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Our world in 2050: Three factors determining how our future will look like

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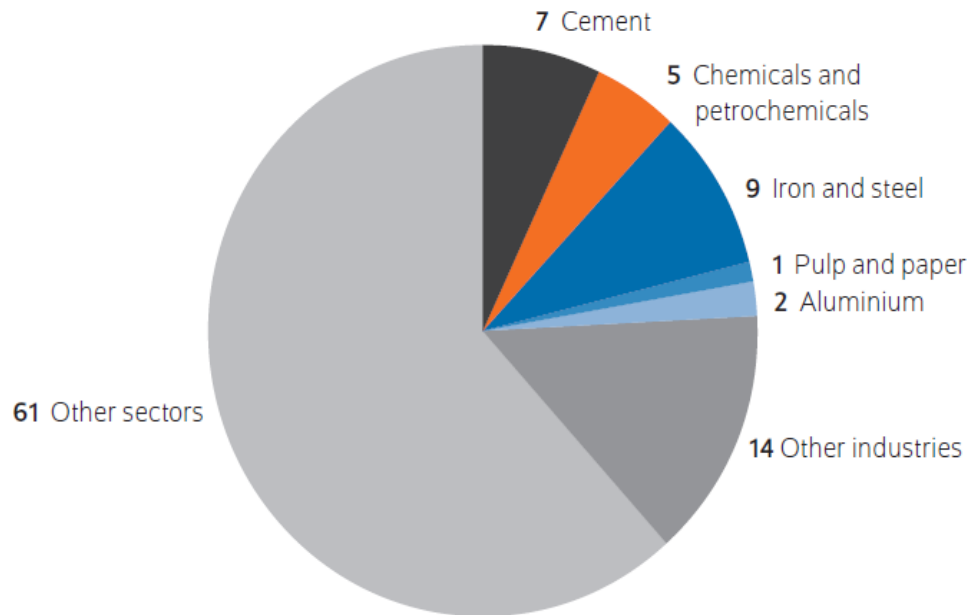
- If climate change triggers economic and social instability, then democratic structures are at risk and global tensions and wars are likely.
- Need to cooperate locally, nationally and internationally to
 - tackle climate change,
 - care for local jobs and local actors as foundation of democracies.
- History shows – transformation can be faster than you think.

Important determinants for our future:

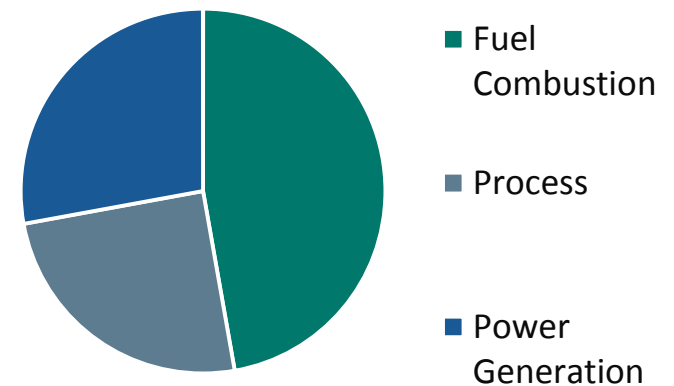
I. Resource and energy efficiency

Why are we interested in materials?

Percentage contribution of various basic materials to global CO2 emissions

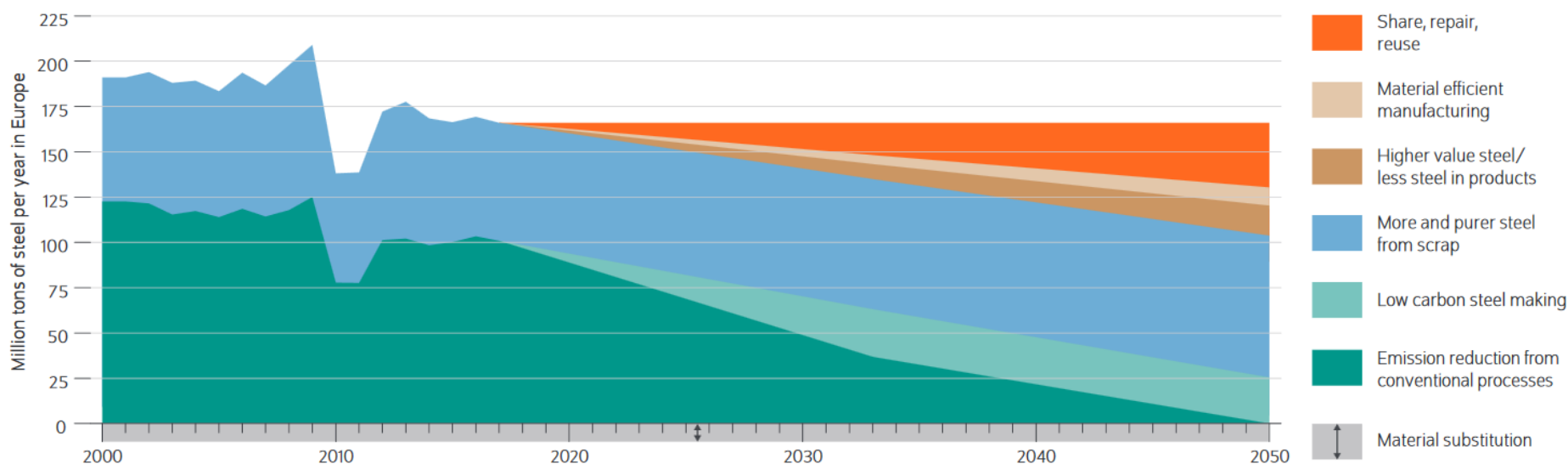


Sources of Emissions in Material Production



Portfolio of mitigation options necessary for shift to a low-carbon material sector

Steel in Europe



Difficult to envisage that RE supply suffices for clean material production, unless portfolio of demand side measures for use of materials successful.

Filling gaps in the policy package to decarbonize Europe's materials sector

Mitigation Option	Gaps in policy package	New / Extended policy instrument to close gap	Target
Share, Repair, Re-use			Climate Friendly Materials Sector
More and pure recycling	1. How to enhance recycling?	<ul style="list-style-type: none"> - Ecodesign directive - Extended producer responsibility 	
Efficient product	2. How to create markets for climate friendly options?	<ul style="list-style-type: none"> - Green public procurement funding - Project based carbon contracts - Carbon charge on materials 	
Efficient manufacturing			
Material substitution			
Low-carbon processes			
Conventional processes	3. How to make BAU not a viable perspective?	<ul style="list-style-type: none"> - ETS including a carbon charge - Emission intensity standard for materials 	

Challenge: Implementation of policy package

One decisive factor: National Climate Change Law, EU 2030 governance, to provide framework for policies in **all** sectors.



- Lack of demand side policies
-> Tension on energy/resource markets
- Inconsistent picture for supply side
-> Public R&D focused policy
-> Investment limbo

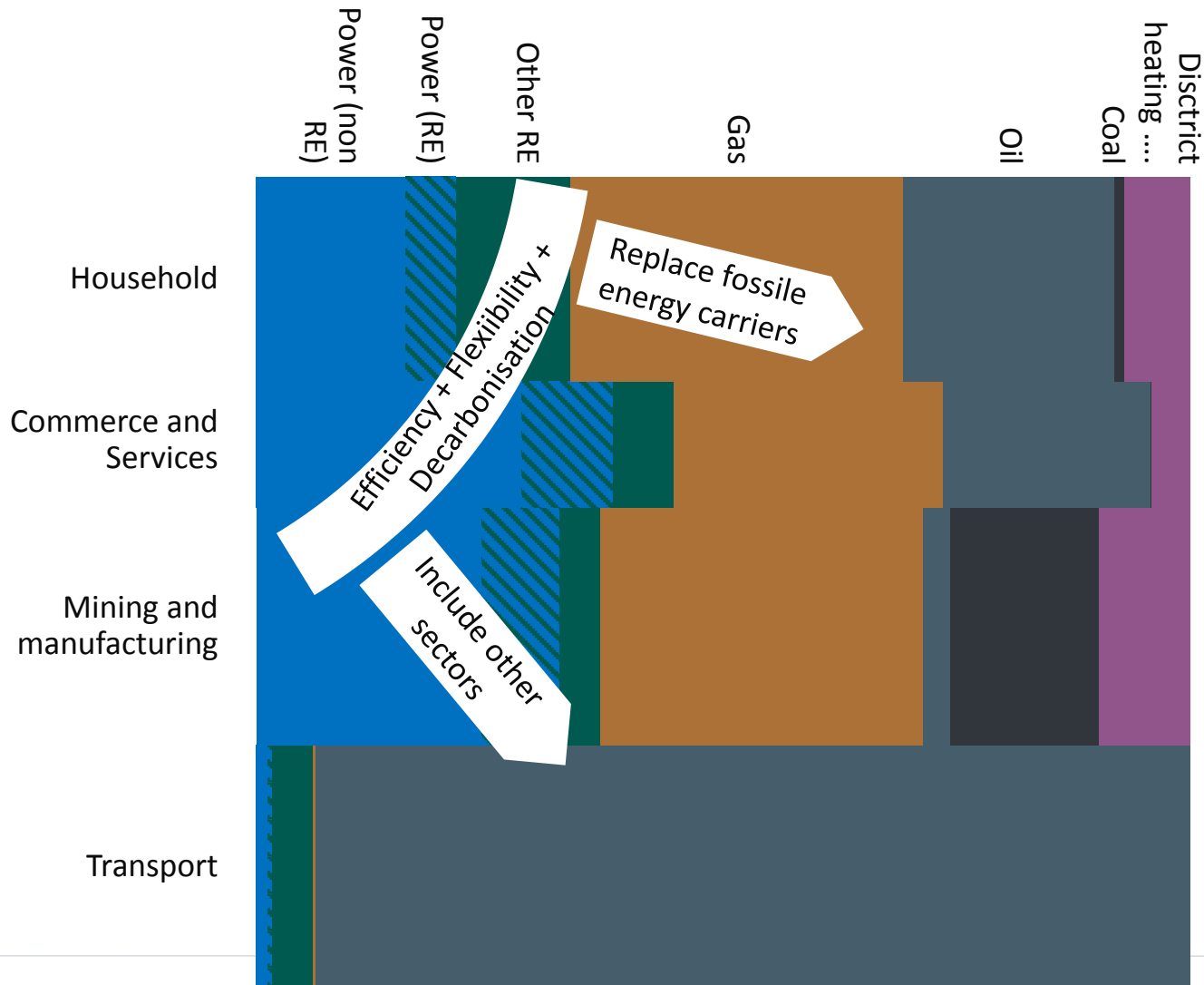
- Successful demand side policies
-> Opportunities for local business
- Clarity on vision for supply side
-> Public & private driven innovation
-> Investment

Important determinants for our future:

II. System integration

Moving beyond today's electricity demand: Flexibility and efficiency for reliable, affordable, and climate friendly energy services

Size of areas proportional to primary input by energy carrier and sector



Based on AG
Energiebilanzen (2016)

- To replace conventional generation and meet extra needs
- Large potentials from e-mobility, electric heating, industry
- Unlocking potentials requires
 - Tailored proposal & credibility to engage consumers
 - Clear interface to distribution/transmission system
- Two scenarios:
 - Flexibility portfolio managed in centralised systems
 - Customers offer flexibility responding to local prices

Challenge: Create incentives for households and regional business to unlock flexibility potential

One decisive factor: Local prices



- Cloud-based flexibility control
 - > concentration of actors and data
 - > accelerated if used for re-dispatch
 - > lack of regional anchoring/jobs
 - > difficult to align with cyber security
- Tendency towards autarky
 - Households seek privacy
 - Physical linking of RE and Flex
- > Failure to reach scale and efficiency

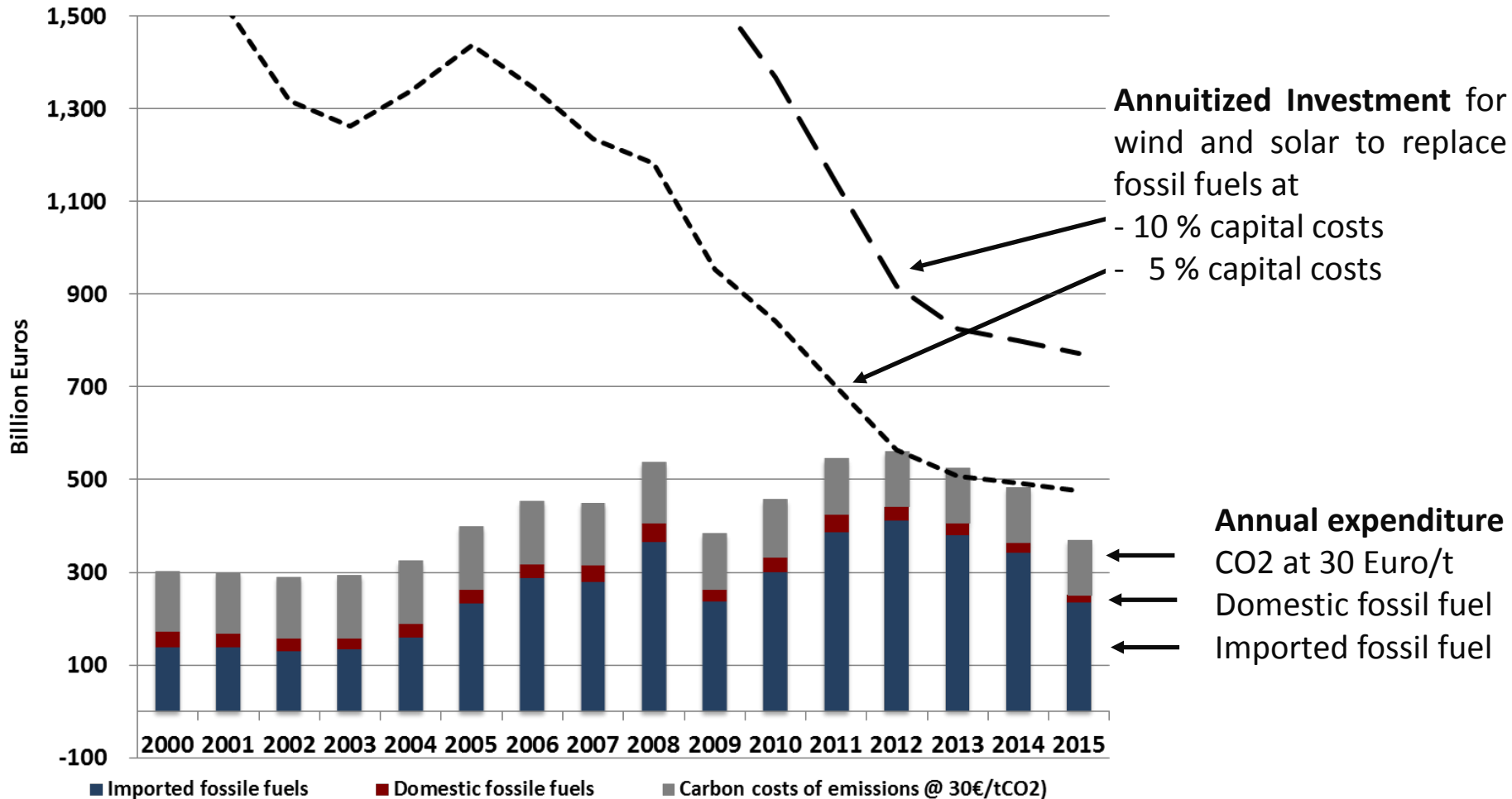
- Price based flexibility control
 - > standardised protocols address cyber security and privacy risks
 - > value for system fully remunerated
 - > easy market entry for local actors
 - > tailored solutions unlock potentials

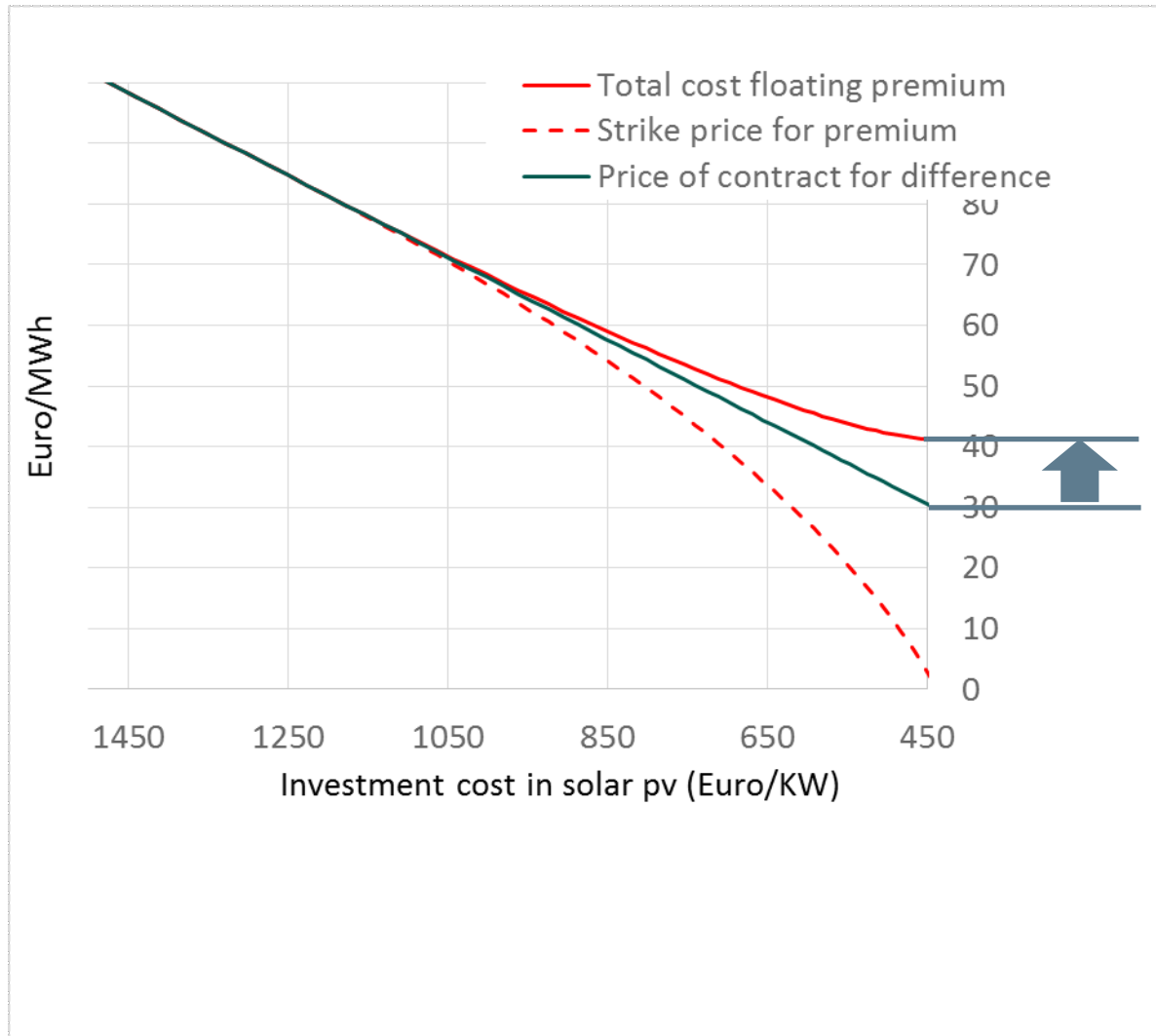
Important determinants for our future:

III. Financing

Financing costs important for viability of wind and solar

Illustration excludes system costs





Floating Premium: As technology costs decline optionality kicks in, floating premium offers less hedging, financing costs increase, total cost increase.

Without long-term hedging 30% cost increase from

- Project revenue risk (1)
- Liability in LT Contracts (2)

Matches overall assessment (3)

Challenge: Allow simple hedging to facilitate low-cost finance

One decisive factor: Shift to contracts for difference



- Concentration of actors
 - > lack of local engagement and support
 - > insufficient capacity to realize projects
- Increase of cost to consumer (example Germany 2030 projection)*
 - Floating market premium: 0,8 billion
 - Fixed market premium: 2,7 billion
 - CO2 price only: 3,4 billion.
 - > Industry/HH less supportive for RE
 - > Speed of transition declines

- Multiple actors compete
 - > improves projects/technologies
 - > realisation of deployment targets
- Consumers fully benefit from cost RE reductions
 - > accelerate electrification
 - > accelerate speed of transition

What do we need for our world in 2050?

- Rapid reduction of emissions
- Functioning communities



What is important to make this happen?

- Governance for efficiency policies
- Local prices for system integration
- Remuneration for simple financing

