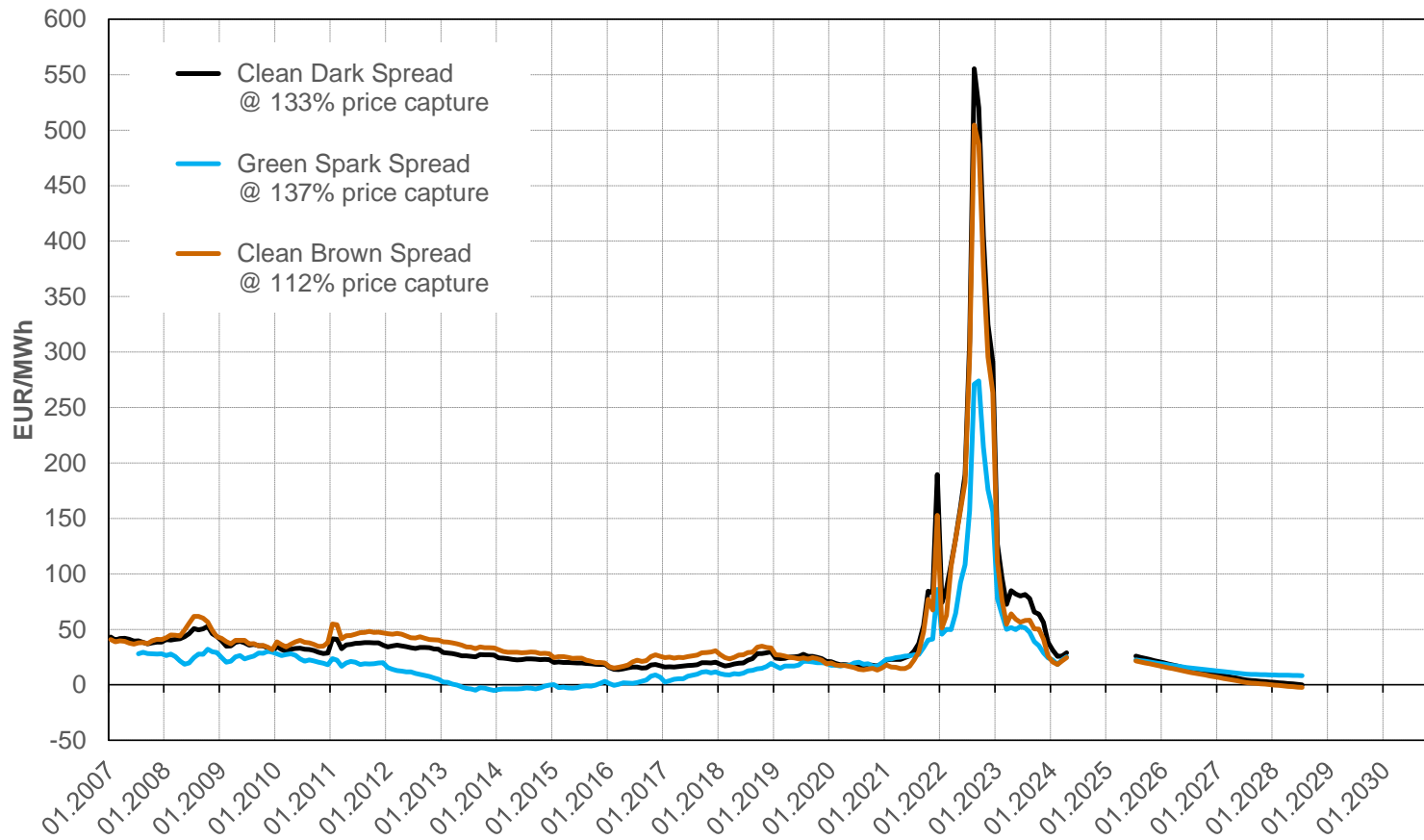


- Coal phase-out act as the legal basis
  - Results from the Coal Commission 2019
  - Deal between the Federal and the North-Rhine Westphalian government and RWE 2022
- Essentially three elements
  - Negotiated coal phase-out compensation for lignite (approved for RWE, challenged by DG COMP for LEAG in Eastern Germany)
  - Tenders for shut-down of hard coal (and small lignite) plants
  - Legally forced shut-downs without compensation
- Legal end of coal by 2038

# German power system

## Market driven coal phase-out

Power generation spreads by November 2023 / January 2024 / March 2024



- Market-driven coal phase-out as the reality
  - Contribution margins of hard coal and lignite plants (as well as some natural gas plants) on a strong decreasing trend after the energy market turbulences in 2022 and 2023
  - Contribution margins tend to shrink massively by the end of the 2020ies (based on energy market futures and observed capture rates)
  - Situation got massively worse during the last 6 months
- General trend is relatively clear but uncertainties remain
  - Fuel market trends
  - CO2 market trends

# German power system System adequacy assessments

## German and European system adequacy assessments

	2023	2025	2028	2030	2033
	GW				
Scenario A (Central Reference)*	33	28	33	48	57
Scenario B (Sensitivity)**	33	25	31	42	50
	Mittelwert LOLE (P50 - P95***) [h/a]				
Scenario A	-	2,16 (0 - 9)	3,55 (0 - 15,8)	4,28 (1 - 17)	8,07 (2 - 45,8)
Scenario B	-	7,35 (2 - 31,8)	12,26 (5 - 53)	11,19 (3 - 54,4)	21,63 (11 - 89,8)

Anmerkungen: \* substantielle Reaktion der Investitionen auf Preisspitzen. \*\* geringere Reaktion der Investitionen auf Preisspitzen. - \*\*\* P50 beschreibt das 50. Perzentil, P95 das 95. Perzentil

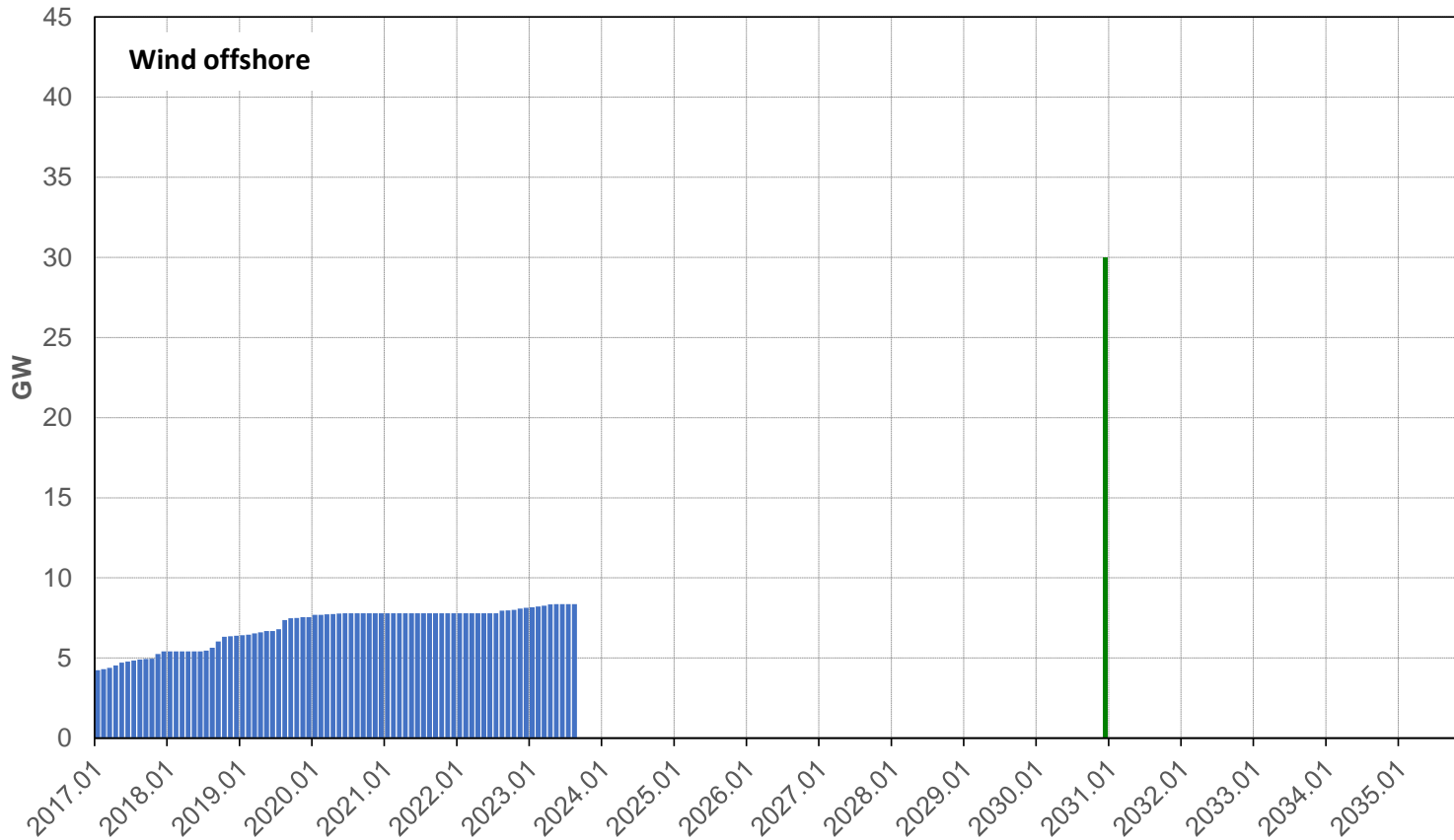
- Significant losses of dispatchable power generation capacities in the 2020ies
- Additional natural gas (hydrogen-fuelled/-ready) capacities needed by end of 2020ies or early 2030ies
  - Range of 20 to 30 GW (net additions) as a robust basis
  - Depending on many assumptions (residual peak load, cross-border contributions, weather year etc.)
- With these capacity additions different LOLE effects have been modelled



# German power system

## Historical trends for renewables and actual targets in the law

Historical trends and expansion targets for PV, wind onshore and wind offshore



Sources: BNetzA, Öko-Institut

- EEG 2023 and WindSeeG 2023 lay down very ambitious expansion targets and tender volumes for PV, onshore wind power and offshore wind power.
  - PV: currently high monthly expansion figures, target achievement very likely
  - Onshore wind power: expansion figures clearly behind schedule, bottleneck beyond the scope of the Renewable Energy Sources Act, achievement of targets rather unlikely
  - Offshore wind power: large commissioning waves foreseeable, target achievement ambitious but possible

## Coal phase-out by 2030

### Conclusions

- **Coal phase-out will occur around 2030**
  - Regulatory- and increasingly market-driven
  - No major differences between hard coal and lignite
- **System adequacy as a key major determinant, roll-out of renewables of less importance for the coal phase-out**
- **Some coal power plants might hold outside the market after they left the market**
  - Major restrictions exist on technology, labor force and fuel stockpiling
- **Upcoming (and late) revision of the market design paradigm is an important issue**
  - Power Plant Strategy (10.5 GW gas-fired new-built) in the final phase
  - Options paper on CRMs by summer and process towards CRM implementation afterwards (enabling another 10 to 20 GW gas-fired/hydrogen-ready capacities and/or equivalents)
  - Some reserves maintained?
- **Hopefully no worst-case scenario**
  - Public support for loss-making coal-fired power plants in the late 2020ies/early 2030ies

# Thank you very much

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