SEERMAP

South East Europe Electricity Roadmap

SEERMAP: Modelling results and conclusions

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REKK FOUNDATION

European Climate Foundation

The SEERMAP project

SEERMAP
South East Europe Electricity Roadmap

Project title	South East European Electricity Roadmap
Region of implementation	Albania, Bosnia and Herzegovina, Kosovo*, Montenegro, Macedonia, Serbia, Romania, Bulgaria, Greece
Consortium Partners	REKK, TU Wien, OG Research, EKC
Project cycle	July 2016 to October 2017
Donors	Austrian Federal Ministry of Agriculture, Forestry, Environment and Water Management 
	European Climate Foundation 
Web	www.seermap.rekk.hu

Our partners

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Country	Name of the Partner	Logo
Albania	POLIS University, Co-Plan	
Bosnia and Herzegovina	ENOVA	
Bulgaria	CSD	
Greece	FACETS	
Kosovo*	INDEP	
FYR of Macedonia	MACEF	
Montenegro	IPER	
Romania	EPG	
Serbia	RES Foundation	
Organisational Partner	ERRA	

Our goals

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Modelling

- Analyse the impact of the transition to a low carbon and energy secure pathway the electricity sector until 2050 in line with EU 2050 Roadmap
- Develop of a Long Term Electricity Roadmap for the SEE region and effectively distribute the findings to the high level decision-makers - Promote a regional integration scenario

Dialogue and capacity building

- Build up capacities – in the form of training courses - amongst policy makers, TSO members, energy regulators and local think tanks in the field of renewable energy deployment and transmission network planning issues
- Build up a network of regional think tanks capable of contributing to the debate on the long term decarbonisation pathways in the SEE region
- Trigger discussions on electricity scenarios at a national level in the region

Models applied and interlinkages

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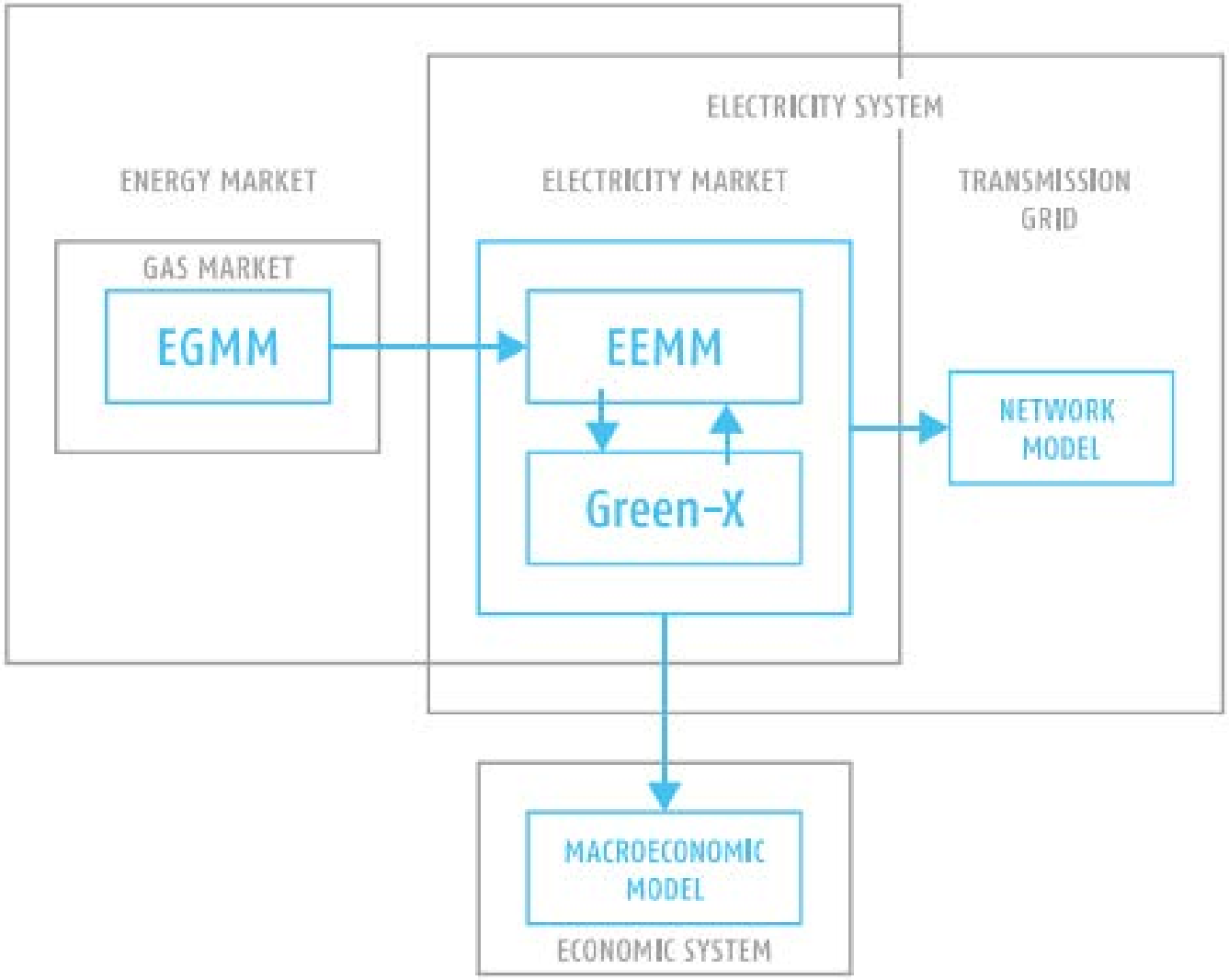

European Electricity Market Model (EEMM)

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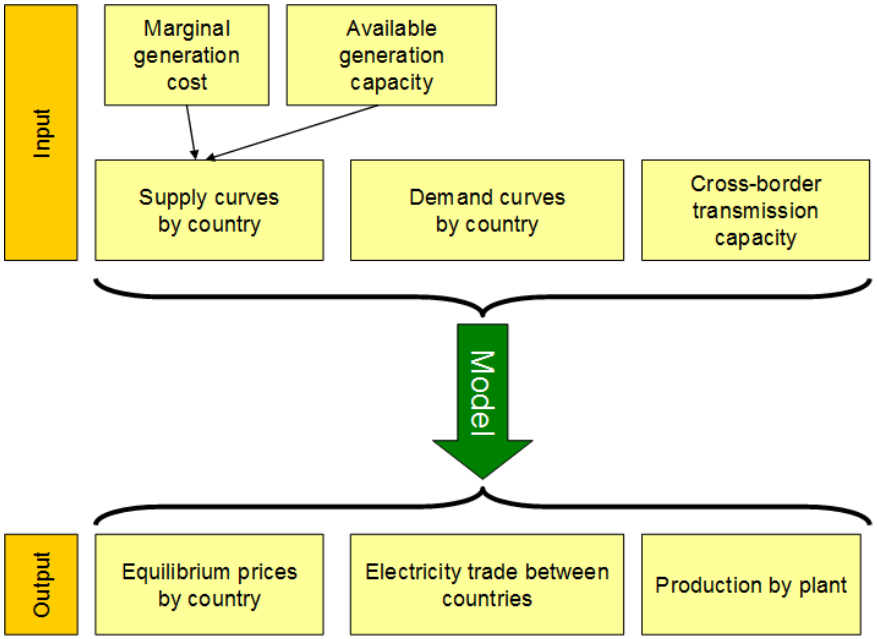
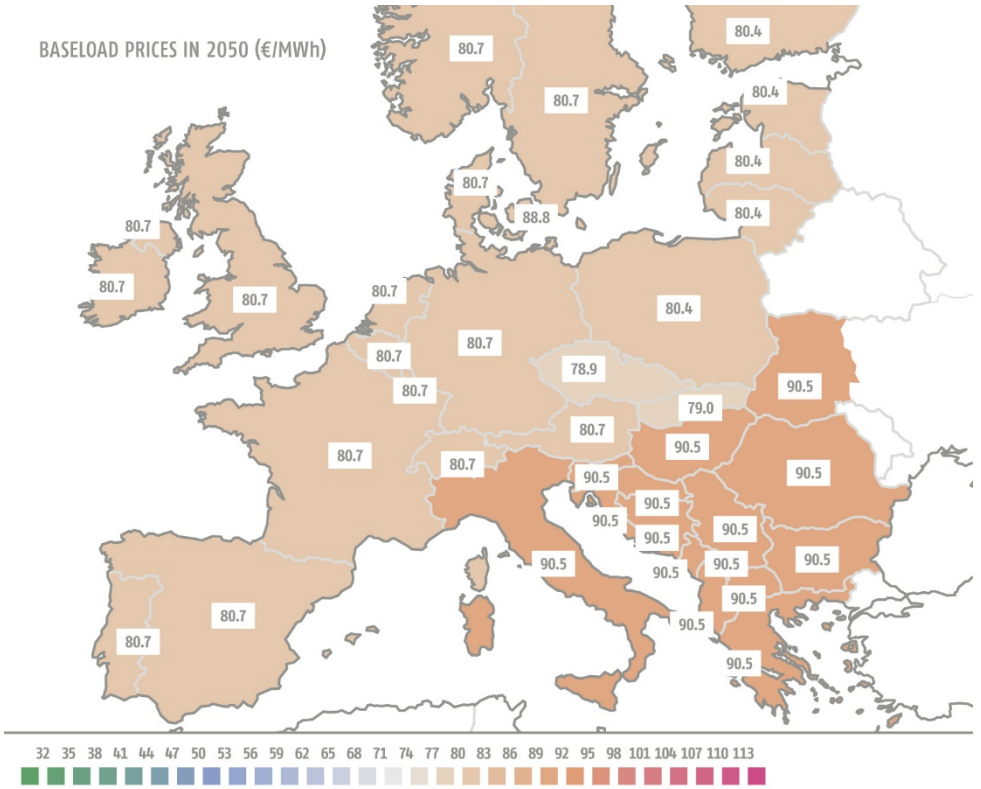


- 40 countries (ENTSO-E + neighbours)
- Around 3400 power plant blocks
- 104 interconnectors between countries



- Partial equilibrium model in which homogeneous product is traded across neighboring markets
- Competitive behaviour in production and trade
- Constrained capacity limits on cross border networks, power flows on an interconnector are limited by NTC.

Three scenarios

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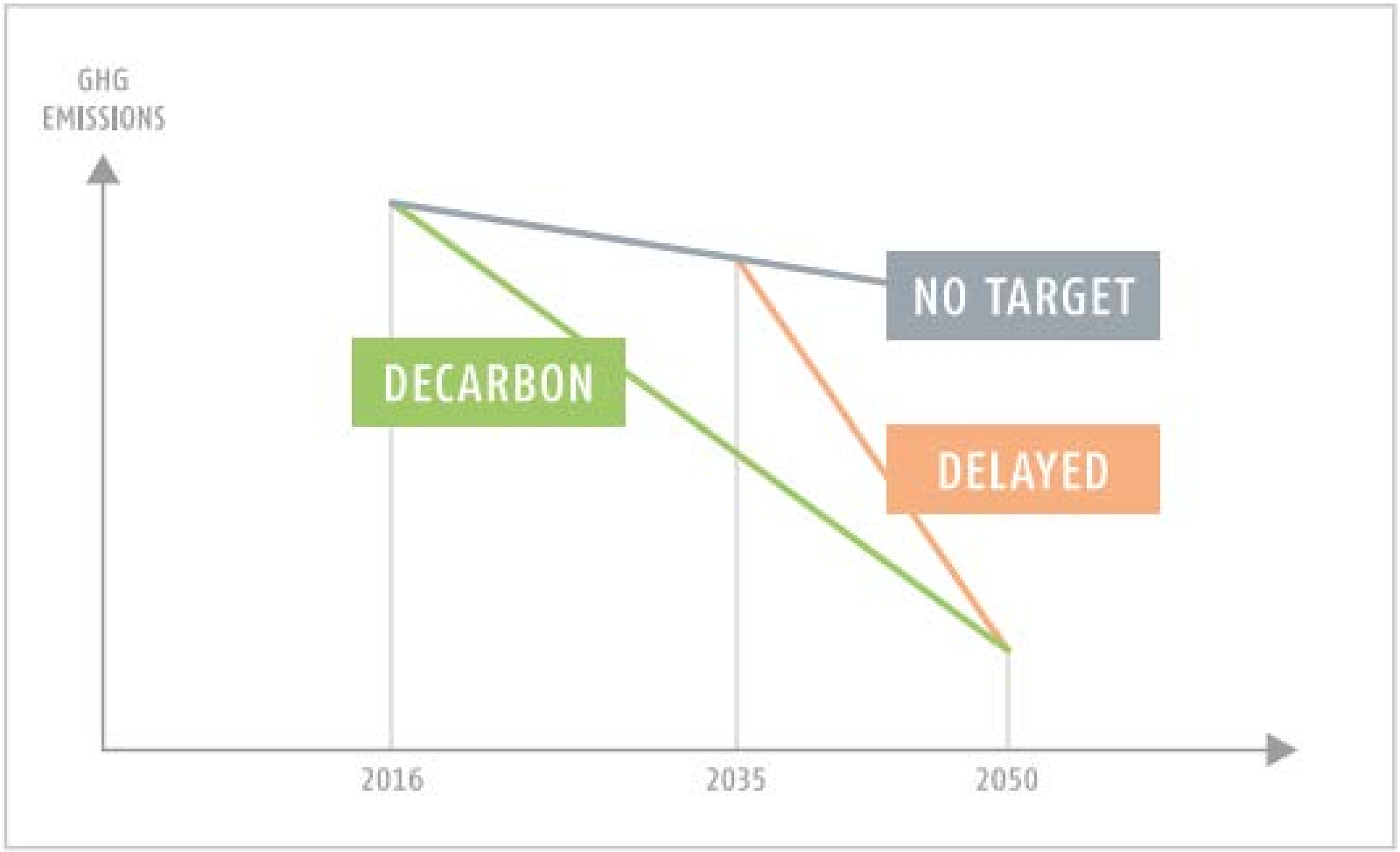

The assumptions behind the scenarios

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	No Target	Delayed	Decarbonization
CO_2 target	No target	94% reduction	94% reduction
Fossil plants	National plans: all PPs	National plans: all PPs	National plans: only PPs with FID
SEERMAP RES target	Phase out of support after 2025	Continuation of current policies till 2035 and than high uptake	More ambitious RES deployment from 2020 to reach the 2050 target
Shared assumptions	Demand, CO_2 (2030: 33 €/tCO_2, 2050: 88€/tCO_2) and fossil fuel prices, gas infrastructure, WACC, NTCs WB6 countries see carbon pricing only from 2030		

MODELLING RESULTS FOR THE SEERMAP REGION

Installed capacity

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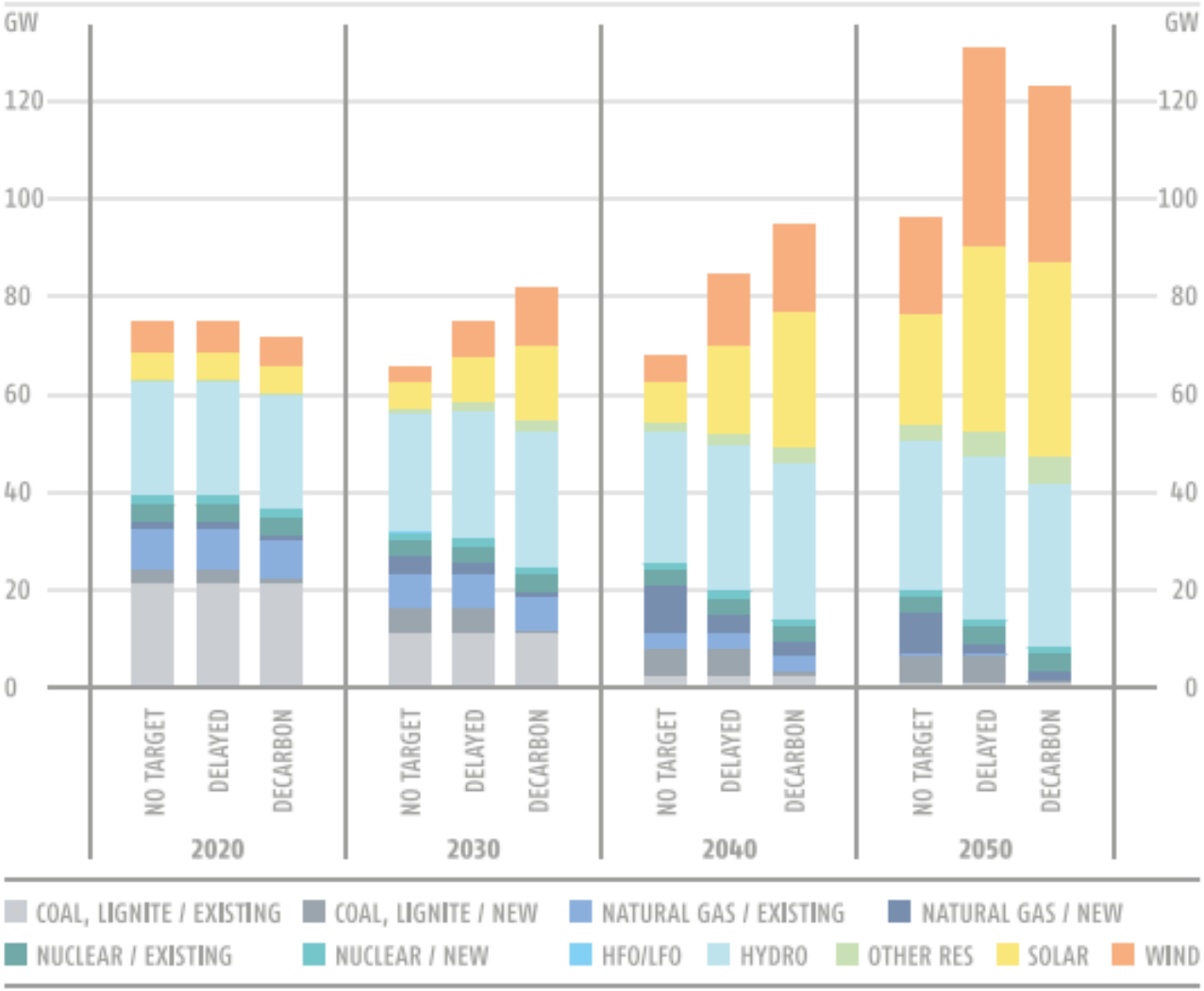

- Gradual phase out of fossil capacities
- Role of natural gas is uncertain: bridging role in ‚decarbonisation' and ‚delayed' scenario, where gas is crowded out from the market, and more permanent role in the ‚no target'
- Dynamic uptake of RES technologies, especially wind and solar – including the ‚no target' scenario

Gross electricity mix

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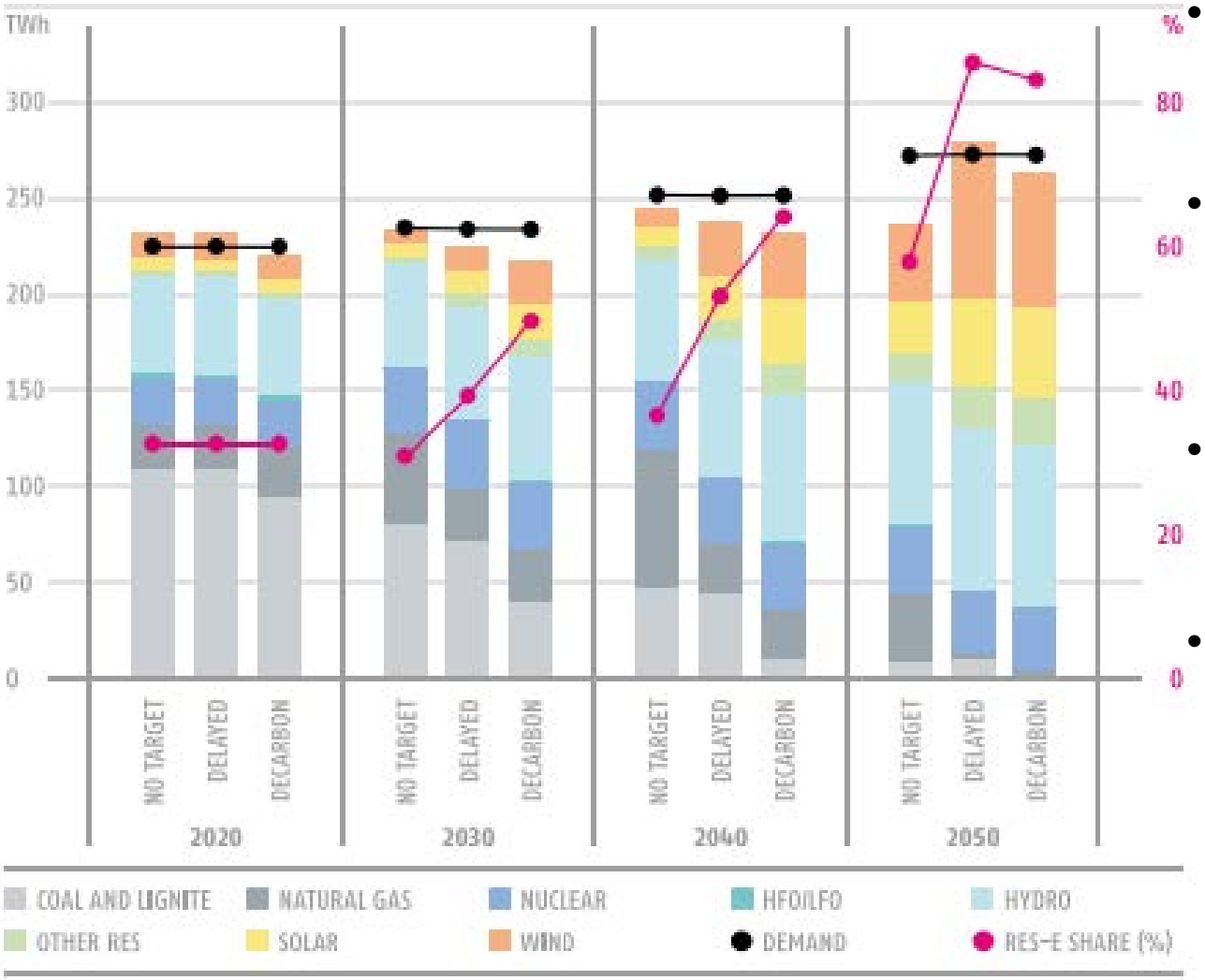

- Coal based generation disappears form electricity mix
- Gas consumption peaks in 2030-2040, and downward trend afterwards.
- Trade position of the region slightly deteriorates
- RES domination in the generation mix after 2030

Gross electricity mix by country in 2050

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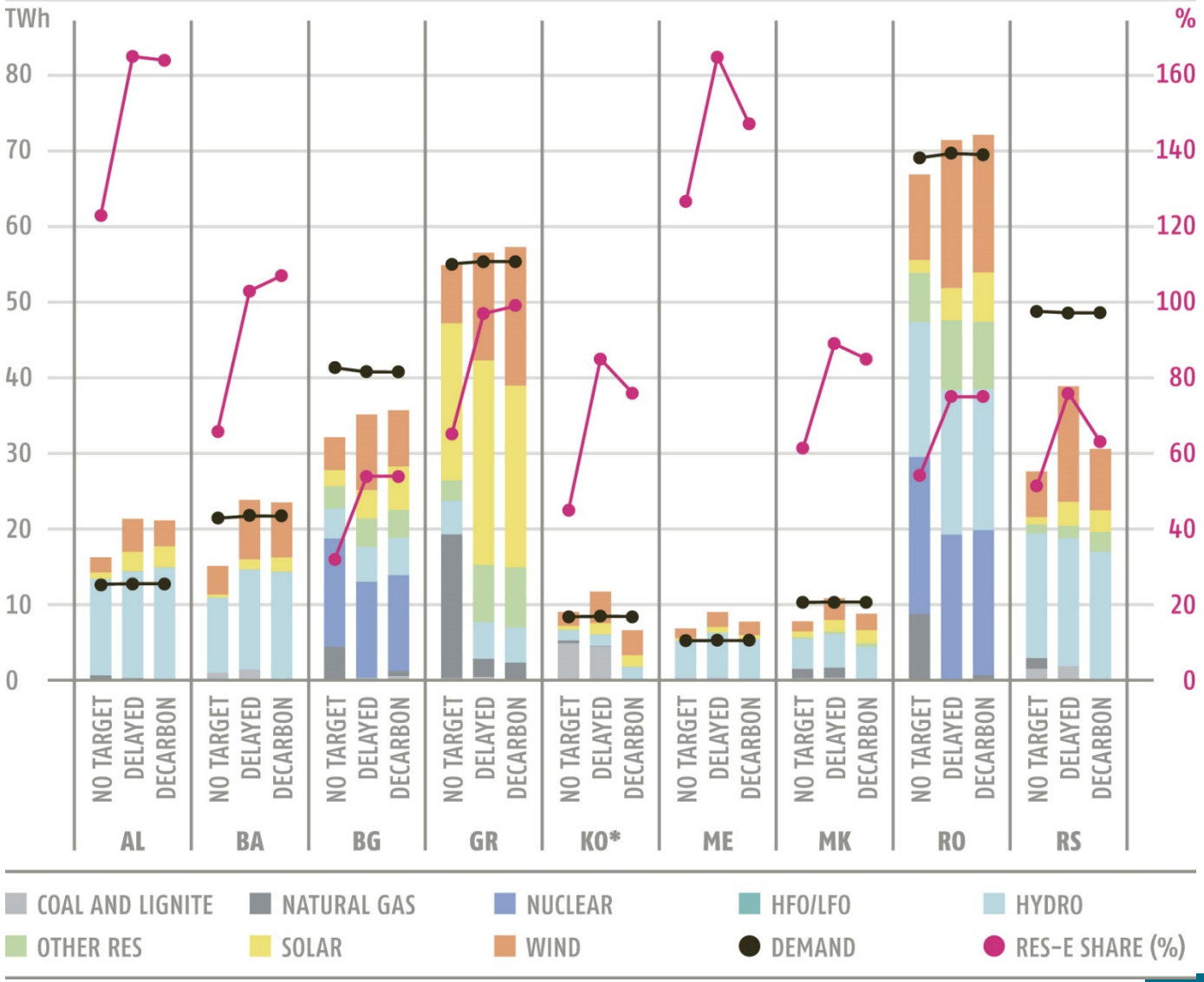

- Intermittent RES dominated countries: GR, RO
- Hydro domination in: AL, BA, ME, MK, RS
- RES shares above 100% in AL and ME
- Significant import in RS and BG; Exporting countries: AL, BA and ME

Natural gas consumption in electricity generation

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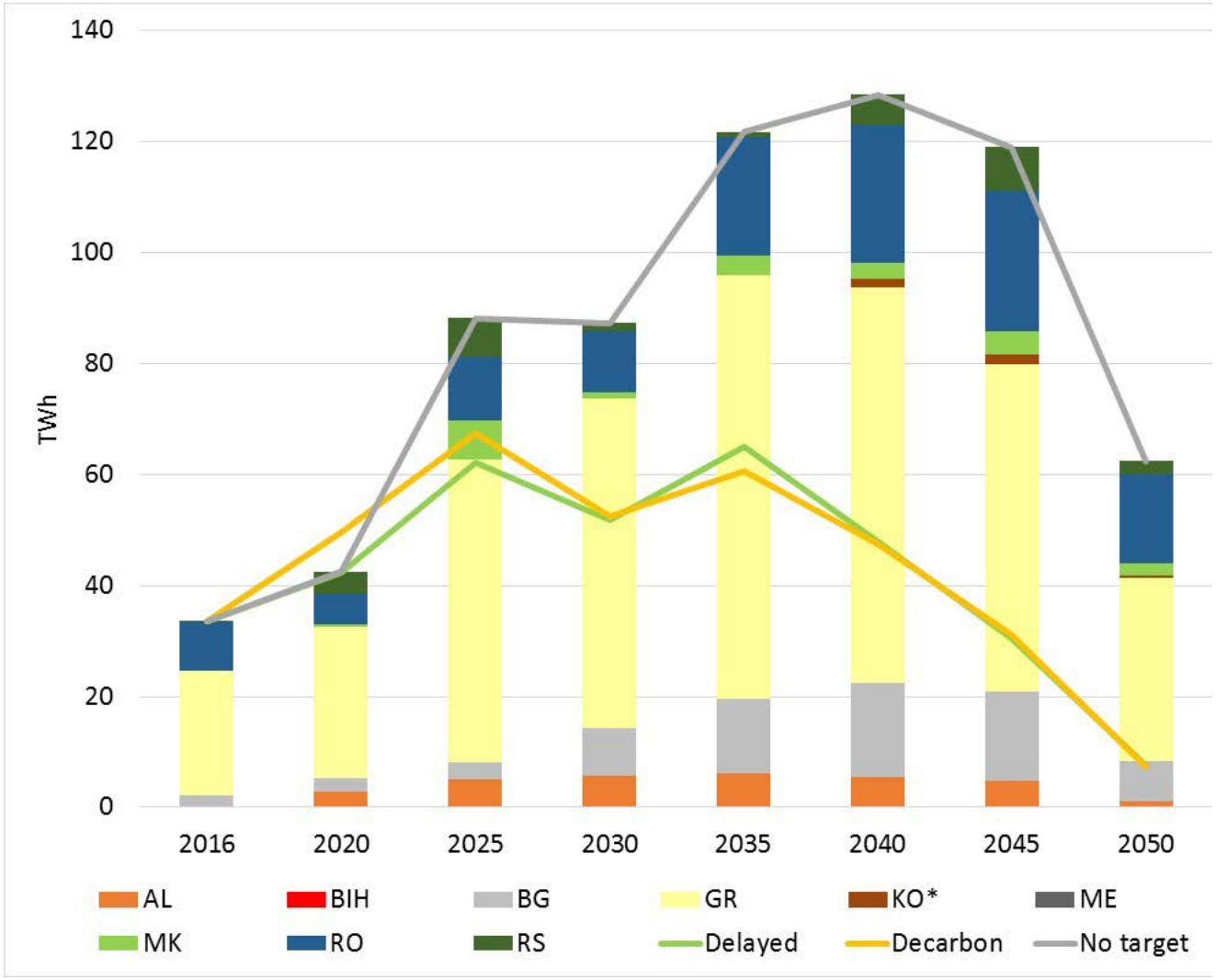

- Bridging role of natural gas in all scenarios
- In ‚delayed' and 'decarbonisation' scenario gas based generation is crowded out from the market by 2050
- GR, RO and BG are the large gas consumers. In WB6 AL, MK and RS show the highest increase

Utilisation rate of conventional power plants

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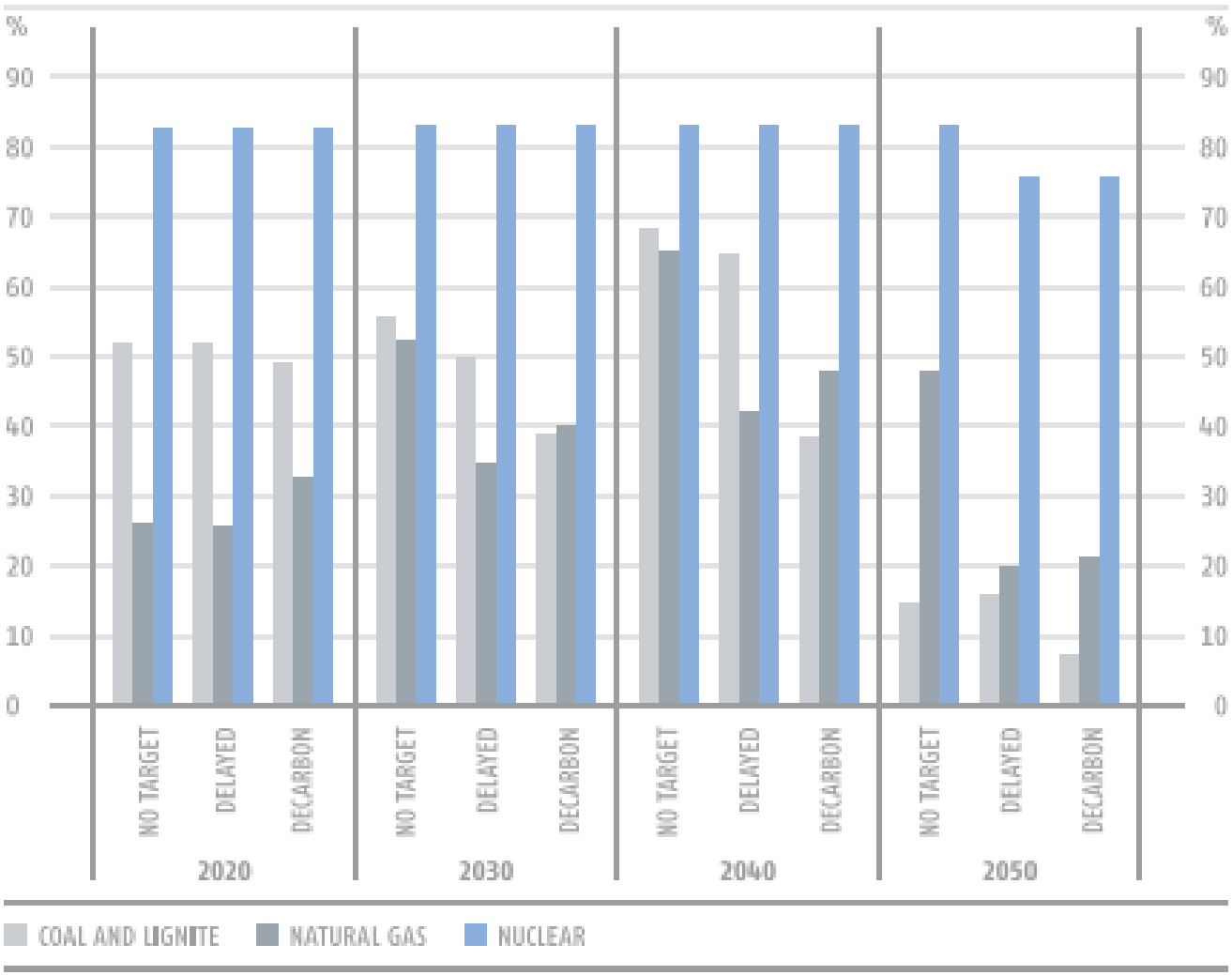

- Sharp decrease in gas and coal utilisation rates after 2040. Coal rates fall below economically sustainable levels.
- Gas takes over coal generation with increasing rates in 2030-2040.
- Even nuclear utilisation reduces in 2050 due to high RES penetration.

CO_2 emissions

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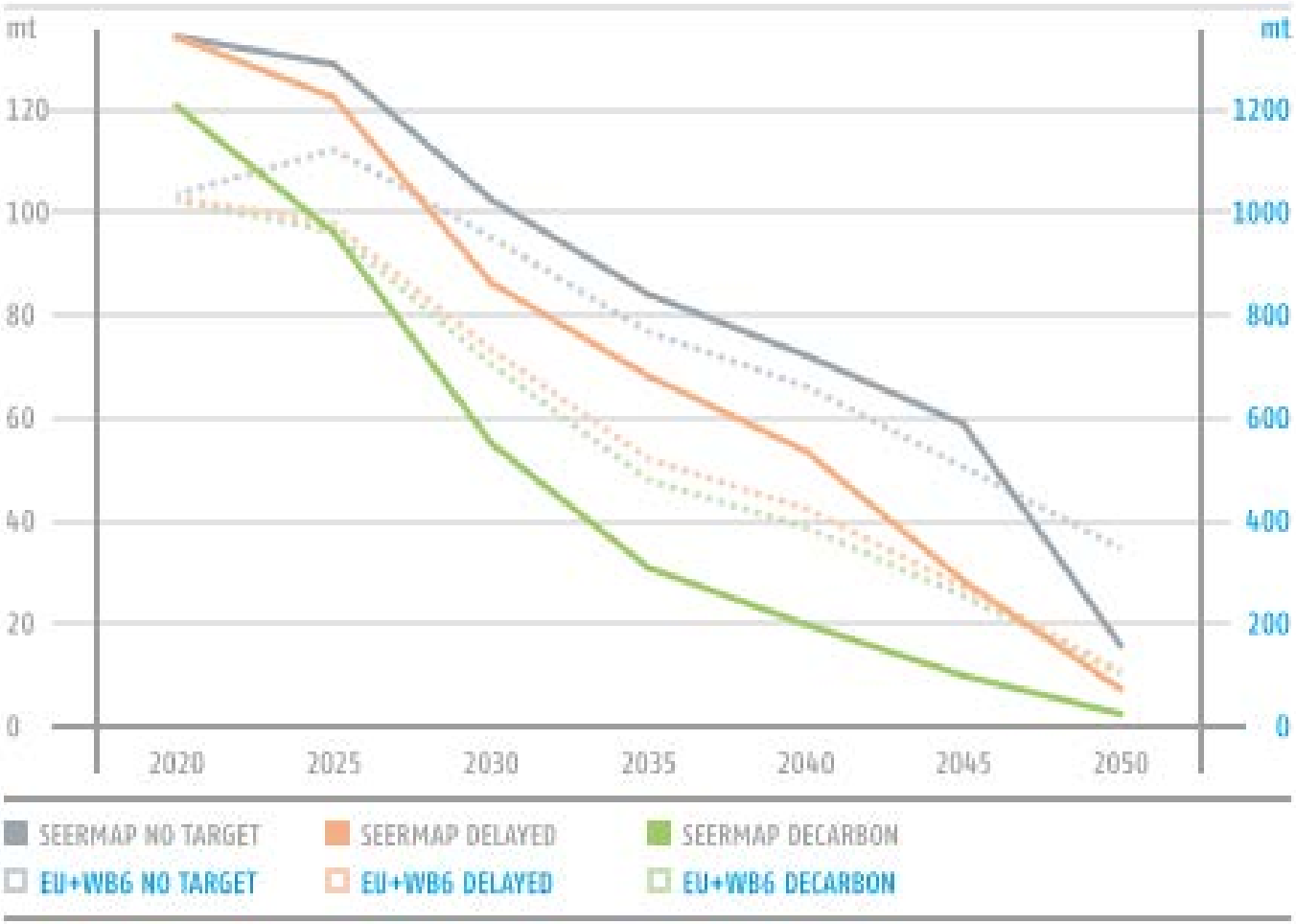

- Sharp CO2 reductions in the region: over 98% in the ‚decarbonisation' scenario,
- Even the ‚no target' scenario reaches 90% reduction rate by 2050
- Higher reduction rates than EU average – SEERMAP region can contribute to the reduction target efficiently

SEERMAP: left hand axis, EU28+WB6: right hand axis

Fossil and RES investment cost

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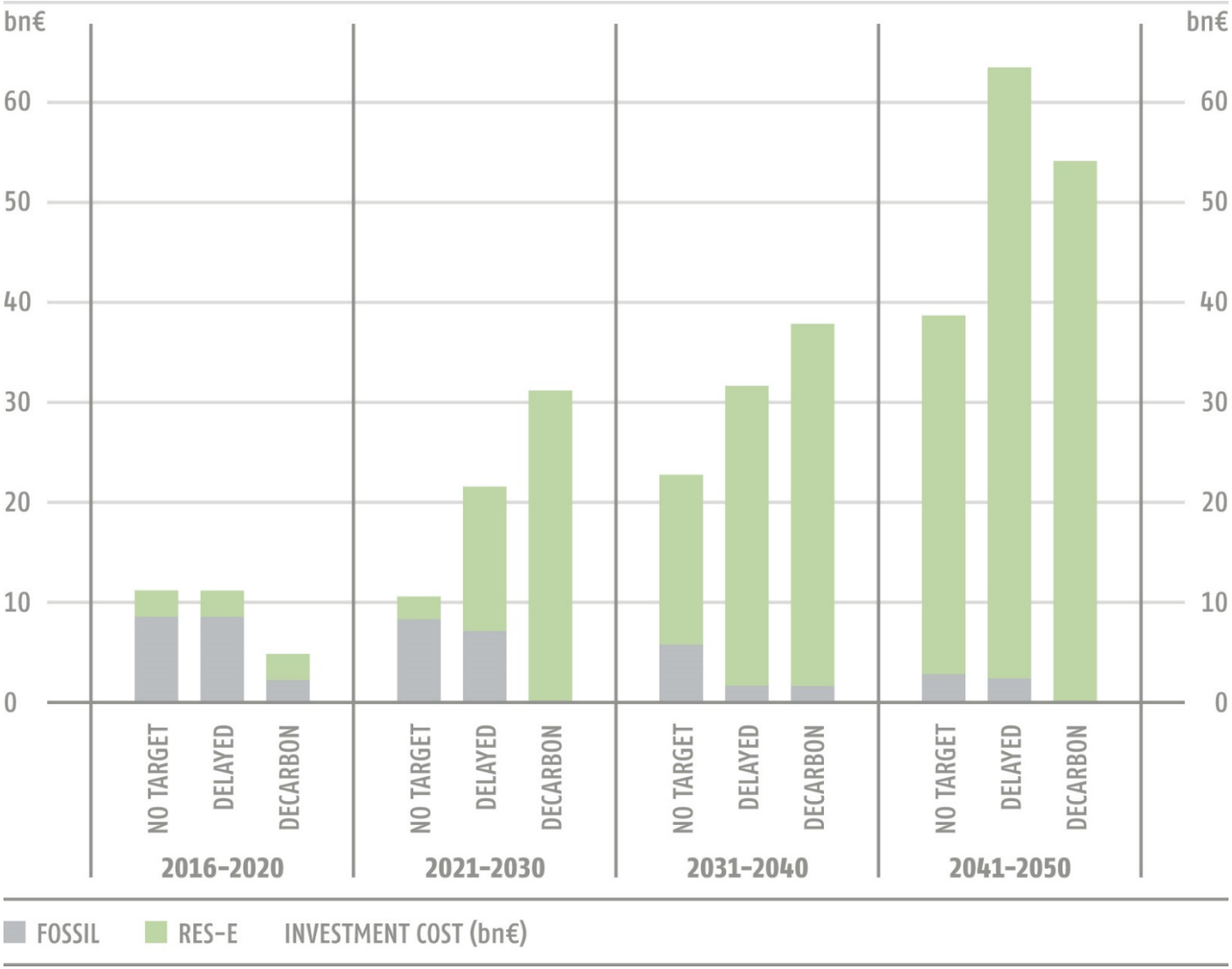

- All scenarios require dynamic investment uptake in the region.
- RES investment costs dominate the post 2020 period

Magnitude of wholesale price and RES support

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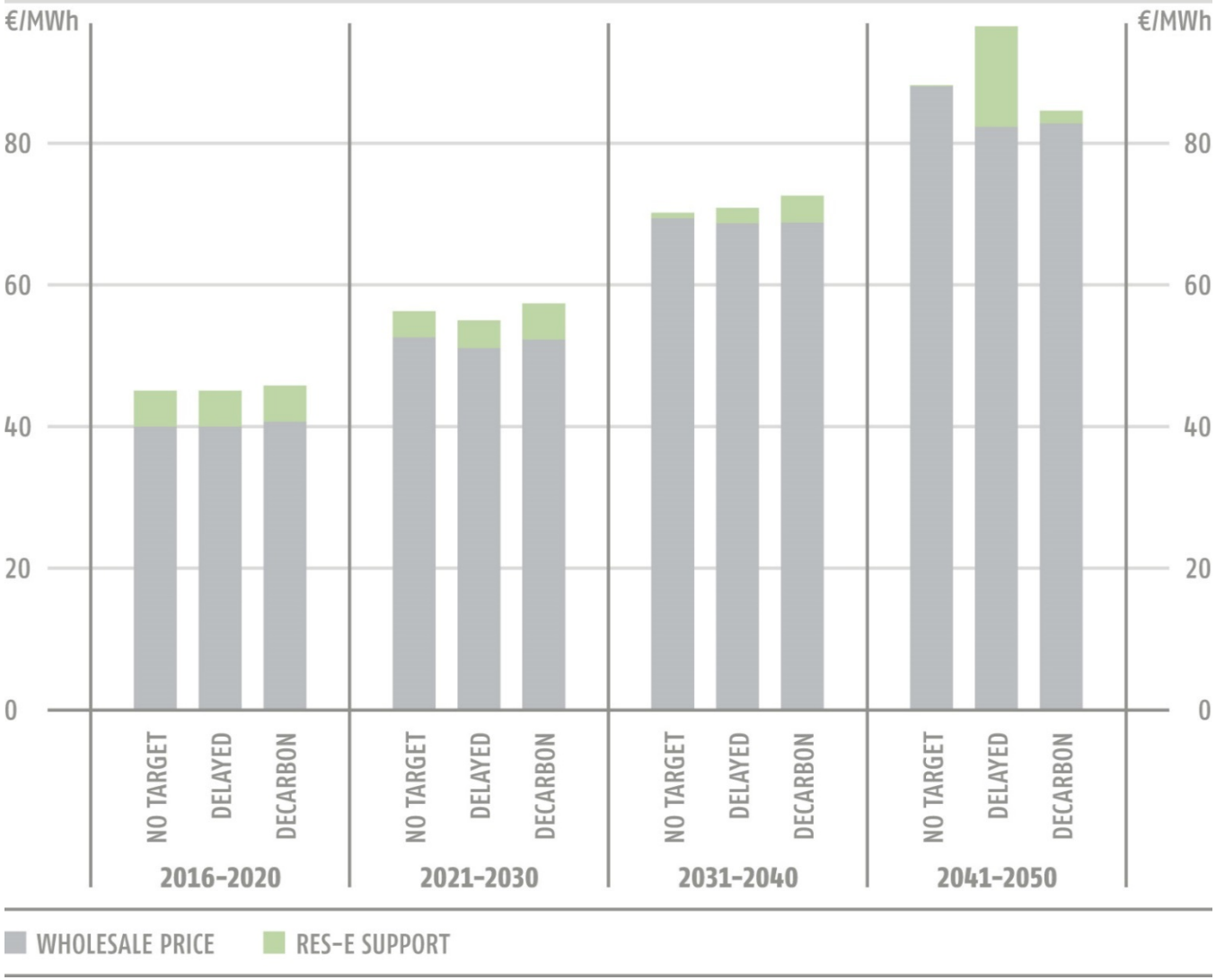

- Increasing wholesale price level over the period, reaching above 80 €/MWh by 2050
- Low variable costs of RES reduces wholesale prices by 2050 compared to ‚no target'
- RES support need reduces and become minor by 2050
- In ‚delayed' scenario sharp increase of support need in 2041-2050

System / generation adequacy by country – ‚decarbonisation' scenario

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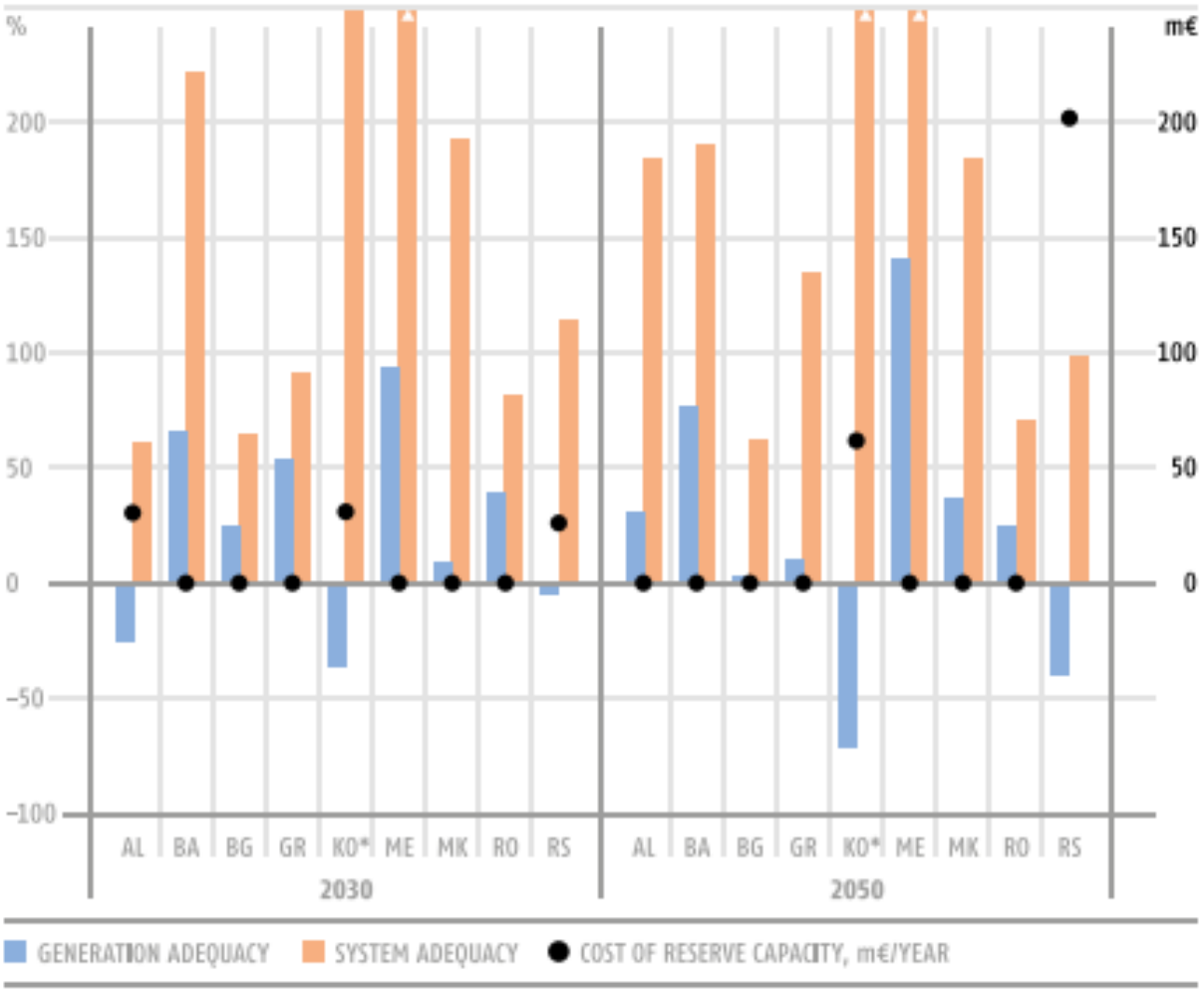
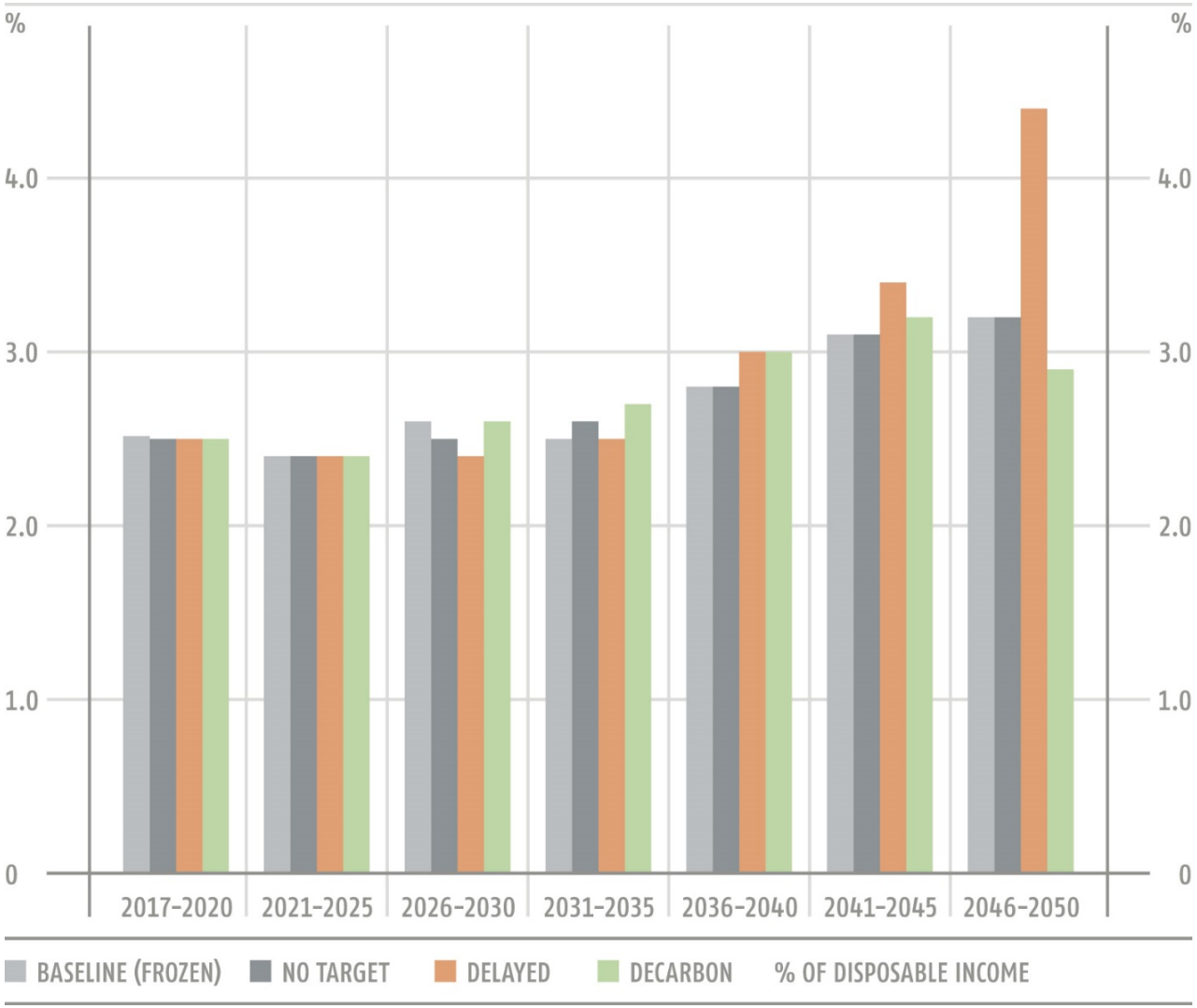


- Negative generation adequacy (generation below peak load) in: AL, KO*, RS.
- Cost of improving generation adequacy: between 30-200 m€/year to reach zero generation adequacy level
- ‚Delayed' and ‚no target' scenarios also present generation adequacy problems in: AL, BG, KO*, RS

DEFINITIONS:
Generation adequacy: ability to cover peak demand with domestic generation (Zero value means capacities equal to peak load)
System adequacy: Ability to cover peak demand with domestic capacity plus Net Transfer Capacity (NTC)

Macroeconomic results: % of household electricity expenditure in HH income



- Macroeconomic assessment was carried out to check impacts on GDP, employment, household expenditure, external and fiscal balance.
- GDP and employment shows slight improvement, while affordability slightly reduces at regional level. In some countries, affordability deteriorates significantly.
- Decarbonisation has lowest HH expenditure in the long term.

Stranded costs of power generation

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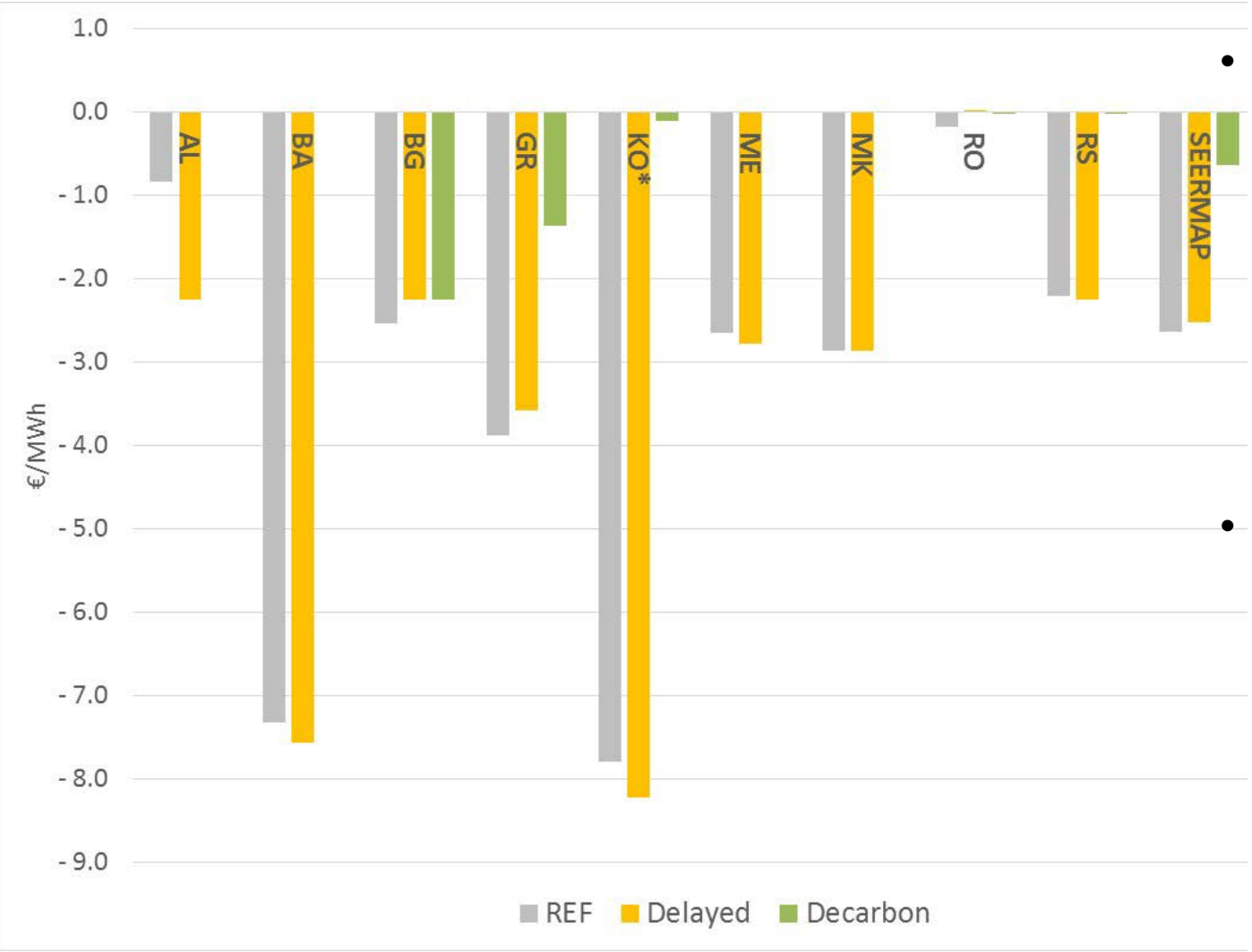

- Stranded cost of underutilised gas and coal assets applies in most countries in the ‚no target' and ‚delayed' scenarios, ranging between 2-8 €/MWh (over a 10 year period)
- The lower investment level of coal/lignite and gas based capacities in the ‚decarbonisation' scenarios help to reduce, or eliminate these stranded costs

Conclusions 1

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Market integration

- Introduction of competitive market is a key driver for the SEE electricity sector: support RES deployment, price equalisation.
- No need for massive cross border capacity increase, rather functioning market institutions.

Natural gas

- Role of gas is transitionary in electricity generation:
  - in the ‚no target' scenario it peaks at 2040
  - in the ‚delayed' and ‚decarbonisation' scenarios it is fully replaced by RES by 2050

Coal

- Gradual elimination of coal capacity and production in all scenarios
- Very low utilization from 2040 onwards (below 20% - closure)
- Stranded cost in these assets ranges between 2-8 €/MWh

Conclusions 2

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Security of supply

- The ‚new' domestic resource: RES replaces coal/lignite based generation
- The substitution however results in significant electricity import in many WB6 countries (MK and RS) but dynamic RES deployment supports self-sufficiency
- System adequacy remains high in all scenarios, although generation adequacy deteriorates

RES deployment

- RES deployment increases in all scenarios, even without support significant growth after 2040
- RES support level reduction helped by increased wholesale prices and reducing technology costs

Conclusions 3

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Price evolution

- Setting a decarbonisation target does not lead to higher prices: quasi identical wholesale electricity price increase across scenarios (from 35 EUR/MWh to 80-90 EUR/MWh)
- SEERMAP region remains a single price zone

Carbon Emissions

- The SEERMAP region offers relatively cheap decarbonisation options: SEERMAP region is 99% compared to the 94% of EU
- Significant reduction even in the ‚no target' scenario.
- Future carbon price is key determinant of the generation portfolio and the cost of transition

Macro-econmic impacts

- Macroeconomic impacts show small impact of decarbonisation, mostly in positive direction,
- Affordability emerges as issue in several countries: BIH, BG, ME, MK, RO

Policy conclusions

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- The high penetration of renewables in all scenarios suggests that energy policy, both at the national and regional level, should focus on enabling RES integration
- National energy policy will have less influence on the future generation mix – it will be driven by market forces
- EU and regional level policies should be incorporated in national energy planning
- Stranded costs should be carefully considered in fossil generation and gas network investment decisions
- Household electricity expenditure increase significantly in some countries, it may require new policy approach
- Regional cooperation helps to handle SoS issues and reduce costs of decarbonisation

Thank you very much for your attention!

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