Carbon pricing in Europe after the ETS reform and Brexit

EPRG Spring Seminar : “Energy revolution: where next?”

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Agenda

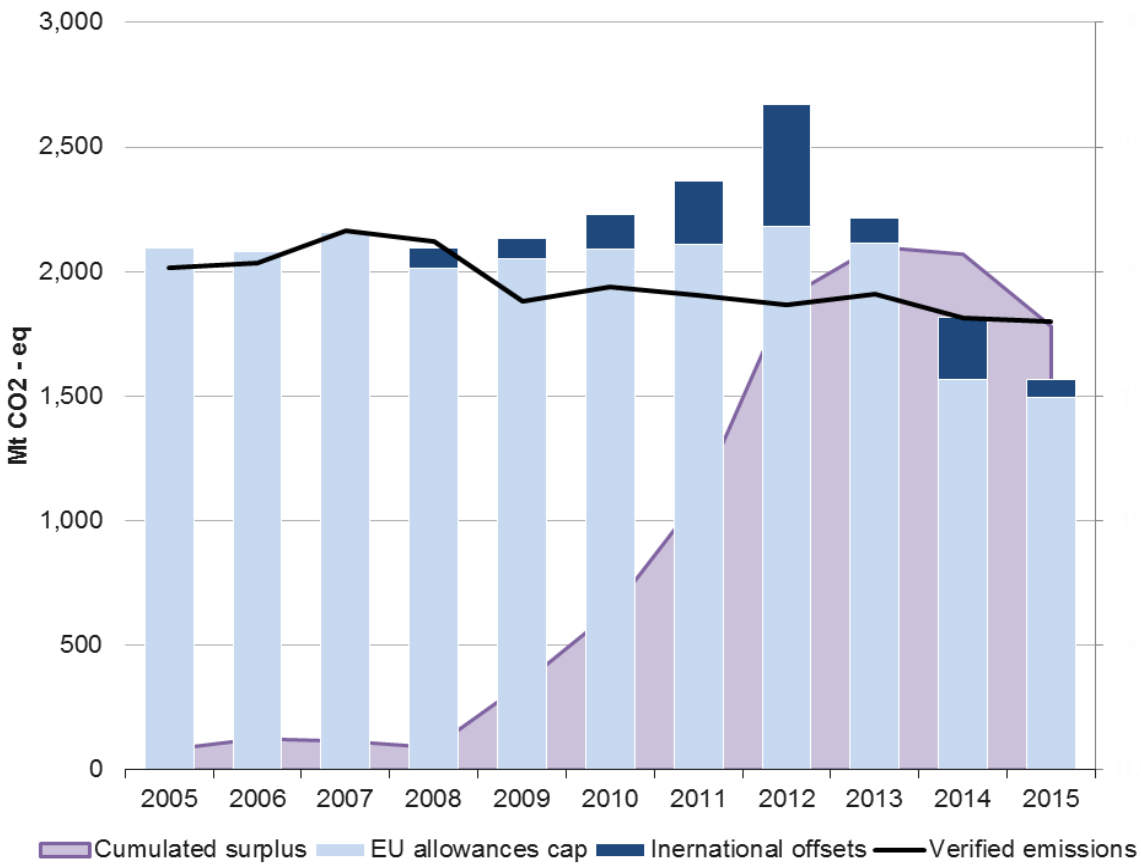
- EU ETS outlook – key issues and impact on the power sector decarbonization
- Options for reform of the ETS - potential impact
- Helping the ETS do its job – the role of complimentary policies
- Conclusions

EU ETS outlook – key issues and impact on the power sector decarbonization

A series of economic and political factors have led to a significant surplus of ETS allowances which requires urgent and decisive action

- The EU established a pioneering CO_2 Emissions Trading Scheme **(ETS) in 2003 as the cornerstone of its climate** change strategy
- Yet a series of economic and political factors **have led to an imbalance** of supply and demand and **depressed carbon prices**
- This risks **increasing the costs of mitigating climate change** as the ETS does not support investment in clean technologies
- The **mere existence of the ETS is threatened** as another decade of low prices would likely **undermine its credibility** and lead to the **implementation of national policies**

EU ETS emissions (stationary installations), 2005 – 2015



Source: http://www.eea.europa.eu/data-and-maps/data/data-viewers/emissions-trading-viewer

ETS reform options are currently discussed actively as part of the Trialogue

Context of the study

2015-2017

A current window of opportunity to reform the EU ETS, but closing in a few months

- Ongoing codecision process in Parliament and Council following proposal from Commission
- Urgent action required before ETS loses credibility and national policies get implemented

Proposal from the Commission being discussed, supporting 3 structural reforms

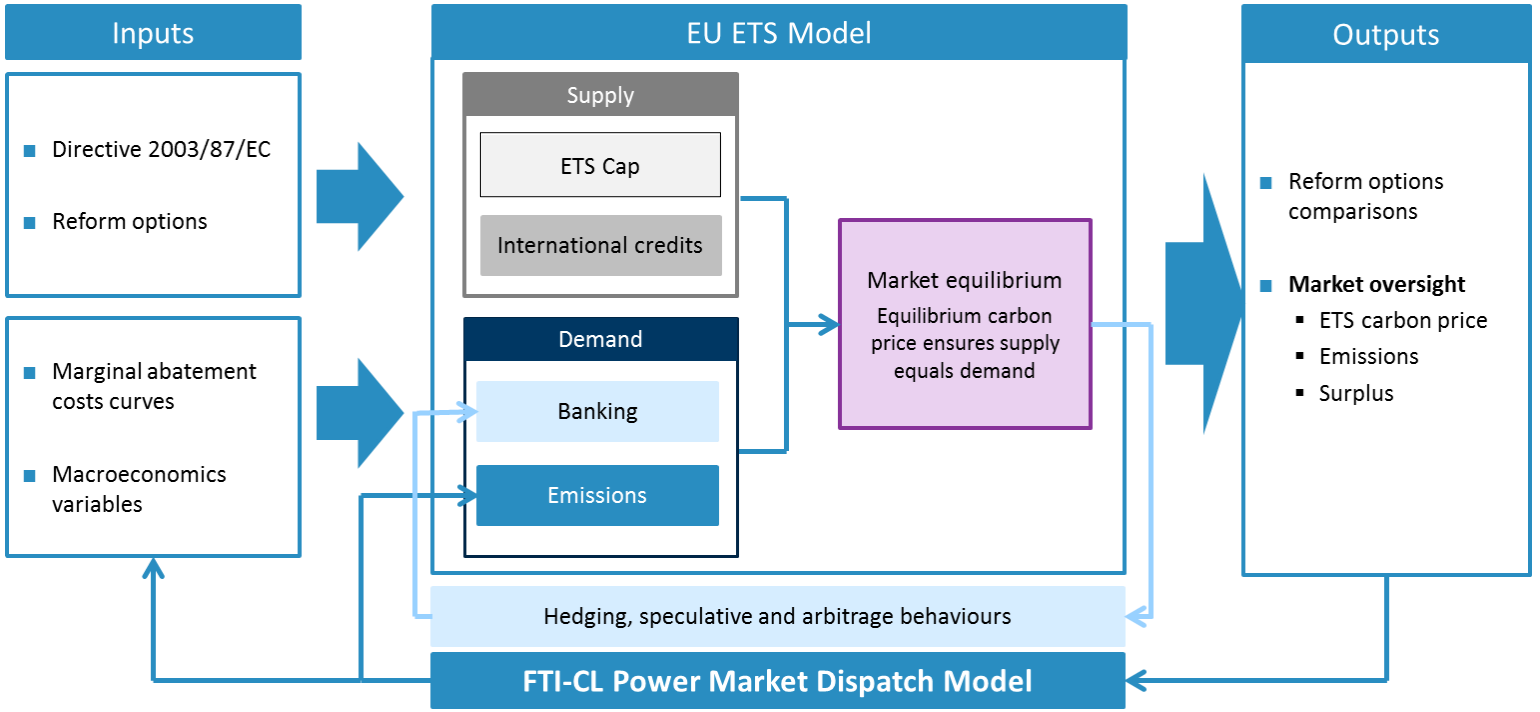
- An increase in the speed of decline of the annual emissions cap from -1.74%/year to -2.20%/year
- A Market Stability Reserve (MSR) which could park annually 12% of the surplus allowances accumulated in the previous years(i)
- An enhanced carbon leakage framework to preserve the competitiveness of the European industry

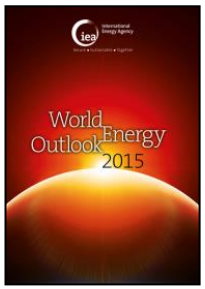
Changed context since Commission tabled proposals

- Paris climate Agreement committing EU to pursue efforts towards a more ambitious +1.5°C target
- Spread of uncoordinated Member States interventions to decarbonise their national electricity sector, displacing the EU ETS as the central tool to decarbonise the EU ETS sectors

(i) MSR enacted through an EU decision – Not part of Directive revision

Our modelling is based on an in-house ETS and EU power market model calibrated based on a robust set of assumptions



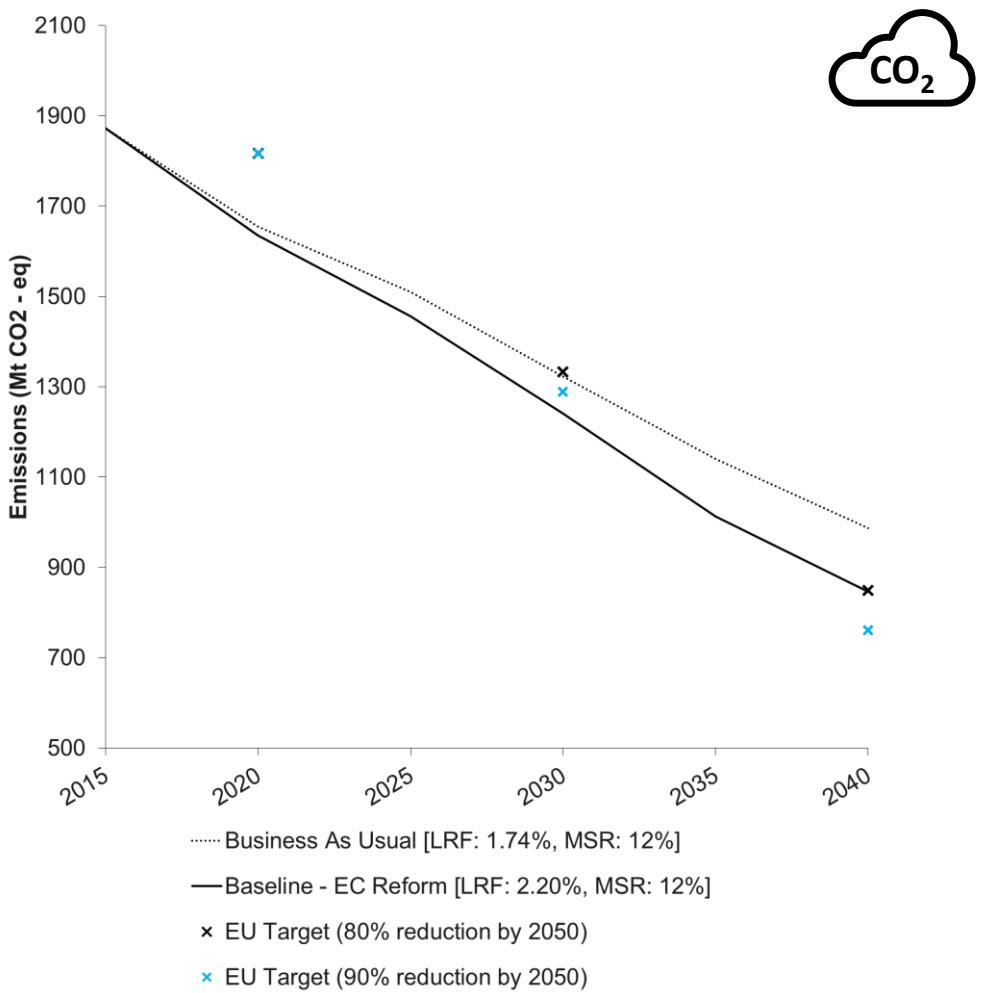


- Our **baseline scenario is based on the recent EC Reference Scenario 2016**, and our power sector model is based on the latest announcements from TSOs, regulators and market participants
- FTI-CL **EU ETS model factors in the inter-temporality and anticipations** from the different market participants **actually observed in the ETS market** (myopic agents with 3-5 years horizon)

Note: The EU ETS modelling approach is inspired from the ZEPHYR model developed by Raphaël Trotignon & Boris Solier (Paris Dauphine University, Chaire Economie du Climat : http://www.chaireeconomieduclimat.org)

1 The current emissions trajectory is not in line with the objective of limiting global warming to +2°C

ETS emissions, 2015 – 2040



- The EU ETS proposal is **not in line with the EU 2050 objective** of 80%-95% emissions reduction to stay below 2°C…

  "In order to set the cap equal to this level [90% emissions reduction by 2050], the LRF in the ETS would need to further increase to -2.4% until 2050" (EC, Impact Assement 2014)

- … and a fortiori, **with the ambition of limiting it to 1.5°C** as suggested by the Paris agreement

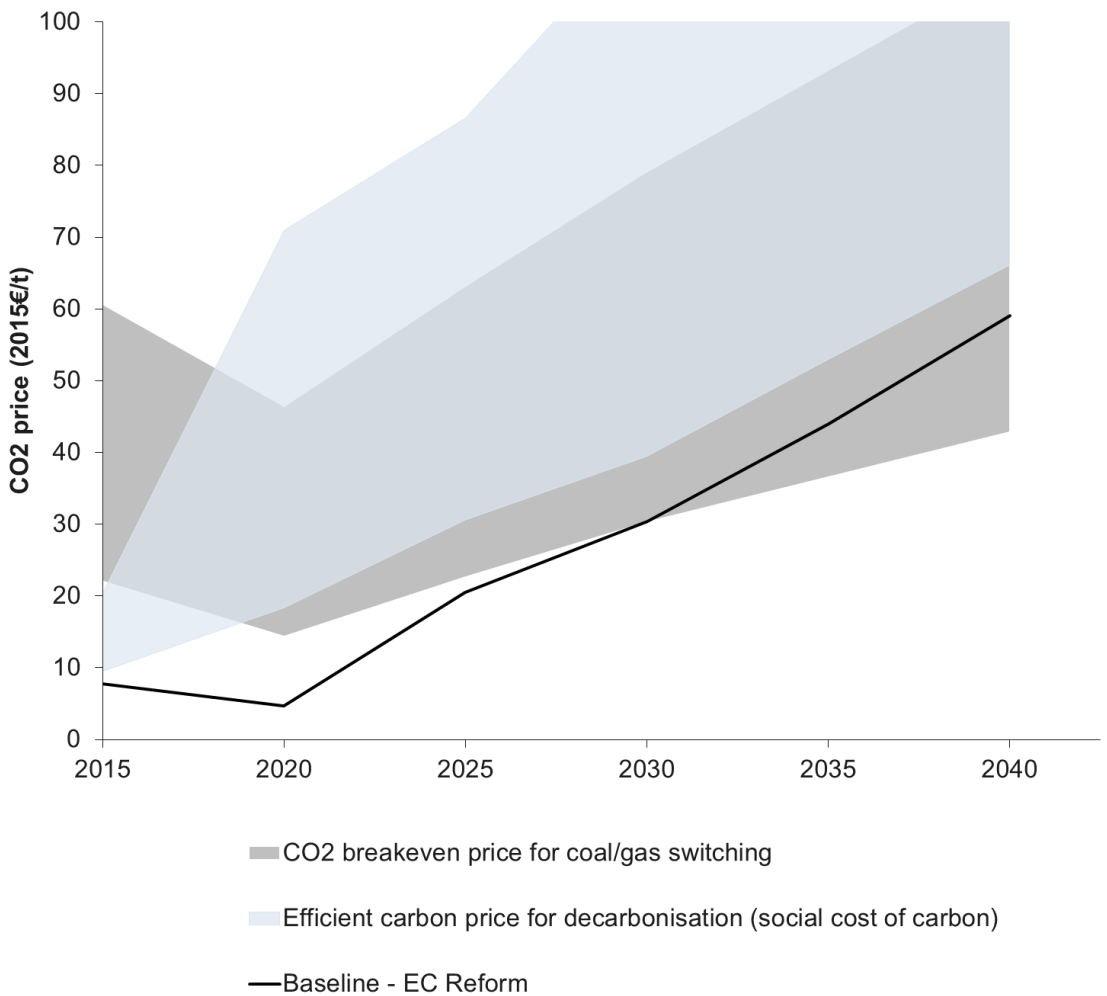
Note: EU ETS targets calculated based on (i) the verified emissions for ETS sectors as of 2005, and (ii) the EU emissions reduction targets expressed in % 2005 emissions reduction.
Source: European Commission, "Impact assessment 2014 - A policy framework for climate and energy in the period from 2020 up to 2030", p. 105

2 ETS prices do not support investment in clean technologies, leading to an inefficient decarbonisation path

- The EU ETS carbon price level is **too low to drive investment in clean technologies (RES, nuclear, etc.)** and avoid investments in fossil fuels technologies
  - The social cost of carbon is the marginal cost of carbon emissions for Europe. It represents the optimal value of current carbon emissions taking into account their future impacts
  - Estimates of the social cost of carbon[(i)] range from about 20-70€/t in 2020, and 40-110€/t in 2030

- The EU ETS carbon price level is **too low to provide a reliable short-term economic signal for switching to low carbon technology** in the power sector[(ii)]
  - It only reaches the CO_2 coal / gas breakeven price in the 2030s[(ii)]

EU ETS carbon price (real 2015), 2015 – 2040

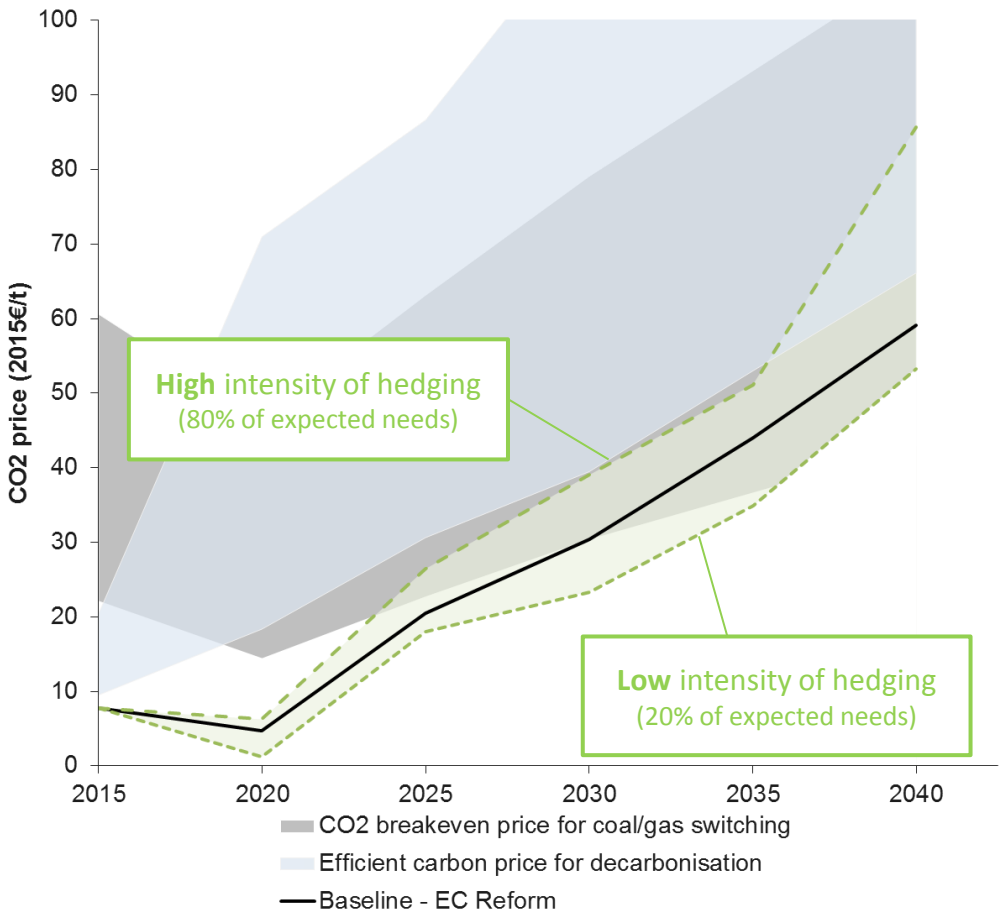


Note : Given the range of efficiencies of existing plants, the fuel switch would be triggered between a range of CO_2 price.

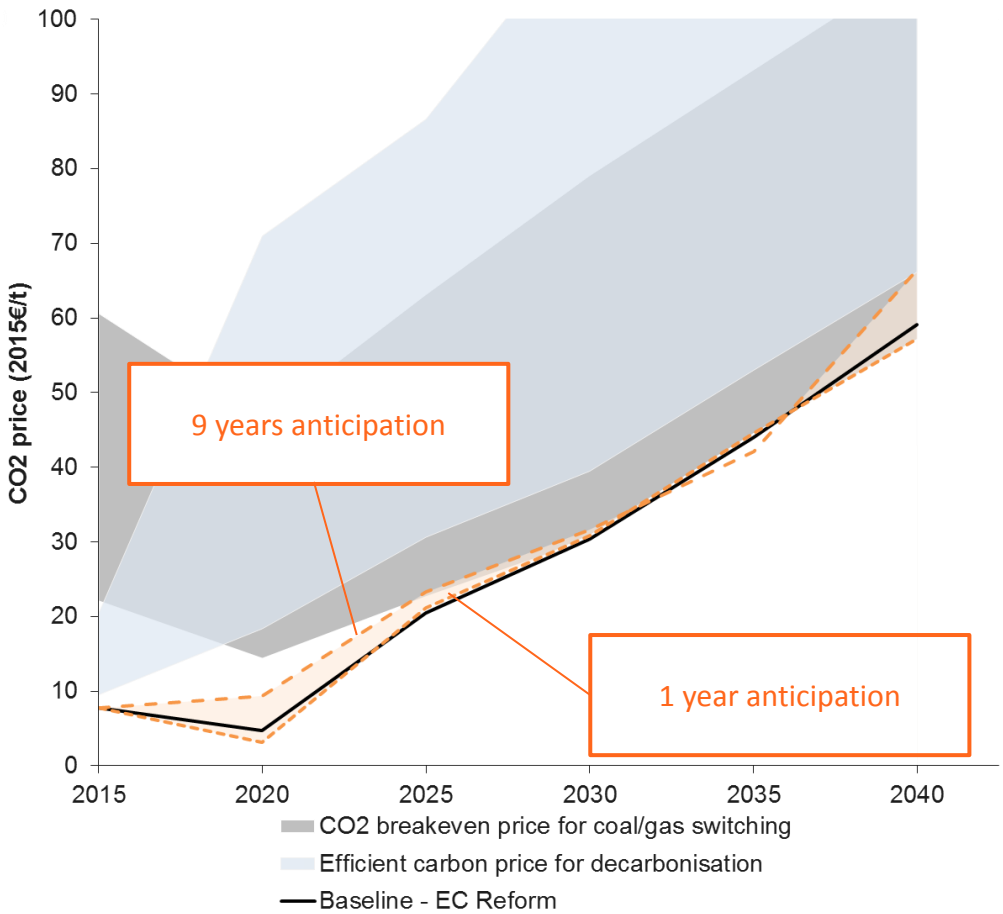
Source: Knopf (2013), "The EMF28 Study on Scenarios for Transforming the European Energy System".

2 … And this is robust across a range of banking behaviours driven by intensity of hedging and foresightedness of participants

Sensibility to intensity of hedging



Sensibility to foresightedness of participants



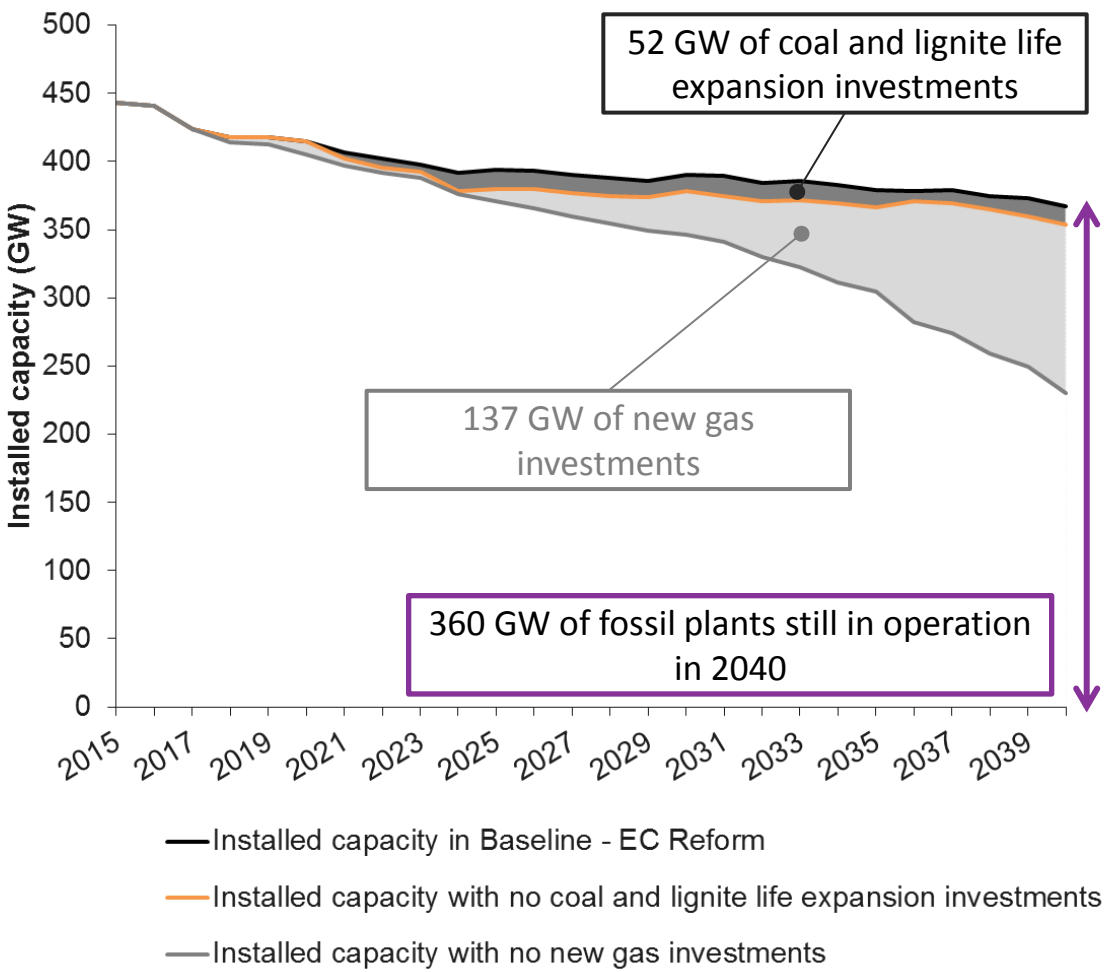
- **Carbon price increases with the intensity of hedging**, as stronger hedging implies higher demand for credits and thus a tighter market.
- The **intertemporal impact of the MSR on carbon price increases with the time horizon considered by market participants**.

2/3 The ETS baseline scenario leads to a significant long-term lock-in of fossil generation capacity

- Carbon prices below 20€/tonne by 2020 and 25€/tonne by 2025 would drive **lock-in of emissions via (re)investment in 187 GW of fossil technologies over 2025-2040** (52 GW of coal and lignite power plants lifetime expansions and 137 GW of gas new capacity)

- **Low carbon price would maintain significant carbon emitting technologies in the mix**: about 360 GW of fossil fuel plants still in operation in 2040 (67 GW of coal and 293 GW of gas)

Carbon emitting technologies capacity outlook, 2015 – 2040

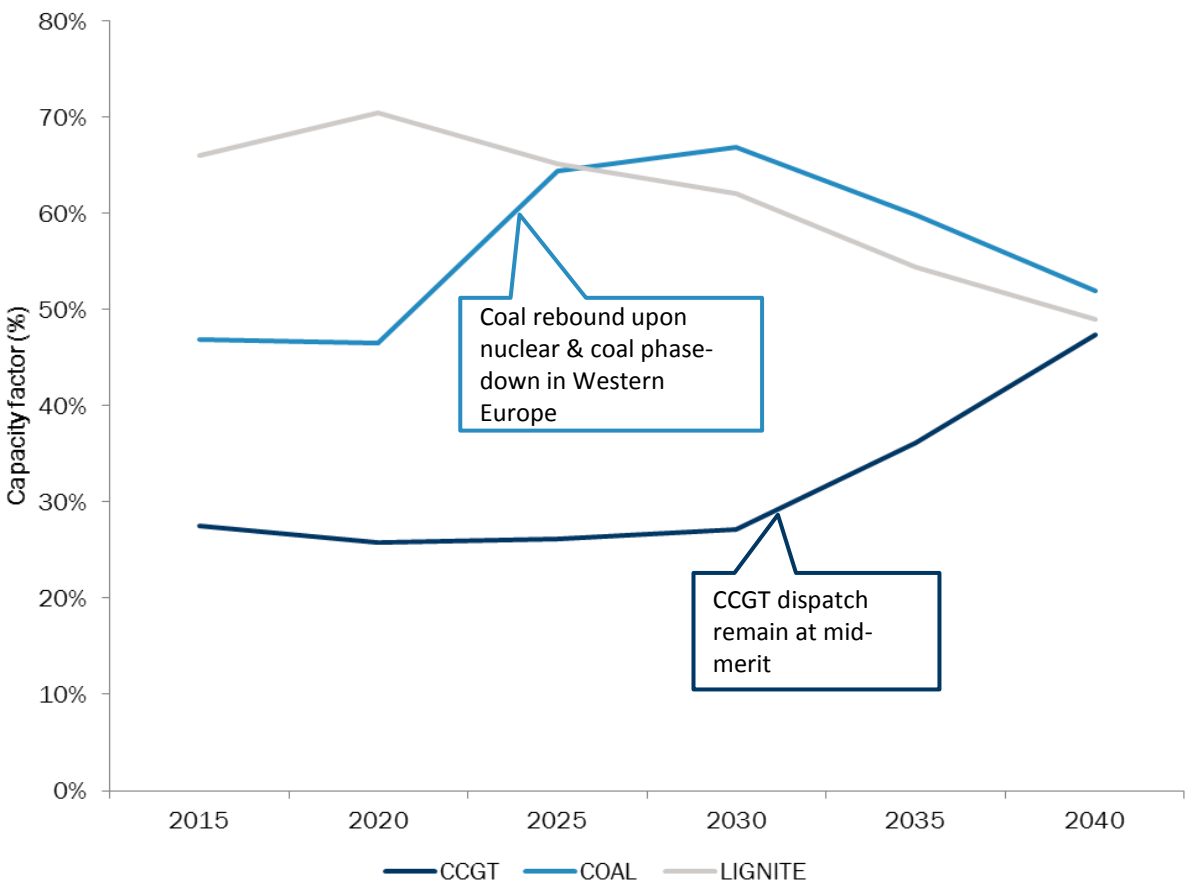


Notes: (i) Plants compliant with emissions standards could be extended ;(ii) We use plant-specific information on all coal & lignite plants, from Platts, national registers, LCP dataset, Transitional National Plan and operators announcements. In case of no data, assumption of a standard lifetime of 50 years coherent with Germany G7 Coal analysis (September 2015); (iii) For more details, see Slide 66.

2/3 Remaining high carbon plants will keep operating at significant capacity factors from today until well beyond 2030

- In the baseline scenario the remaining **coal and lignite plants will keep operating at high capacity factors** as the carbon price is insufficient to trigger switching to gas plants
- **CCGTs will keep a low capacity factor until 2030** before a gradual recovery
- In other words, coal and lignite plants will remain baseload plants, while gas plants will remain mid-merit to peaking plants

European plant average utilization factor, 2015 – 2040



4 A number of EU and national policies have reduced the demand for carbon allowances, threatening the ETS balance

EU and national policies overlapping with the EU ETS

EU policies

Energy performance legislation
- Eco Design and Energy Labelling
- Energy Performance of Buildings Directive

Renewable Energy Directive (RED)

Air quality plant level legislation
- Large Combustion Plant Directive (LCPD)
- Industrial Emissions Directive (IED)
- Medium Combustion Plant Directive (MCPD)

Energy Efficiency Directive (EED)

EU ETS

National policies

National Emissions Ceilings Directive

Carbon tax

Hybrid approach: Penalty payment on exceeded pre-set emission volumes

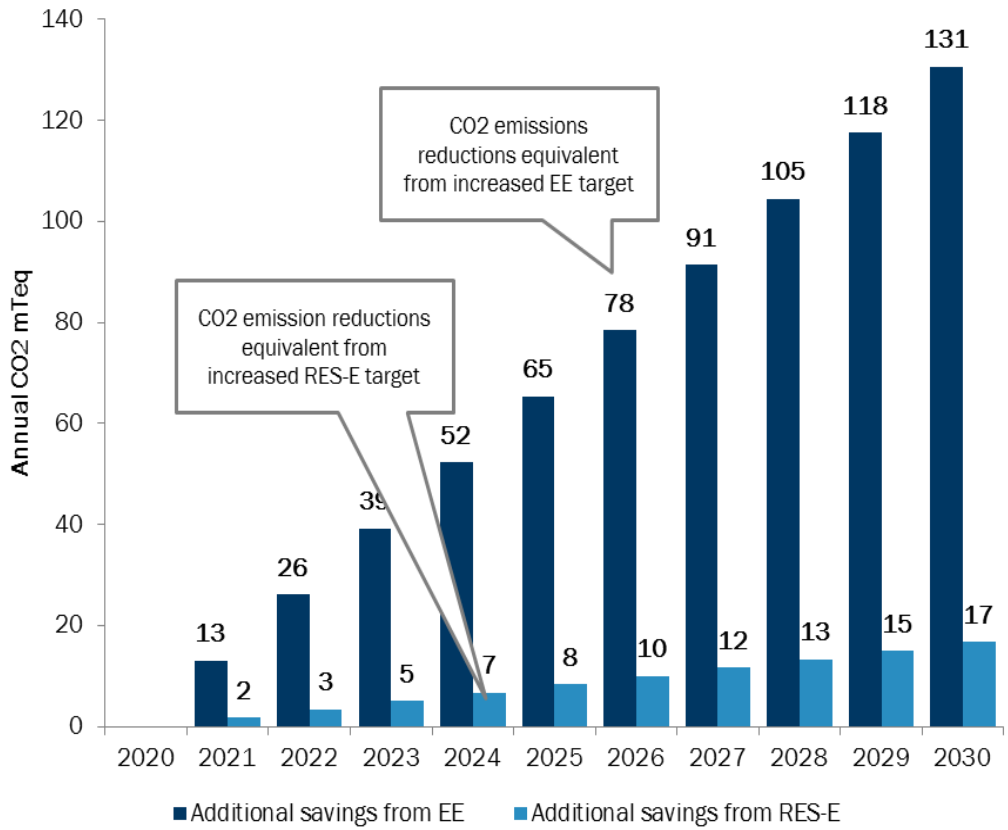
Emissions Performance Standards on CO2

4 RES and energy efficiency policies lead to significant carbon abatement outside of the ETS

- Emission **allowances cap could be reduced by 810Mt over 2021-2030** to adjust for further RES-E and EE 2030 targets
  - RES-E and EE targets further increased after the 2014 EC Impact Assessment that supported the ETS reform proposal
  - EE targets accounting for 89% of emissions difference due to raised targets

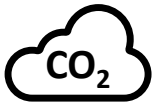
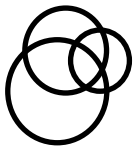
	RES-E 2030 Target Overall // Power	EE 2030 Target
Old reference GHG 40 scenario	26.5% // 47.3%	25.1%
New reference EU 2030 Targets	27% // 48.2%	30%
Delta New vs. Old Generation equivalent (TWh)	-24 TWh in 2030	-187 TWh in 2030
Delta New vs. Old CO_2 emission equivalent (Mt)	-17 Mt in 2030	-131 Mt in 2030

Allowance cap reduction over 2021-2030 to neutralize RES and EE policies



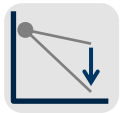
Note: Calculations are based on the 2007 baseline final consumption in 2030 of 3,809 TWh and a marginal emission intensity of 0.7t/MWh (Source: EC (2007), "Reference scenario to 2050"). https://ec.europa.eu/energy/sites/ener/files/documents/trends_to_2030_update_2007.pdf

Summary - Key issues with the EU ETS

	Short-term	Long-term
Emissions 	✓ Emissions below target – largely driven by complementary policies	X 1 **Not in line** with the goal of limiting global warming to **2°C, and a fortiori, with the ambition of limiting it to 1.5°C**
Prices 	X 2 **Too low** to provide efficient signal for carbon abatement via coal-gas switching, and driving lock-in of fossil plants	X 3 **Too low to drive investment in clean technologies** leading to continuation of need for targeted support for specific technologies
Policies overlap 	X 4 **Overlap with complementary policies** ■ Overlapping low carbon policies achieve mandated abatement at a high cost and displace ETS-driven efficient abatement	
Credibility		X 5 **Lack of credibility of policy markers' commitment** ■ in supporting a strong enough and predictable carbon price over time

Options for reform of the ETS - potential impact

We have assessed six types of options for a more ambitious reform

Option types	Central parameters	Parameters range in policy debate
Setting a higher Linear Reduction Factor (LRF) consistent with COP21 targets (above 2.2%)		
 Without rebasing	■ **2.6%**	■ 1.74% - 2.8%
 With rebasing	■ Rebasing in 2021 on **projected 2018-2020** emissions (LRF@2.2%)	■ Rebasing on 2016-2018 or 2018-2020 emissions
 Developing **voluntary allowance cancellation**	■ **Green club of countries** cancelling allowances with budget of 0.007% GDP(i)	■ No / One-off / Continuous cancellations
 **Adjustments of overlapping policies** to neutralize the effect of Energy Efficiency, Renewable policies, IED, etc.	■ Cap reduced by amount of emissions equivalent to **EE & RES measures**	■ No compensation ■ Compensation of national measures ■ Compensation of EU measures
 Introducing a **price corridor**	■ **20-50€/t** growing at 5%+inflation p.a.	■ No measure / Floor only / Cap & floor ■ Strong or moderate growth of cap/floor
 Increasing the **Market Stability Reserve outtake rate** (above 12%)	■ **24%** outtake rate	■ 12% / 24% ■ 12% + 33% on oversupply above 833Mt

(i) Similar effort as Swedish government measure recently announced

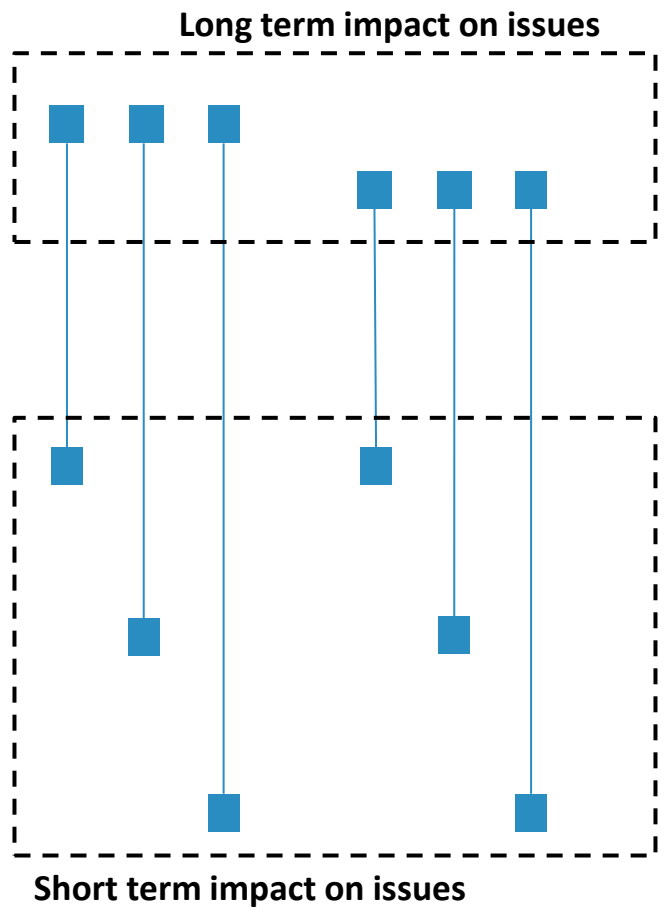
No single option addresses all the issues such that a combination of options is needed to address both short and long term issues

Solutions

Impact on issues

Most relevant combinations to address issues

6 options to address issues	Short Term	Long Term	Robustness/ policy overlap
Higher LRF		+	
Rebasing	+	+	
Voluntary allowance cancellation	+		
Adjustment for overlapping policies	+ *Depends on implementation*	+ *Depends on implementation*	+
Price corridor	+ *Depends on calibration*	+ *Depends on calibration*	+
Stronger Market Stability Reserve	+		+



An appropriate treatment of the carbon leakage risk compensations to is an essential pre-requisite of any ambitious ETS reform

Competiveness support in European Commission's proposal (2015)

Preventing carbon leakage and preserving competitiveness

- **100% free allowances** to sectors with **highest carbon leakage risks / 30% for others**
- **Indirect costs from electricity** price rises compensated through national State Aids
- 400 million free allowances set aside for new entrants

Supporting innovation and energy transition

- **Innovation Fund** (NER 400): 450 million allowances to support low-carbon innovations
- **Modernisation Fund**: At least 250 million allowances to support energy transition in 10 lower-income Member States

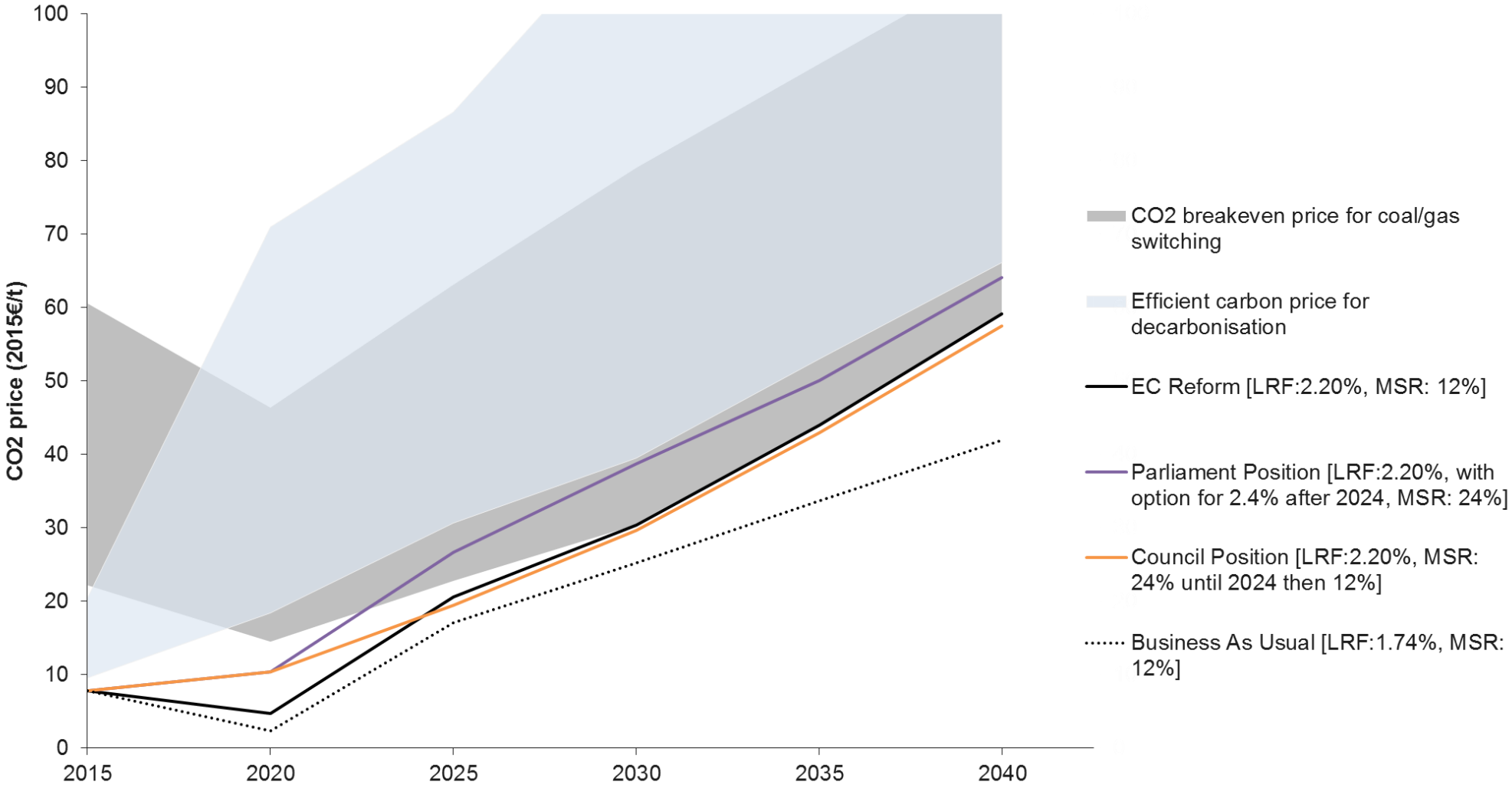
Enhanced support in new ETS reform

- **Up to 86 billion EUR in extra auction revenues** to be split between:
  - Modernisation Fund
  - Innovation Fund
  - Member States
- Budget opportunities to **further compensate European industry** for carbon leakage risk, an essential pre-requisite of any ambitious ETS reform.

Trialogue negotiations have now started, with counterproposal for ETS reform from the Council and Parliament

Issues	EC proposal	Parliament position	Council position
Linear reduction factor	**2.2% from 2021.**	~ **2.2% from 2021**, with option for 2.4% after 2024.	= Same as EU proposal.
Ratio auction-free allowances	**57%,** no CSCF buffer.	≠ **57%,** up to 5% shift from auctioned to free allowances if the CSCF is triggered.	≠ **57%,** up to 2% shift if CSCF is triggered.
Benchmarks	**Subject to the average improvement rate = 0.5% - 1.5%** depending on industry.	~ **Subject to the average improvement rate** compared to the past performance . With **caps: 0.25% and 1.75%.**	~ Same as Parliament, but with **lower caps: 0.2% and 1.5%.**
Indirect costs	**No EU fund**. To be compensated through **national State Aids.**	≠ **EU fund** consisting of 465 million allowances.	= Same as EU proposal.
MSR and cancellation	**12%,** starting in 2019, • 12% of oversupply (>833 million) to be withdrawn 1; • 100 million to be release if oversupply <400 million.	≠ **Doubling to 24%** until the market balance has restored, starting in 2019. ≠ **800 million allowances cancelled** in 2021.	≠ **Doubling to 24% for 5 years,** starting 2019 ≠ Starting 2024, allowances in the MSR above allowances auctioned during the previous year no longer valid.
New Entrance Reserve	**400 million** allowances.	= Same as EU proposal.	≠ **250 million** from MSR, plus unallocated Phase III allowances.
Carbon leakage list	**Binary approach**. Narrowing to 50 sectors (from 177 initially).	~ **No tiered approach**. 30% is gone except for district heating.	~ **Binary approach**. 30% sectors are included.
Innovation Fund	**400 million** funded with free allowances, **plus 50** unallocated allowances MSR.	≠ **600 million**, paid from auctioned allowances.	= Same as EU proposal.
Just Transition Fund	Not mentioning.	≠ **2% of total EU ETS allowances**, but this 2% is part of the 57% (= auctioned allowances).	
Modernisation Fund	**310 million** allowances.	≠ **2% of auction revenue.**	≠ No mentioning.

The options on the table would significantly improve the ETS outlook



- **But will likely not be sufficient to reach a price range supportive of an efficient decarbonization pathway…**

Complementary policies for EU decarbonization: helping the ETS do its job

The ETS was conceived initially to be the core pillar of EU decarbonization policy… but it has turned into a residual market

2011

- **Expectations of EU ETS carbon prices at a sufficient level to lead decarbonisation** for decades to come

- **High ETS prices rendering unnecessary other mechanisms addressing existing assets** – Example: 2011 European Commission report on Emission performance standards[1)]:
  - "The analysis conducted in this report finds that the implementation of a CO2 Emission Performance Standard for power plants post 2020 would have **very little impact**. […] "With the very strong likelihood of **carbon prices being in excess of €20/t by 2020**, one would expect very few new coal-fired stations to be built at all after 2020."
  - "Simple economics for building new plants shows that CCGTs have lower life time costs than coal even in Eastern Europe at carbon prices around €5/t"

2017

- **Abatement in the power sector primarily driven by complementary policies such as:**
  - Direct support for clean technologies,
  - Energy efficiency

- **Debate on potential role for additional complementary policies:**
  - Emissions Performance Standards
    - UK /Dutch coal phase out
  - Mandatory retirements:
    - Germany's climate reserve

=> The **implications of these policies on costs as well as on security of supply** need to be assessed to identify "second best" approaches

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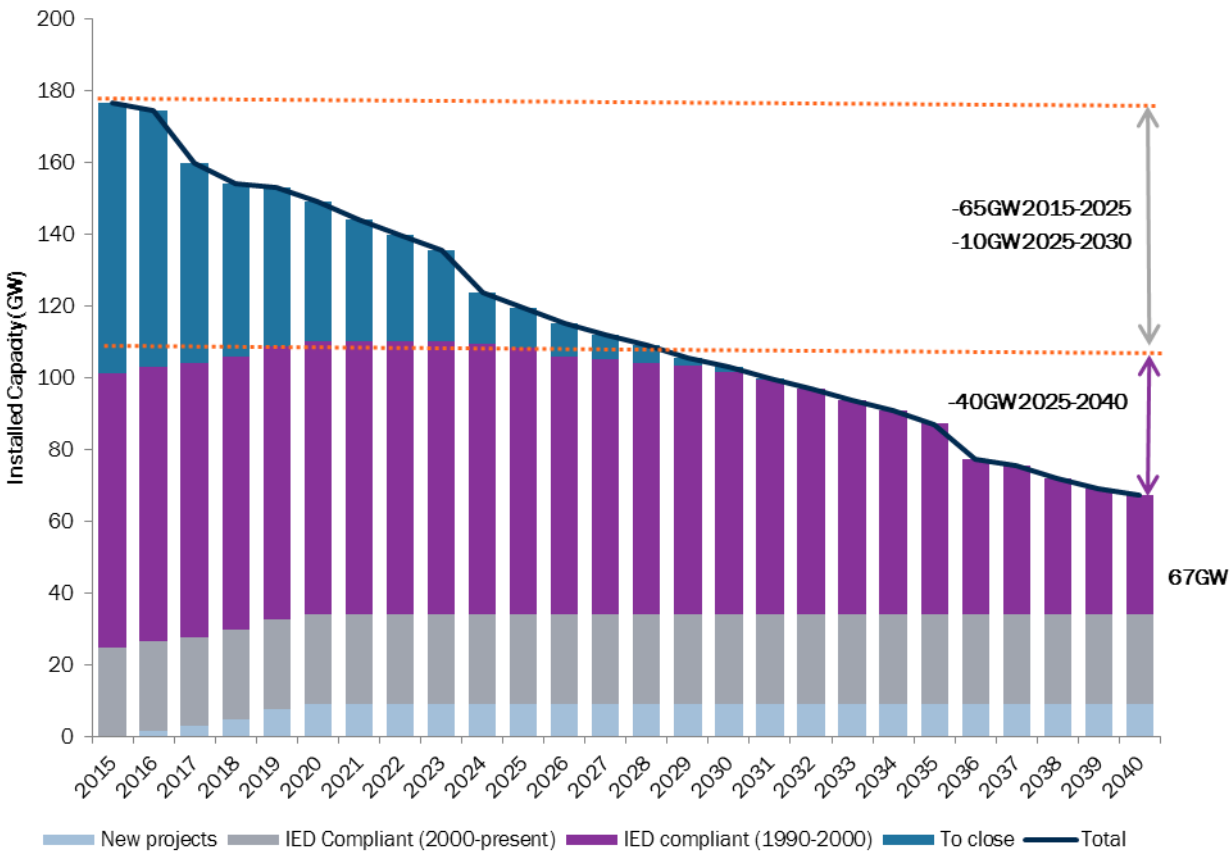
1. Bloomberg New Energy Finance, Emission performance Standards Impacts of power plant CO2 emission performance standards in the context of the European carbon market, Report for the European Commission, 2011

For the power sector, the challenge is to avoid costly lock-in of emissions by managing a transition away from coal and lignite plants

Baseline modelling results

- Our EU dispatch model calculate the expected remaining operational life of coal and lignite plants on a plant-by-plant basis :
  - The ETS baseline and current regulations would lead to a slow decrease of coal and lignite capacity in Europe.
  - c75GW of the coal and lignite capacity will close by 2030 due to current national and European regulations. However, c75GW are compliant with latest regulation and not subject to national phase-out plans.
  - 67 GW would still be in operation in 2040, representing a significant lock-in of CO2 emissions.

Coal and lignite capacity outlook



Note: We use plant-specific information on all coal & lignite plants, from Platts, national registers, LCP dataset, Transitional National Plan and operators announcements. In case of no data, assumption of a standard lifetime of 50 years coherent with Germany G7 Coal analysis (September 2015).

Enhancing the credibility and predictability of the carbon price is key to drive efficient intertemporal abatement

- **Issue rooted in the perceived disconnect between the long term policy targets, and the concrete short term policy instruments put in place to deliver on these targets**
  - Development of forward looking policy roadmaps could provide some clarity
  - A process to monitor progress against the policy roadmap could be put in place

- **The policy debate on the ETS reform has to date focused little on the possible credibility / predictability enhancing mechanisms providing long term visibility on investors, such as:**
  - A "**gateway approach" setting indicative carbon price targets for future phases of the ETS**, coupled with an enhanced MSR approach. For instance, a target range for carbon prices could be defined for 2030 / 2040 / 2050 and a process identified to automatically trigger some allowances cancellation / additions.
  - A (voluntary) **mechanism for countries to guarantee long term carbon prices via carbon contracts / CFDs.** Such long term carbon contracts could for instance play a critical role to reduce the long term commitment to a rising carbon price and the lack of confidence in the ETS and support investment in clean technologies.
  - **A carbon price floor / price cap** which would require a coordinated approach and/ or a border tax adjustment mechanism. The UK example shows both the issues and potential benefits of such an approach.
  - **A supply management mechanism to maintain prices within a predetermined 'politically acceptable' price range**. This can be either based on an improved MSR type mechanism, or delegated to an independent authority – e.g. a EU carbon bank.

- **The alternative is to provide this credible commitment via complementary policies.**

A range of measures / policies have been considered to reduce carbon emissions across the world in supplement to emissions trading

Measure		Description	Advantages	Drawbacks	Examples
Incentive regulation	**Emissions Trading Scheme**	Fixed emissions volumes, with cap and trade system	■ **Efficient** in finding the lowest abatement costs ■ Support **emissions conservation** for all installations	■ **Uncertain carbon price**, limiting support to low carbon investments ■ Potential harm to competitiveness (higher prices)	EU ETS Quebec and California ETS Chinese ETS
	Tax / Price floor	Fixed price of emissions, levied by government	■ **Raising government revenues**[1)] ■ **High predictability** leading to increased low carbon investments / R&D ■ Support **emissions conservation** for all	■ **Uncertain carbon emissions** reduction ■ Potential harm to competitiveness (higher prices)	Carbon Price Floor Carbon tax (?) Carbon tax (?)
Command and control	**Emissions Performance Standards (EPS)**	Mandate lower emissions for every installation	■ **Targeted results** ■ No direct impact on energy/goods prices	■ Potential requests for compensations	EPS (W. Coast & NY) EPS (coal only) EPS (annual) Efficiency standards
	Administrative closures	Close high-carbon plants / factories	■ **Targeted results** ■ No direct impact on energy/goods prices	■ Potential requests for compensations	2025 end of coal Climate reserve 50 year max. life
	Technology subsidies	Subsidise low/zero carbon technologies (renewables)	■ **Targeted results** ■ No direct impact on energy/goods prices	■ **Uncertain carbon emissions** reduction ■ **Significant costs to government budget**	EU renewable targets

1. Leading to potentially higher efficiency if redistributed through tax reduction on other economic activities

Emissions Performance Standards (EPS) are back in fashion – but can be implemented in different ways

Main parameters		Existing implementation					Comments
			 CA,WA OR,NY		 Island		
Where?	One state / Partial		✓				■ Anti leakeage policy necessary, as implemented in California, with EPS applied to purchase from plants outside the state
	National / Near Complete	✓		✓	✓	✓	■ Potentially hard to achieve ambitious carbon policy across EU
Who?	New plants	✓					■ Few fossil fuel plants planned
	Existing plants					✓	■ High footprint of existing plants
	All plants		✓	✓			■ Avoiding threshold effects
	Only large plants				✓	✓	■ Limiting regulatory burden for small installations
What?	Energy based emissions (g_{CO2}/kWh)	✓	✓	✓			■ Targeted result of limiting carbon intensity
	Fuel efficiency (g_{Coal}/kWh)					✓	■ Similar to energy based measure
	Capacity based emissions (g_{CO2}/kW)				✓		■ Allowing high-carbon plants to operate for a limited number of hours
When?	Continually				✓	✓	■ Simpler to implement but does not take into account stranded investments
	At time of refurbishment/new contract	✓	✓				■ Limiting stranded investments
	At end of "useful life"			✓			■ Avoiding stranded investments
When?	Gradable EPS / Penalties	✓				✓	■ Incentive proportionate to emissions
	One size fits all		✓	✓	✓		■ Strict and simple threshold

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=> The **devil is in the implementation details:** careful design and calibration is needed to ensure that EPS efficiently supplements the ETS

A note on Brexit: UK options for carbon pricing

- **Option 1: Stay in the EU-ETS**
  - Benefits of the world's largest carbon market – lower marginal abatement costs and lower transaction costs
  - Other non EU countries participate in the ETS: Norway, Iceland and Liechtenstein
  - but less control of own and EU policy

- **Option 2: Leave EU ETS and institute UK ETS**
  - Likely too small to be efficient
  - Linking possible with EU ETS and/or China / WCI?
  - Might allow a tighter emissions target with coverage of more sectors

- **Option 3: Institute a UK Carbon Tax**
  - Transform carbon price support into a tax
  - Less flexible than ETS to handle competitiveness issues
  - Politically difficult

- **For the rest of Europe, need to redefine level of ambition and recalculate targets… (40% by 2030 no longer possible as UK relatively more ambitious than other countries)**

Conclusion

- **The ETS reform is unlikely to be sufficient to provide an efficient price signal to drive efficient decarbonization**
  - Boost to carbon price likely insufficient to avoid costly lock in of emissions in the power sector

- **Some structural issues of the ETS are not addressed by the reform**
  - Overlap with complementary policies
  - Intertemporal inefficiencies associated with lack of credibility of long term commitments

- **The ongoing discussions cast a new light on the old debate about the need for and optimal design of complementary policies**
  - Normative approaches and EPS back in fashion to ensure an efficient power sector decarbonization

- **More fundamentally, need to rethink trade off between ETS' breadth of sectoral coverage versus level of ambition and role of as part of 'policy mix'**
  - ETS as **prime driver of decarbonization** but centered on a more restricted / homogenous sectoral coverage (i.e. focused on power sector only)
  - Or ETS as **backstop mechanism** with large sectoral coverage to provide some minimal level of harmonization (Californian approach)

Thank you for your attention

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Our recent work on the ETS and RES policies

Wake Up! Reforming the EU ETS: Comparative Evaluation of the Different Options

Web link

The new European Energy Union - Toward a consistent EU energy and climate policy?

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Electricity Market Design and RE Deployment

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