Strengthening the EU Emission Trading System: Its impact, unintended consequences & overlapping policies

Kenneth Bruninx, Marten Ovaere, Kenneth Gillingham & Erik Delarue

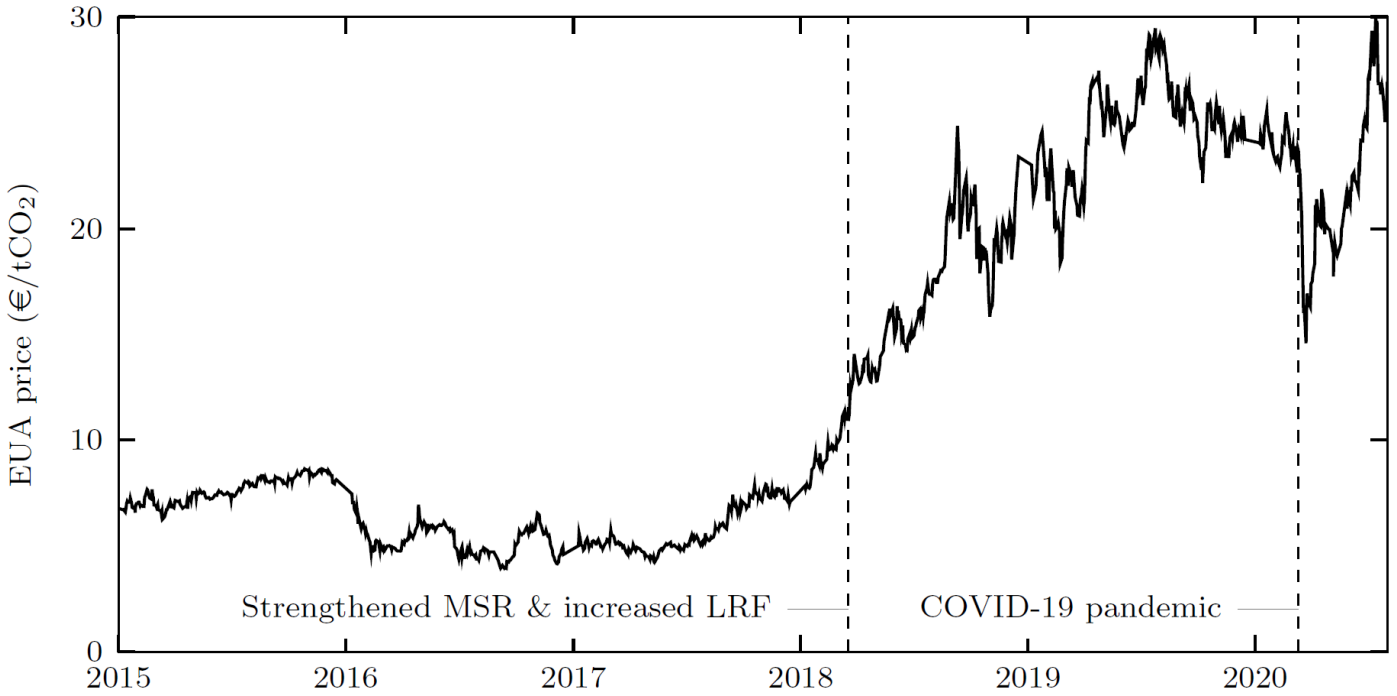
1 High-level summary of the following papers

[1] K. Bruninx, M. Ovaere, and E. Delarue. "**The Long-Term Impact of the Market Stability Reserve on the EU Emission Trading System**" Energy Economics, In press, June 2020.

[2] K. Bruninx, M. Ovaere, K. Gillingham, and E. Delarue. "**The unintended consequences of the EU ETS cancellation policy**", 2019. KU Leuven Energy Institute Working Paper WP EN2019-11. Available online: https://www.mech.kuleuven.be/en/tme/research/energy-systems-integration-modeling

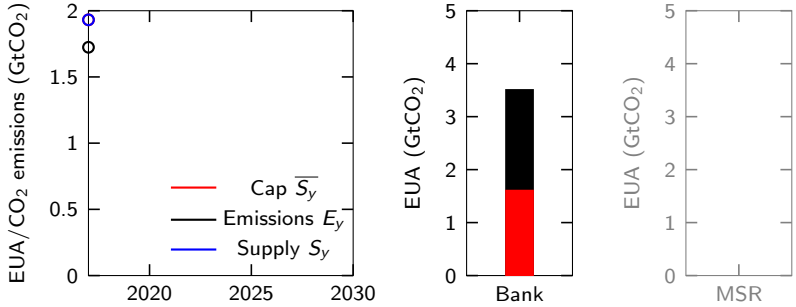
[3] K. Bruninx & M. Ovaere, "**Estimating the impact of COVID-19 on emissions and emission allowance prices under EU ETS**", IAEE Energy Forum / Covid-19 Issue, 2020.

1 Motivation



K. Bruninx et al., 'The Long-Term Impact of the Market Stability Reserve on the EU Emission Trading System', Energy Economics, In press, 2020.

2 From EU ETS in simpler times….



2017 CAP – Linear reduction factor: 38.3 $MtCO_2$/year

MSR – Intake rate: –

MSR – Outflow rate: –

MSR – Cancellation: –

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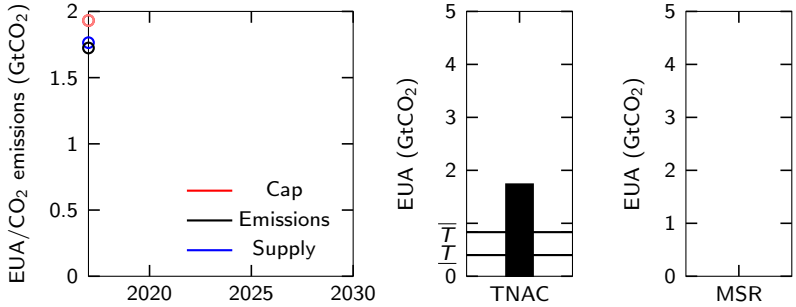
2 To EU ETS & the Market Stability Reserve



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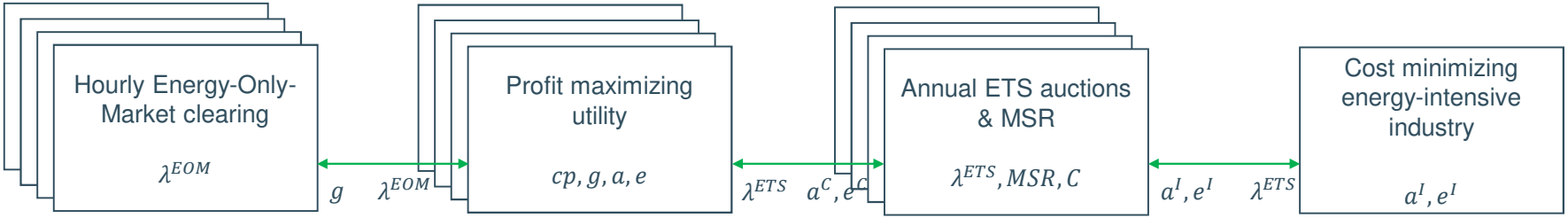
3 Modeling abatement under EU ETS

- Abatement in power sector and energy-intensive industry in 2017-2061
- Simple representation of industry through abatement cost curves
- Starting from existing electricity generation capacity, every year utilities decide on capacity investments considering the expected profits from economic dispatch over their technical lifetime
- Nash equilibrium between utilities & energy-intensive industry, casted as a large-scale mixed complementary problem, incl. discrete triggers MSR



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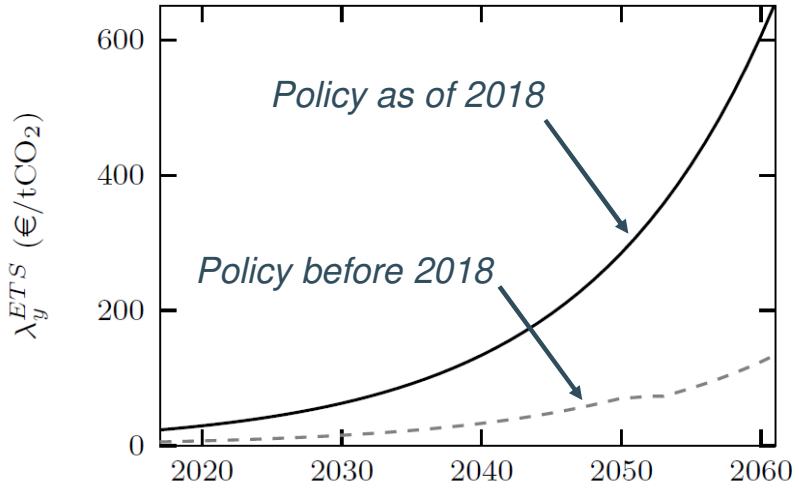
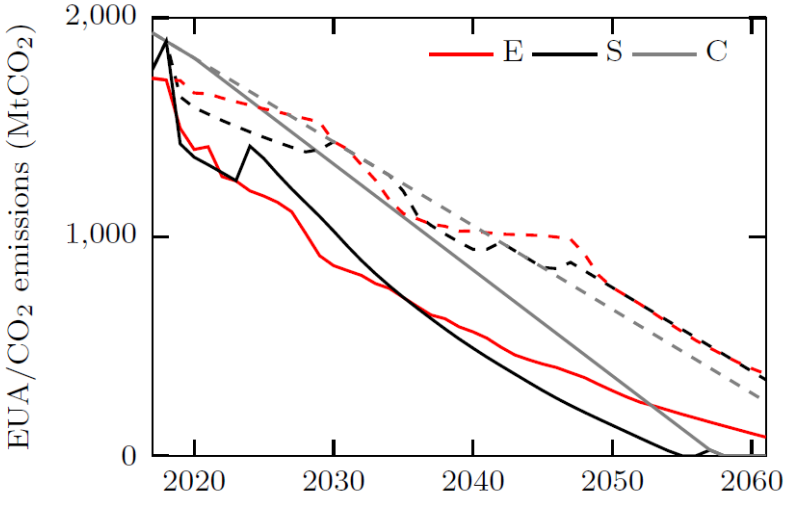
4 Increased linear reduction factor & cancellation policy significantly increase emission allowance prices & reduce cumulative emissions



Emission allowance prices



Supply of allowances, emissions cap and emissions

K. Bruninx et al., 'The Long-Term Impact of the Market Stability Reserve on the EU Emission Trading System', Energy Economics, In press, 2020.

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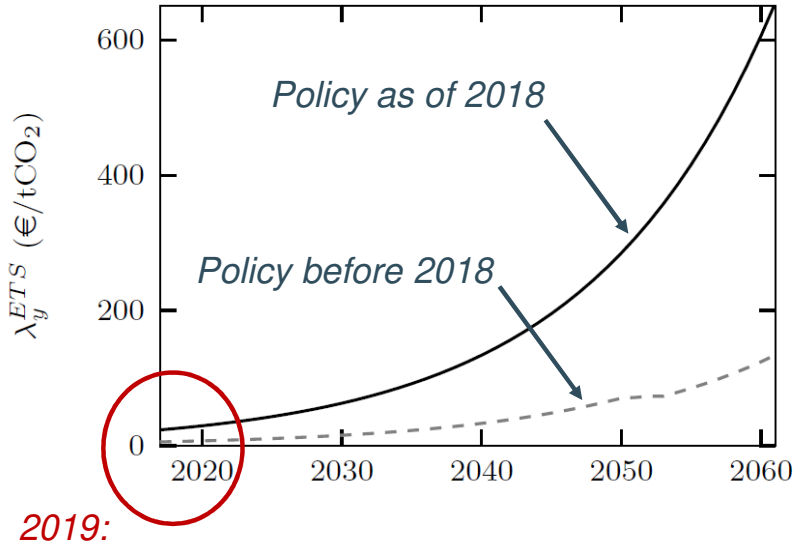
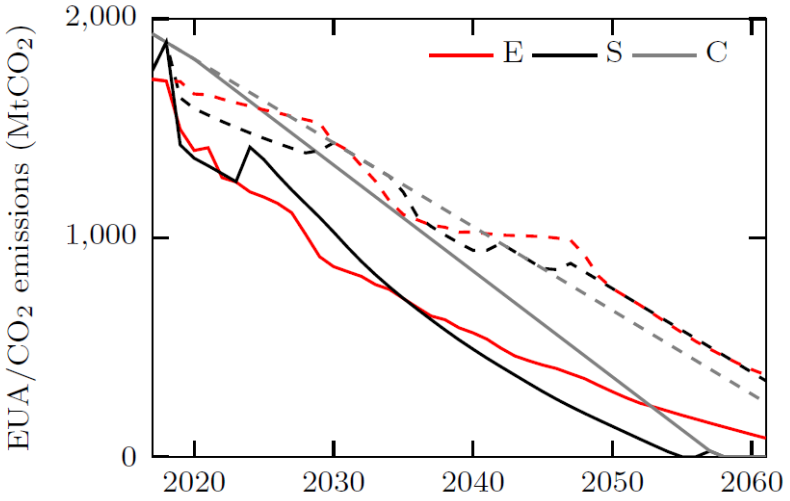


2019:
6.8 → 27.4 €/tCO$_2$

Emission allowance prices



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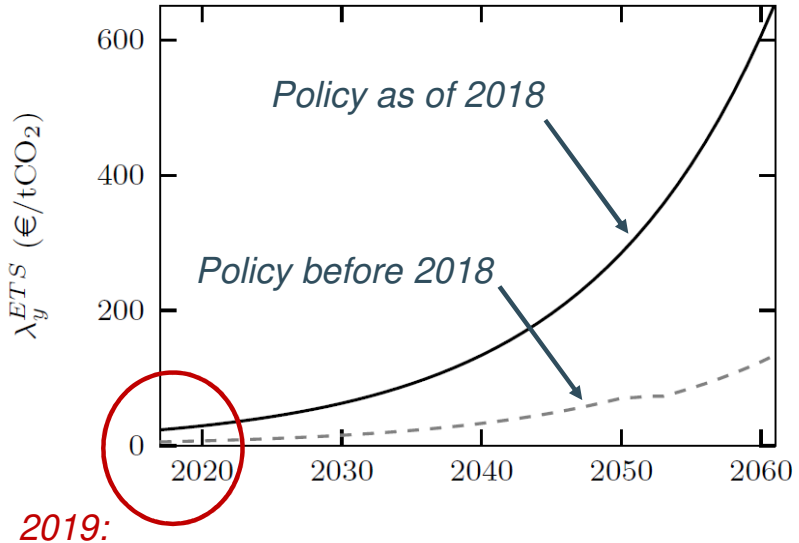

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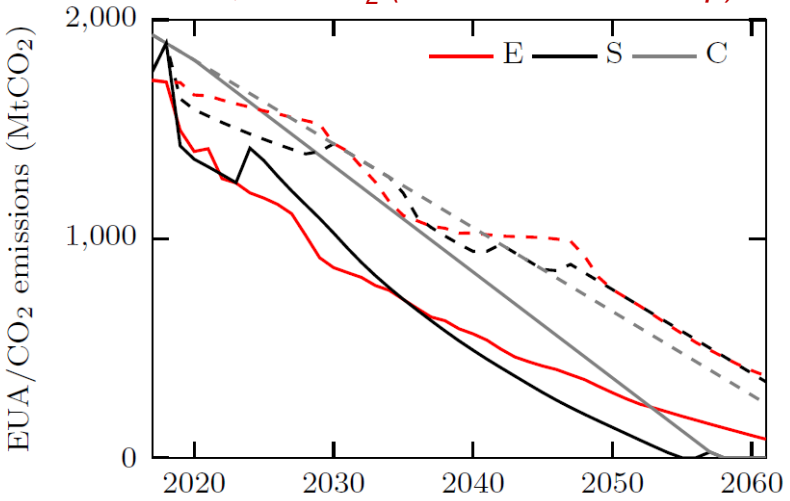
Emission allowance prices

Cumulative emissions:
-21,3 GtCO$_2$ (-41% w.r.t. cum. cap)



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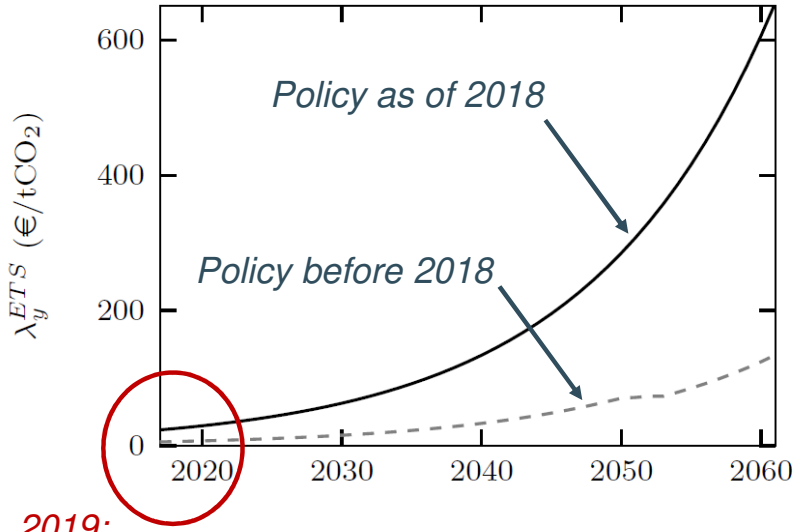

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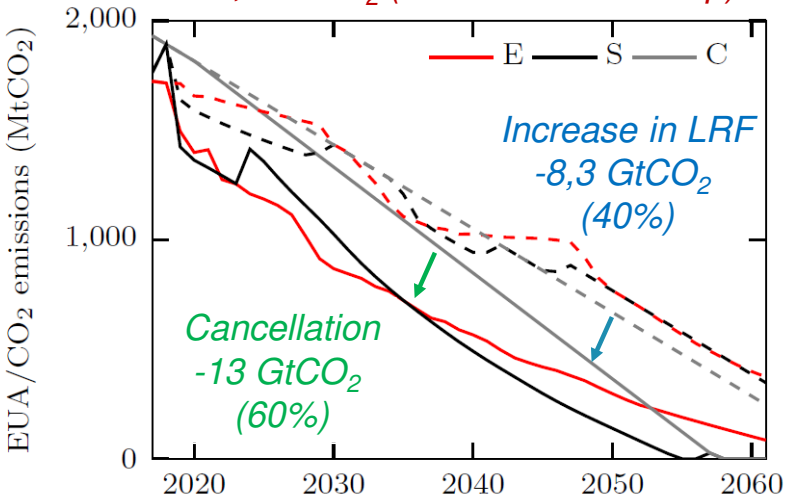

Supply of allowances, emissions cap and emissions

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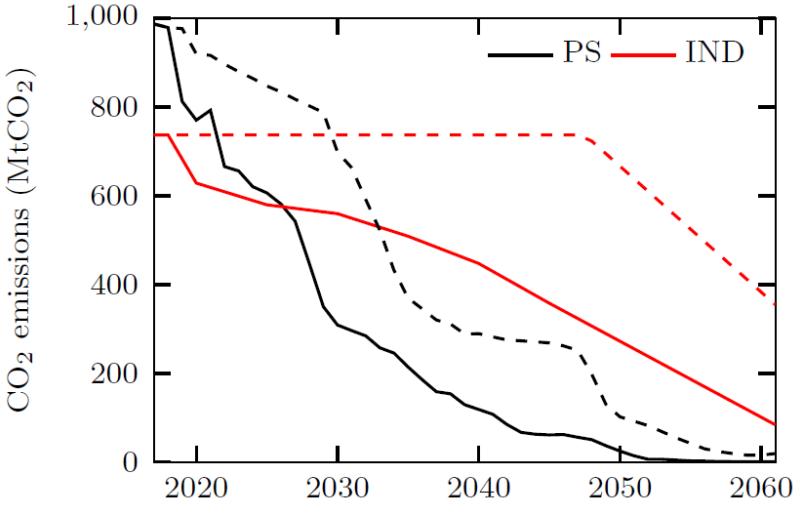
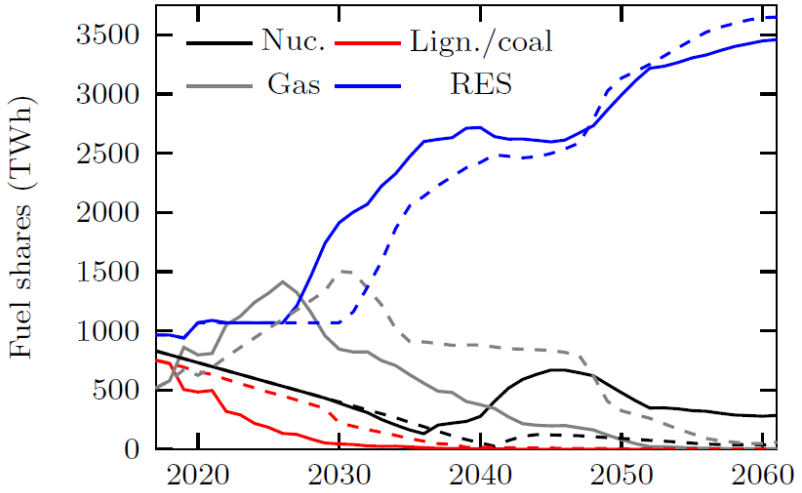
4 The strengthened MSR advances the transition form coal/lignite to natural gas and from natural gas to renewables



Emissions in the power sector (PS) and energy-intensive industry



Fuel shares in the power sector

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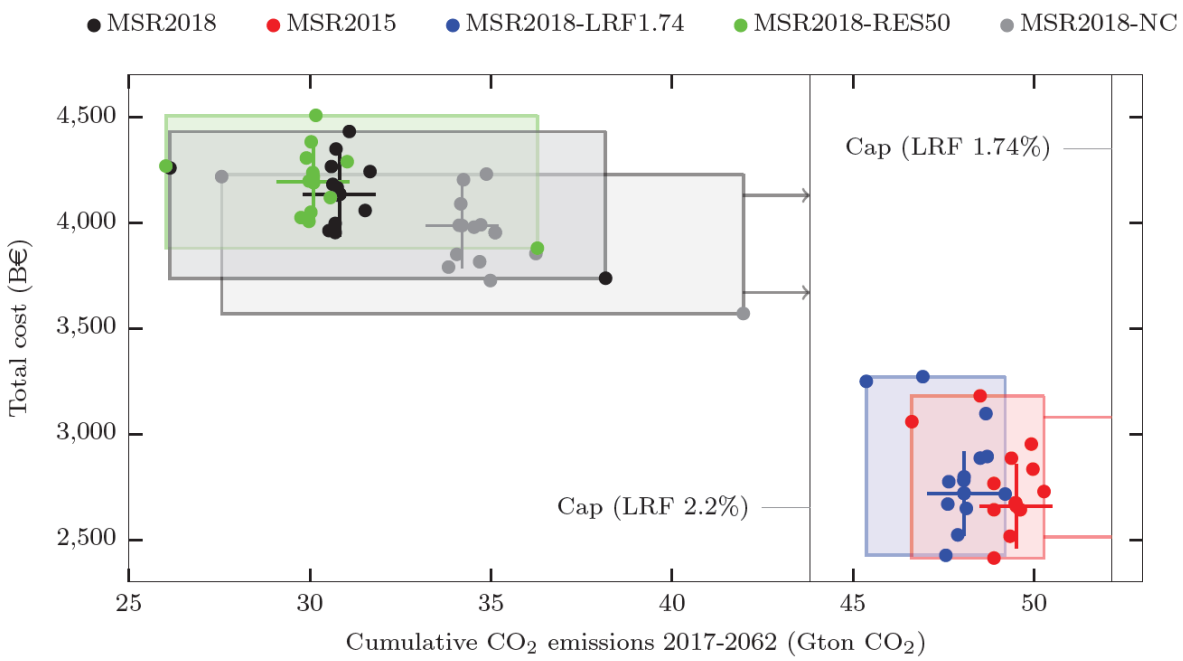
4 What if…



- **Effective cancellation highly uncertain (5.6 – 17.8 $GtCO_2$):** depends on complementary policies (e.g. renewable energy targets, coal/nuclear phase-outs) and cost evolutions (e.g., investment cost reductions for wind and solar power)

- **Feedback or reinforcing effect:** MSR leads to less emissions if combined with increased LRF at expense of higher cost.

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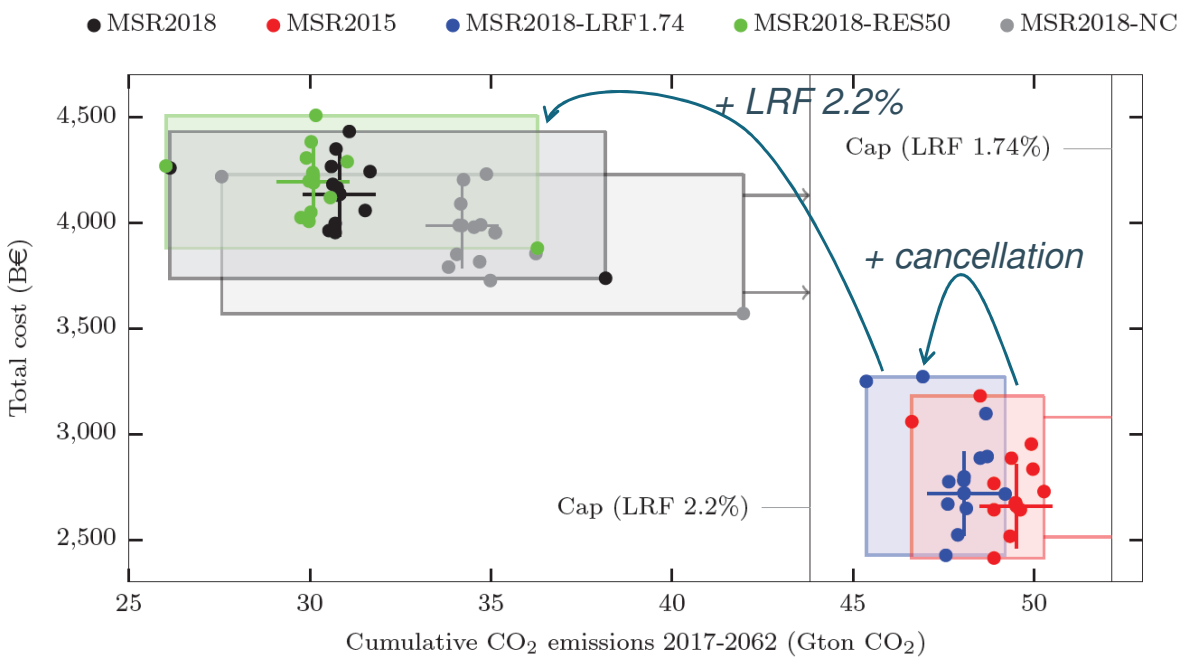

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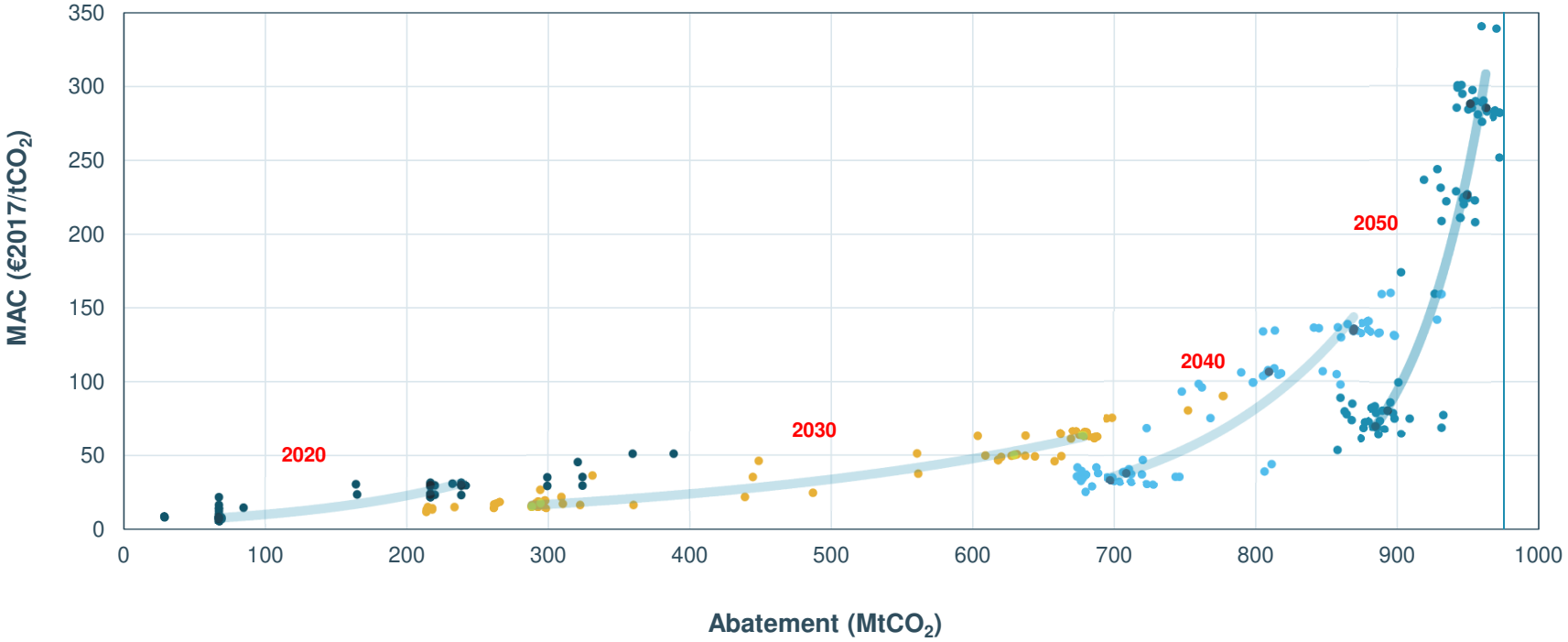
4 Simulated MACC of the power sector is highly non-linear



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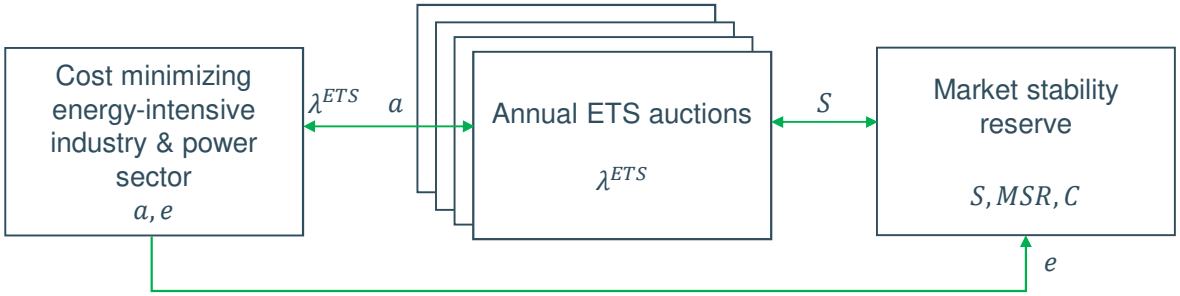
5 The feedback effect, revisited

- Underlying mechanism:

  If the cost of meeting the cap in the future increases:
  → More banking
  → Higher surplus today
  → More EUAs absorbed & cancelled by the MSR
  → Lower cumulative emissions

- Simplified model to expose this interaction:



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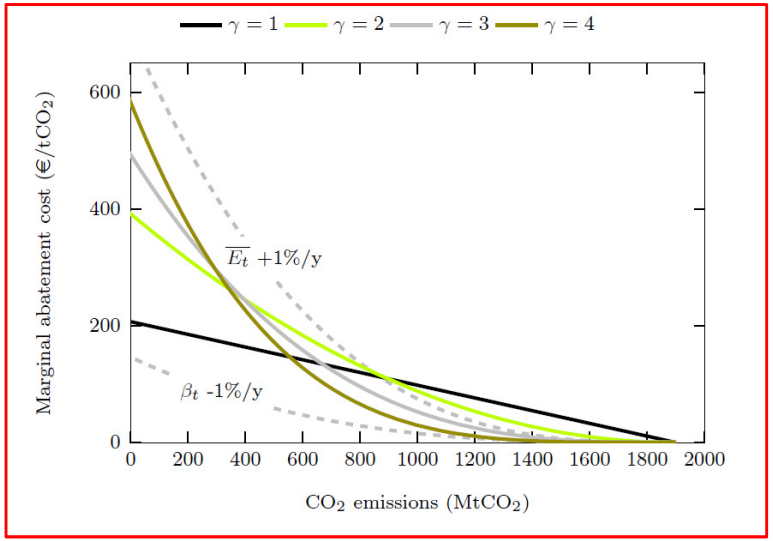

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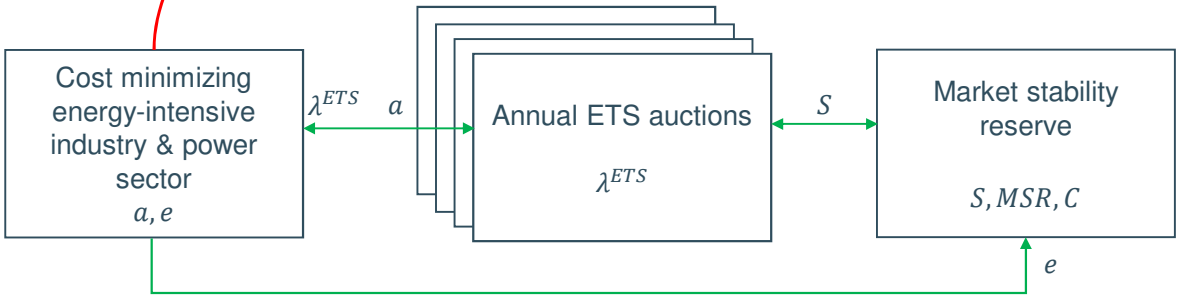

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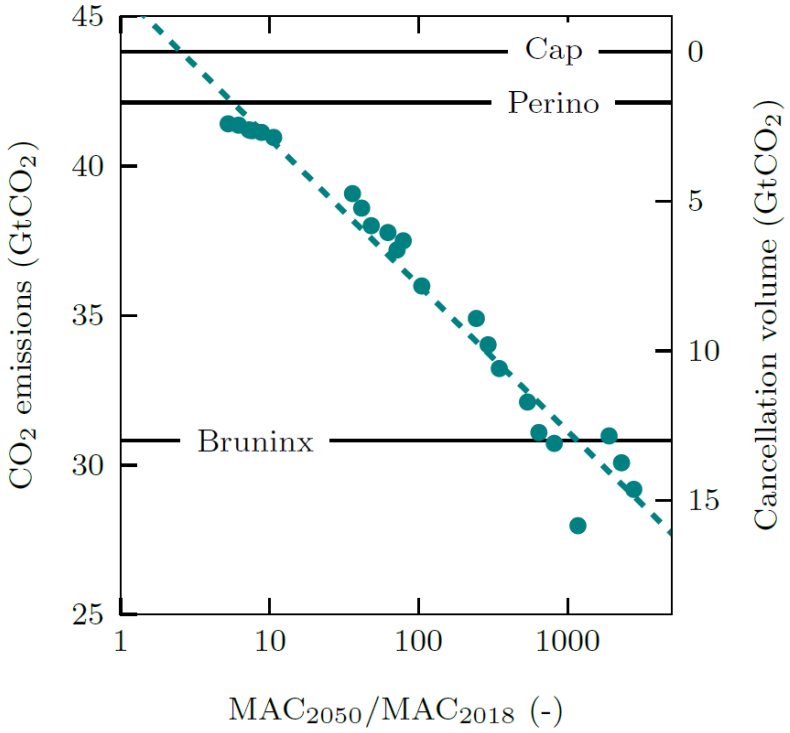


- Simulations based on different MACC $MAC = \beta_t \cdot (E_t - q_t)^\gamma$ with **assumed** curvatures γ & baseline emissions E_t, **calibrated** slope β_t to reproduce average emission allowance prices in 2018 (20.7 €/tCO_2) at historical emission levels

- Higher curvature, higher growth rates baseline emissions or slower decrease in slope: cost of meeting the future cap increases

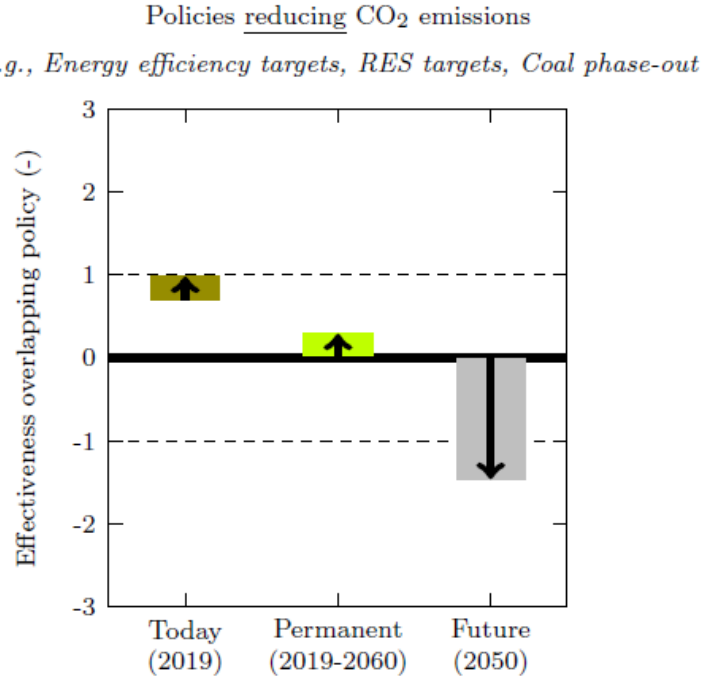
- **For every tenfold increase in ratio MAC, cumulative emissions drop by 4.9 $GtCO_2$ (>11% cumulative cap)**

K. Bruninx et al., 'The unintended consequences of the EU ETS cancellation policy', 2019 (WP).

5 The feedback effect & overlapping policies

- Pre-MSR: overlapping policies have no effect on cumulative emissions under EU ETS
- Post-MSR: overlapping policies affect current and future cost of meeting the cap, hence, may lead to counter-intuitive impact on cumulative emissions

- Simulation results based on policies targeting 1, 10 or 100 $MtCO_2$ today (2019), over the whole period (permanent) or far in the future (2050)
- Effectiveness equals 1 if policy results in intuitively expected result (e.g., policy aimed at reducing emissions by 1 $MtCO_2$ has effectiveness 1 if cumulative emissions drop by 1 $MtCO_2$)



See paper for effect of policies increasing emissions, increasing supply or decreasing supply

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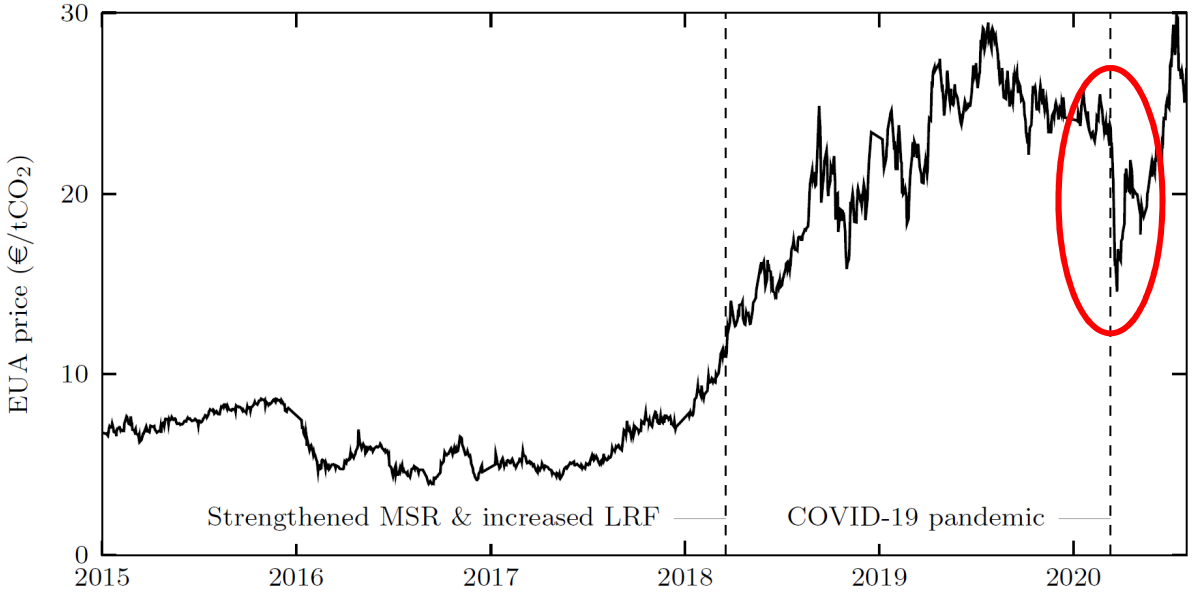
6 COVID-19 & EU ETS



- Is the price drop systemic or an overreaction of the market?
- How big is the impact of COVID-19 on emissions covered by EU ETS?
- Will the MSR remove the additional surplus of allowances?

K. Bruninx & M. Ovaere, 'Estimating the impact of COVID-19 on emissions and emission allowance prices under EU ETS', IAEE Energy Forum / Covid-19 Issue, 2020.

6 COVID-19 & EU ETS

- Similar methodology as for study on feedback effect and overlapping policies
- Abatement cost curves calibrated on 2019 emissions & average 2019 prices (24.7 €/tCO_2)

- Estimated impact on emissions: -38 MtCO_2 EU ETS emissions per month of lockdown

- Three shocks, initially -120 MtCO_2 (3 month lockdown) or -240 MtCO_2 (6 month lockdown)
  - V-shaped: back to normal as of 2021
  - U-shaped: linearly back to normal by 2025
  - Permanent: 25% of shock becomes permanent after 2020

- Set of simulations based on demand shock as such to study systemic effect on EUA prices
- Set of simulations with exogenous EUA price shock, triggered by temporary change in discount rates, to simulate panic selling

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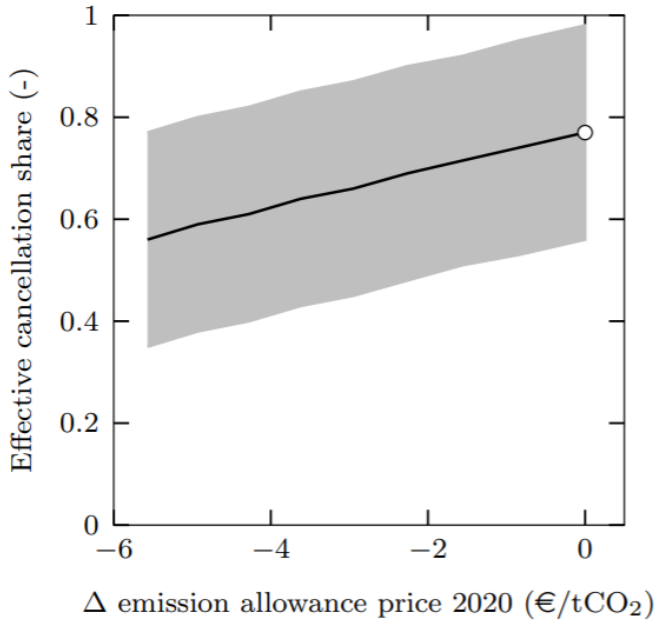

(a) V-shaped negative demand shock

See paper for effect of other shapes of the demand shock

- A negative demand shock by itself has a negligible effect on prices and emissions (high effectiveness, white marker).
- A negative demand shock in combination with a temporary change in discount rates ('future is less important', panic selling), we find the kind of price decreases observed in the market.
- When the prices decrease, abatement is less profitable, hence, part of emission shock is offset by reduced abatement, which, combined with the delay in the MSR's actions, translates into a lower effectiveness of the MSR's cancellation policy.

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7 Conclusions

- Introduction of MSR & LRF increase has significant impact on EUA prices and climate/energy policy:
  - 2018 jump in prices may be result of introduction MSR & increased LRF
  - Significant reduction in allowed cumulative emissions

- Some gaps in regulation (e.g., aviation), but more fundamental design flaws related to feedback effect & overlapping policies:
  - If it becomes more costly to meet the cap, we strengthen the cap;
  - National policies may (counterintuitively) affect cumulative emissions;
  - COVID-19 as a stresstest of the MSR reveals the wide range of possible outcomes & limited ability to cushion effect of price shocks on cumulative emissions.

- Revisions foreseen every 5 years, starting in 2021…

Thank you for your attention!
Questions?

References:

[1] K. Bruninx et al., ‘The Long-Term Impact of the Market Stability Reserve on the EU Emission Trading System,’ Energy Economics, Forthcoming, 2020.

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