MSR design parameters: Does a stable "surplus" make a stable market?

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Paris-Dauphine University - Climate Economics Chair

Expert Meeting on EU ETS Market Stability Reserve – EC, Bruxelles – June 25th, 2014

Our approach

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• "Surplus" is on the accounts of market participants (not only covered firms). It cannot be cancelled directly. It's not on the market.

• "Surplus" allowances (called banking in C&T economics) are either held by someone, or they are used to cover emissions. No other possibilities.

• The MSR will decrease auctioned amounts as long as market participants hold "surplus" allowances above a certain global threshold

→ The emission and price trajectories can (will) change in reaction to the presence of the MSR (the effect of MSR on "surplus" is indirect)
→ Importance of the relationship between market participants' anticipations and the functioning of the reserve
→ Use of the Zephyr model to help us understand:
- Simulation of extreme scenarios (see our CEC Policy Brief)
- Simulation of alternative designs (used in the "Charpin Report")

Zephyr: Extreme cases

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- The Zephyr model is an EU ETS supply-demand simulation model, allowing to test different configurations of anticipations (i.e. banking trajectories, i.e. intertemporal arbitrage)

- In our Policy Brief, two behavior in reaction to the MSR:
  - Participants want to keep their "surplus": then the reduction of supply in auctions creates an additional need for emission reductions
    Price: ↑ Emissions:↓ Surplus: ↔
  - Participants allow themselves to use "surplus" EUAs to cover more emissions: the reduction of supply in auctions is compensated by "unbanking" and rising emissions
    Price: ↔ Emissions: ↑ Surplus: ↓

→ Crucial role of participants' emission trajectories and banking behavior in determining the effect of the MSR
→ Dangerous effects when actors anticipations enter into contradiction with the predefined thresholds

Zephyr: Other scenarios

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• Scenarios for the Charpin Report (French government) ; interpretation here is our own

• Different designs, tested in a central anticipation scenario (intermediary between the two extremes = "surplus" needs of 1.1Gt)
  • MSR as proposed by the EC : 400-833 Mt, 12% of TNAC/100Mt
  • MSR A : 800-1,300 Mt, 33% of distance to threshold, symmetric
  • MSR B : 800-1,300 Mt linearly decreasing, 33% of distance to threshold…
  • MSR C : 800-1,300 Mt adapted if growth > or < to forecasts, 33%...
• All tested on 4 growth scenarios (1.6%, 3.2%, 0.8%, sequence of the 3)

→An error in assessing the thresholds levels and their relationship with anticipations risks to disturb the market
→Risks of instability are limited when the thresholds are set at the "right" level
→Is there a "right" surplus level? Should it be stable over time for the market to be stable?

The diverse nature of "surplus"

Emission reductions are the only source of "surplus":

- Linked to the carbon price: "My emission reduction costs are lower than the market price so I reduce my emissions to get a surplus"
- Not linked to the carbon price: policy interactions, economic conditions

Possible reasons for holding a "surplus" (i.e. banking):

- Passive banking: "I keep all my surplus allowances whatever the price"
- Liquidity : "I only keep what is needed to face short term uncertainties"
- Hedging: "I need allowances in the future so I buy them and keep them" or "I buy them on the futures market and manage my position", so someone should hold the physical counterpart in the meantime
- Speculation: "I think I can benefit from price movements by holding allowances or managing a position on the futures market"

→ MSR does not differentiate the sources of "surplus". How to define a desirable level of "surplus" in this context ?

→ Once chosen, why should this amount be stable over time ?

To stabilize, or not to stabilize

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• When electric utilities sell electricity on the futures market, they buy at the same time EUA futures to cover the emissions that will be induced when the electricity will eventually be generated

• If suddenly the expected carbon content of future electricity production rises (e.g. Fukushima and nuclear in Germany), then electric utilities need to account for more future emissions and buy more EUAs than initially accounted for

→ Hedging needs are not stable, they are accounting for changes in expectations (future carbon content of production, expected carbon price, policy interactions: IED, renewables…)
→ If the MSR reduces supply as hedging needs rise, or increases supply when hedging needs decrease, would the market be stabilized ?

Conclusions

• The choice of a surplus corridor is as discretionary as the choice of a price corridor

• Whatever the thresholds chosen, three sources of instability in the current proposal:

– No possibility to adapt the thresholds and formula as anticipations change

– Start in six years, two years delay, and first review by 2026

– More profoundly, TNAC does not seem to be a good indicator ("a stable surplus does not make a stable market")

• Flexibility of the supply is indeed necessary, but not to stabilize the surplus: to ensure the credibility of the reduction target over time

– Supply flexibility should control policy interactions, unexpected consequences from linking, other events **if judged necessary**

– Need for permanent & real time monitoring and evaluation

– Need for adaptability and speed of action

Thank you for your attention

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The Zephyr model

Zephyr is a simulation model of supply-demand equilibrium in the EU ETS from 2005 to 2030

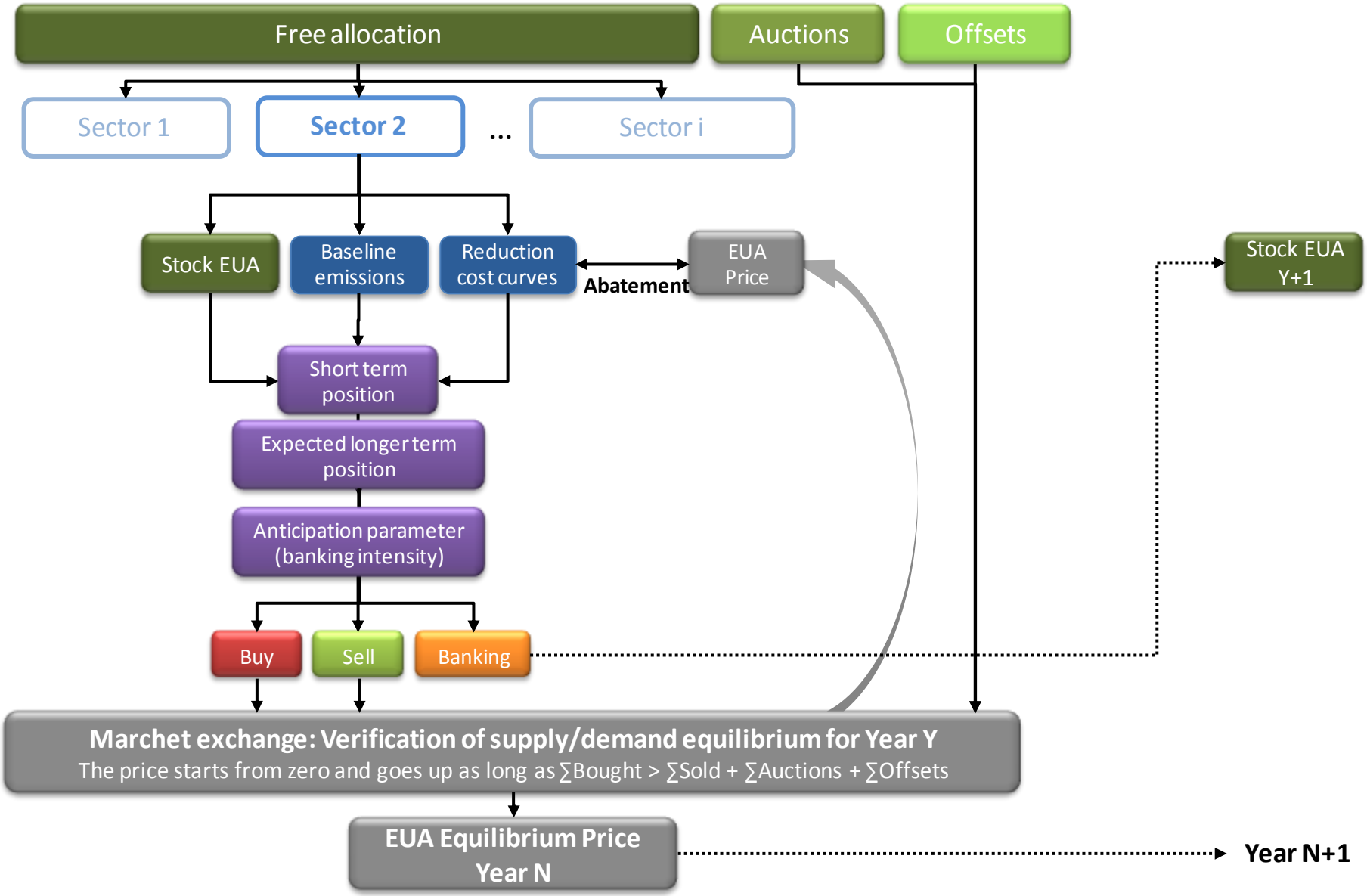
- Operators (sectors) are represented :
  - they have **baseline emissions**, driven by growth
  - they receive **free allocation**
  - they have marginal **abatement cost** curves

- Operator **reduce emissions** as long as their marginal abatement cost is below the market price
  - without anticipations, operators buy deficits and sell surpluses

- Operator anticipate the future and **can bank surplus** allowances
  - they look at how much EUAs they will need over a certain anticipation horizon
  - they can keep unused EUAs or buy EUAs to bank them for a later use
  - intensity of banking is exogenous, so that **different anticipation scenarios** can be simulated

- Each year the price starts at zero and rises until we reach a EUA **supply-demand equilibrium** on the market

The Zephyr model



Assumptions of our scenarios

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Allowance Cap
-21% in 2020 / 2005
-43% in 2030 / 2005 from 2021 on
Backloading on 2014-16 and 2019-22 (300, 350, 250 then 300, 200, 200, 200)

Growth/Baseline emissions
Ex post : Production index × emission elasticity to production (0.6)
Ex ante : GDP growth × emission elasticity to GDP (0.48)
GDP : 1.5%/yr until 2020, 1.6%/yr afterwards

Kyoto offsets
Ex post : observed use (1,060 Mt in Phase 2)
Ex ante : ~ potential use on 2013-2020 (600 Mt) ; 0 Mt after 2020

Other
No demand from the aviation sector

MACCs in Zephyr

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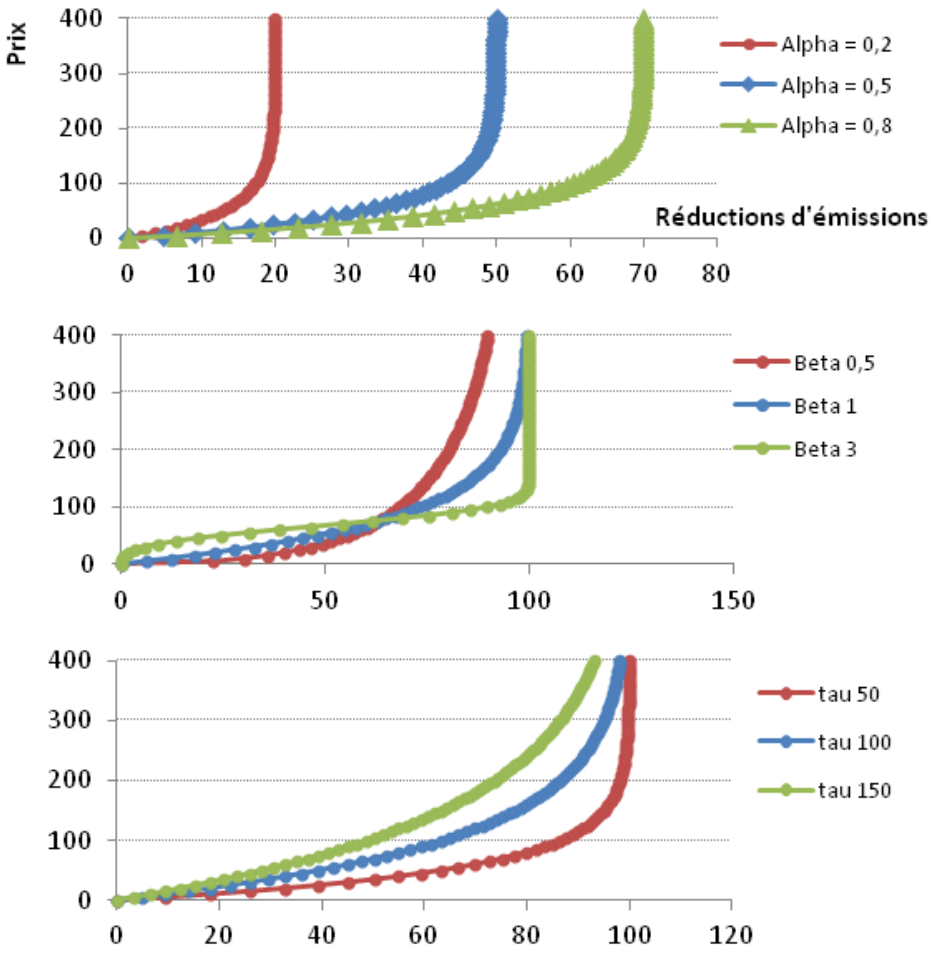
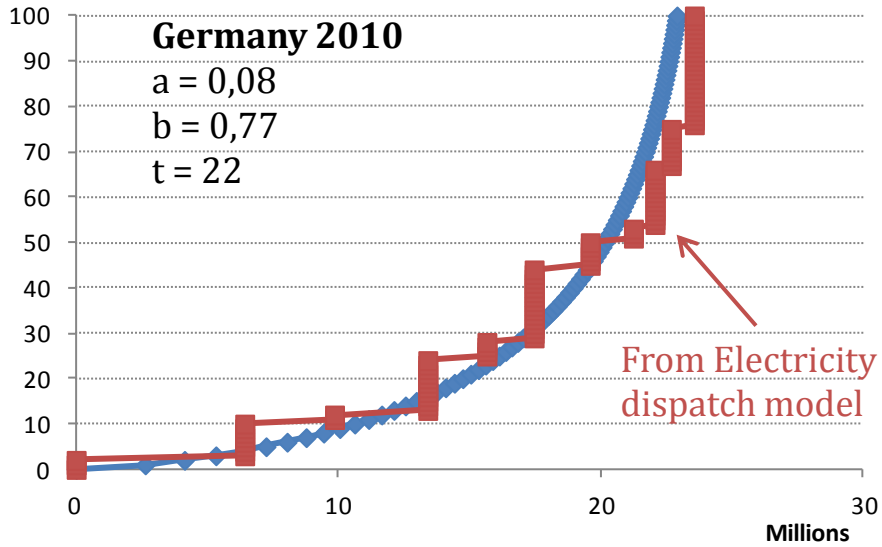
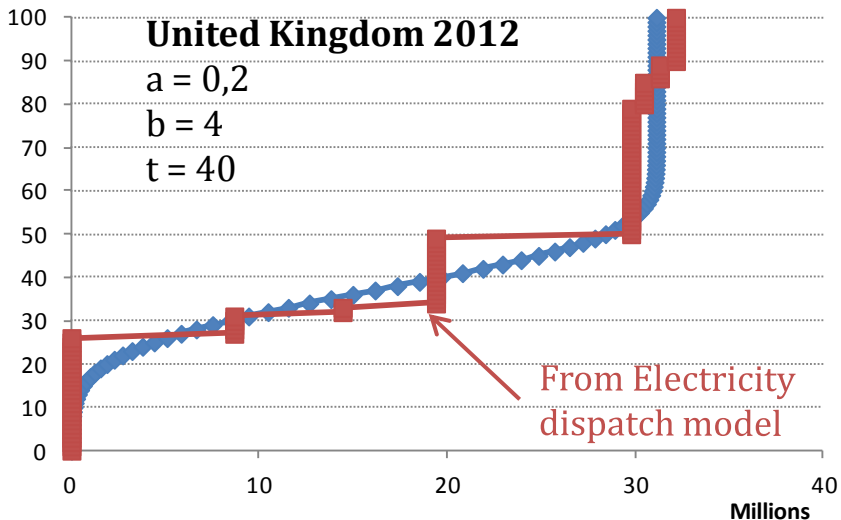
Principle

$$E_p = E_0\left(1 - \alpha\left(1 - e^{-\left(\frac{p}{\tau}\right)^{\beta}}\right)\right)$$



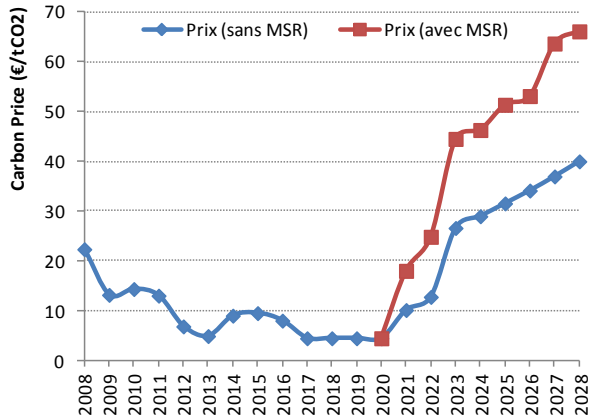
Examples

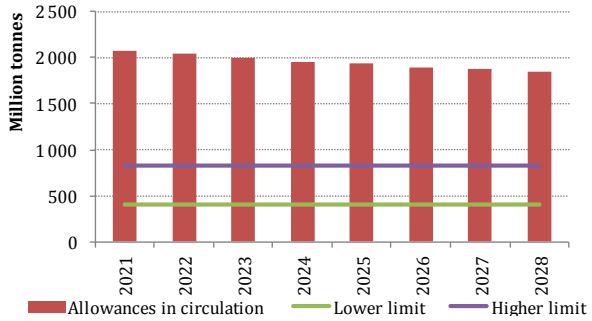


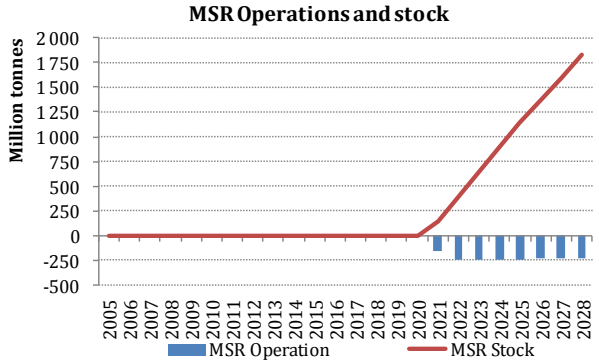


Policy Brief simulations

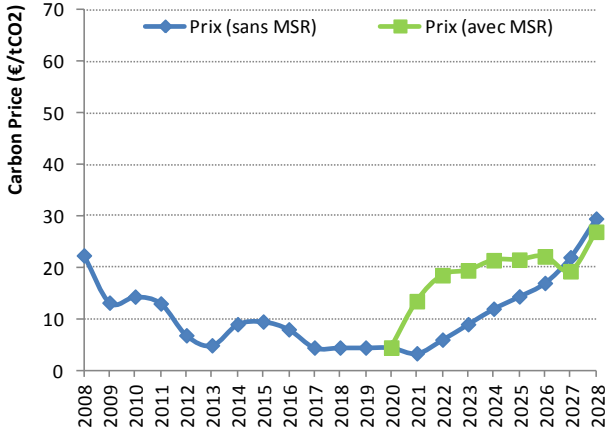
Red scenario

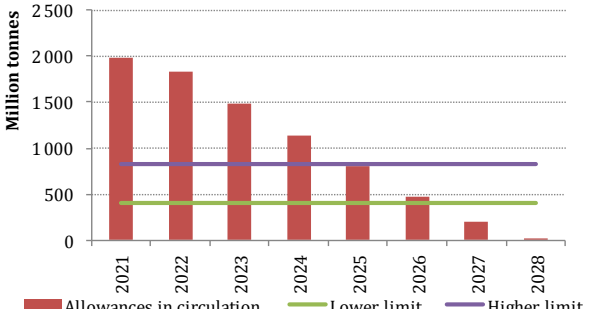


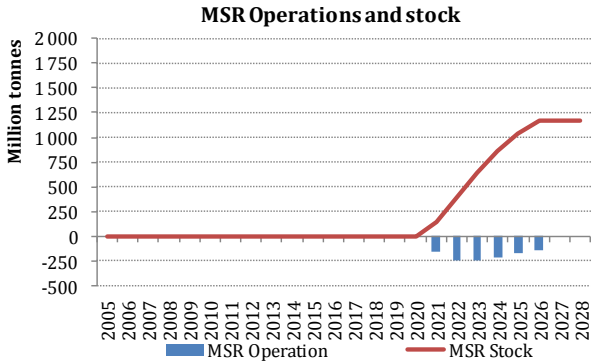




Green scenario







Banking scenarios in Zephyr

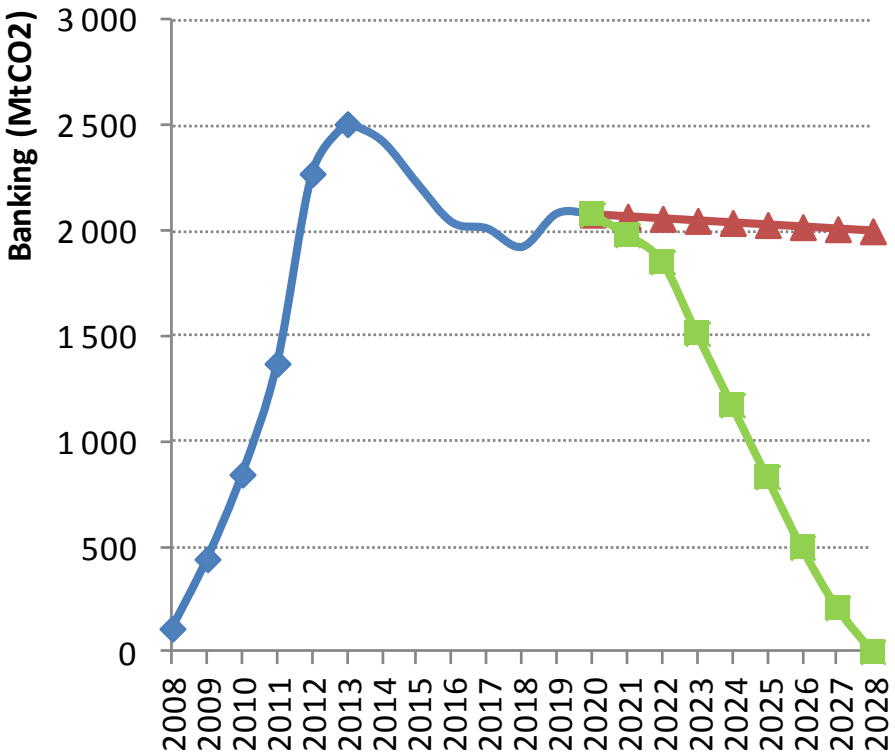
• **Up to 2020** : hypothesis of a small impact of backloading on the price, leading to a cumulated banking of 2,100 Mt in 2021

• **After 2020** :

- What will happen in reality will depend on actors' intertemporal choices; the model enables us to simulate two extreme situations

- **Red scenario** = actors hold on to their surplus, leading to more emission reduction now and banking of surplus allowances

- **Green scenario** = actors let go their surplus, leading to less emission reduction now and using more allowances to cover emissions



Charpin report: four scenarios

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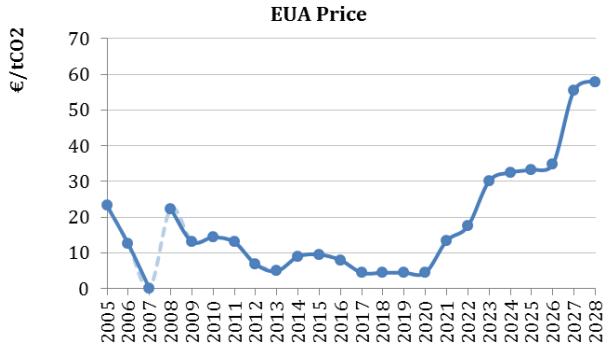
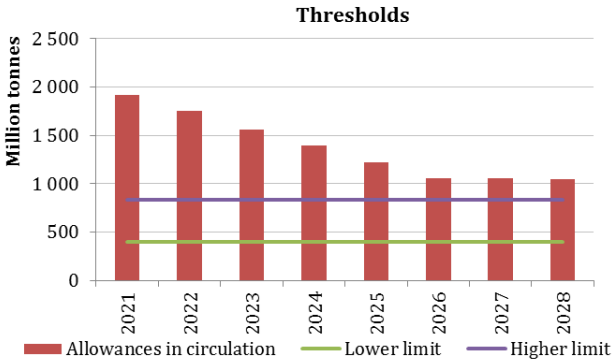
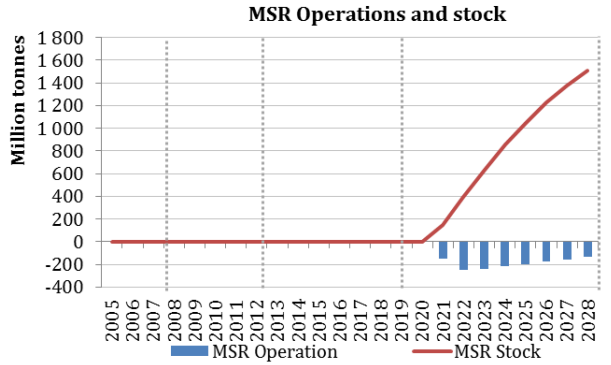
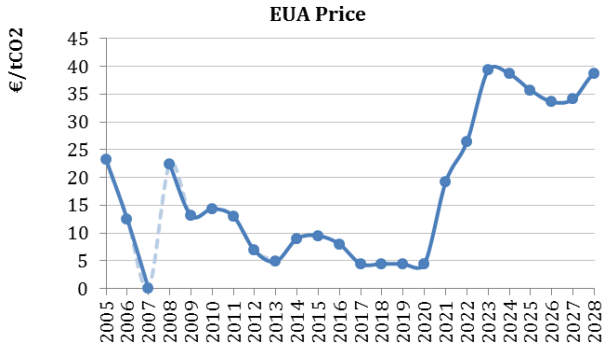
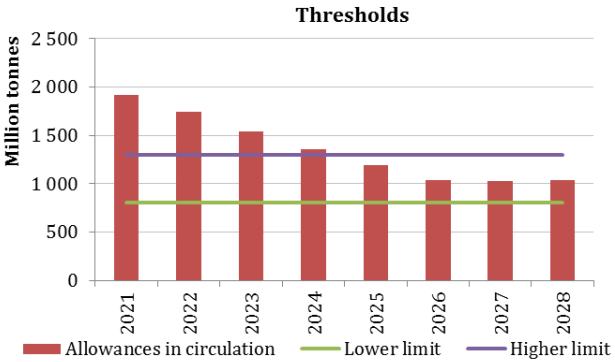


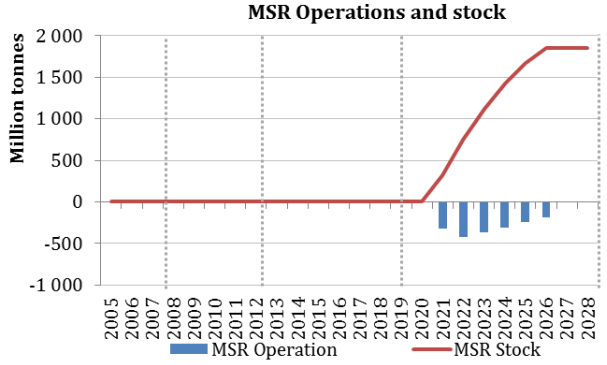




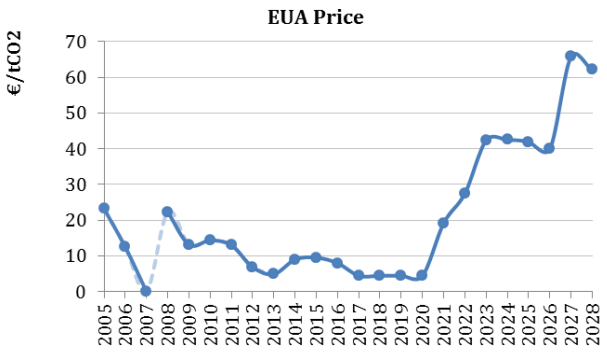
A and C

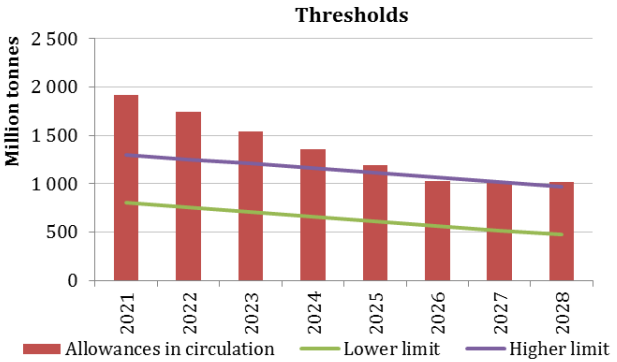


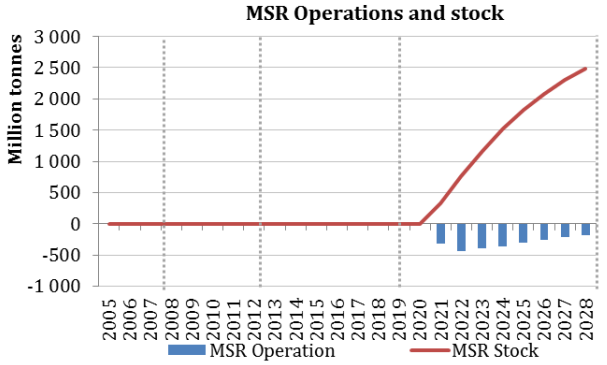




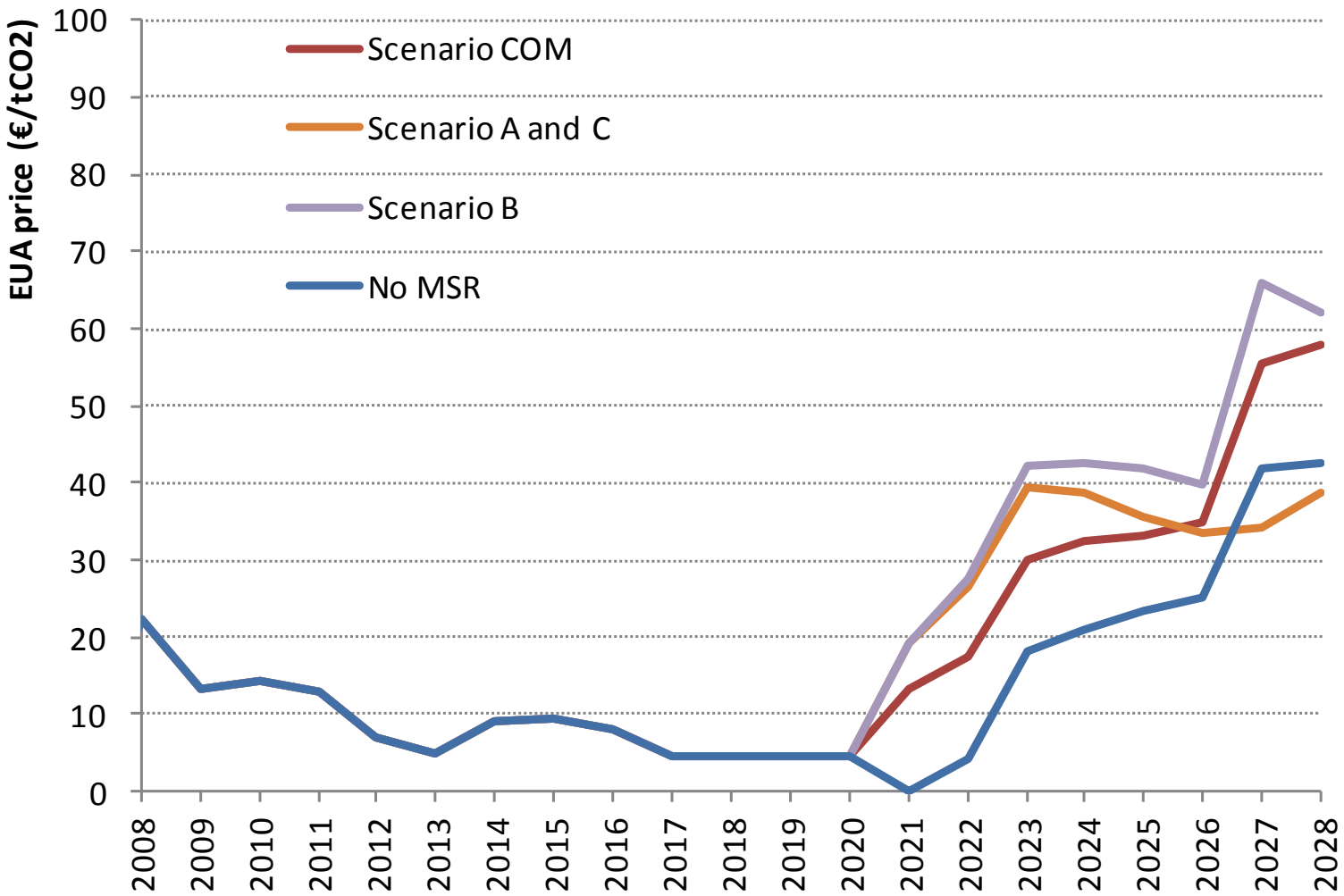
B



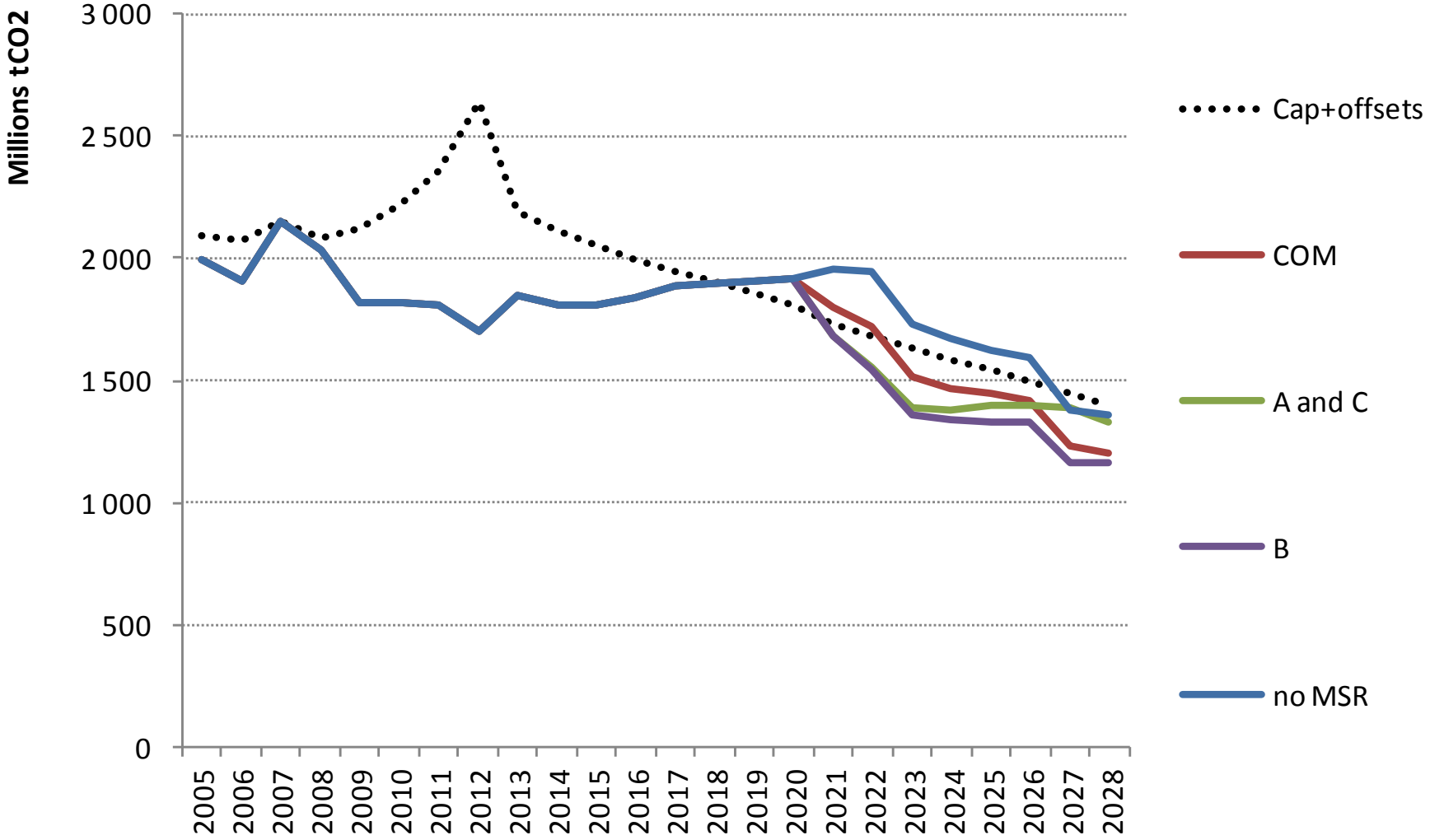




EUA price in four scenarios



Emissions in four scenarios



Sensivity to growth in four scenarios

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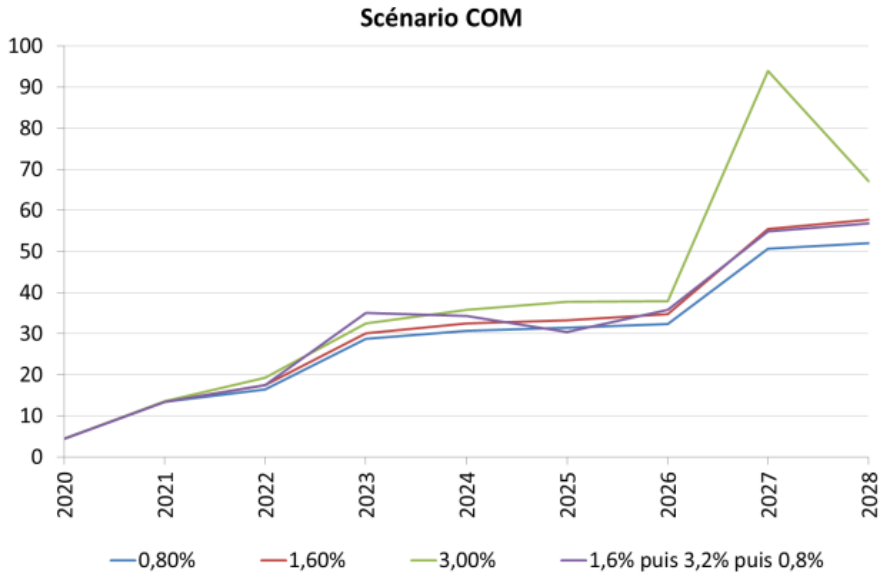

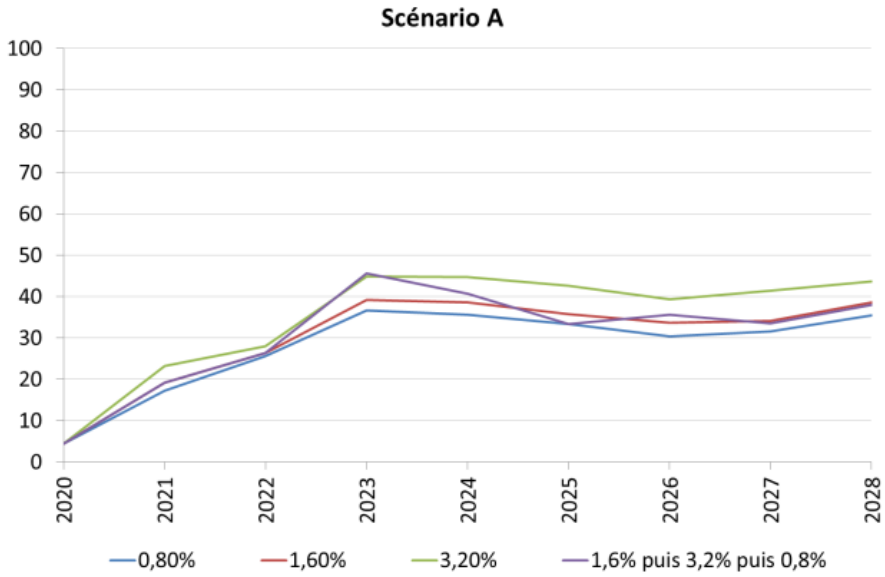

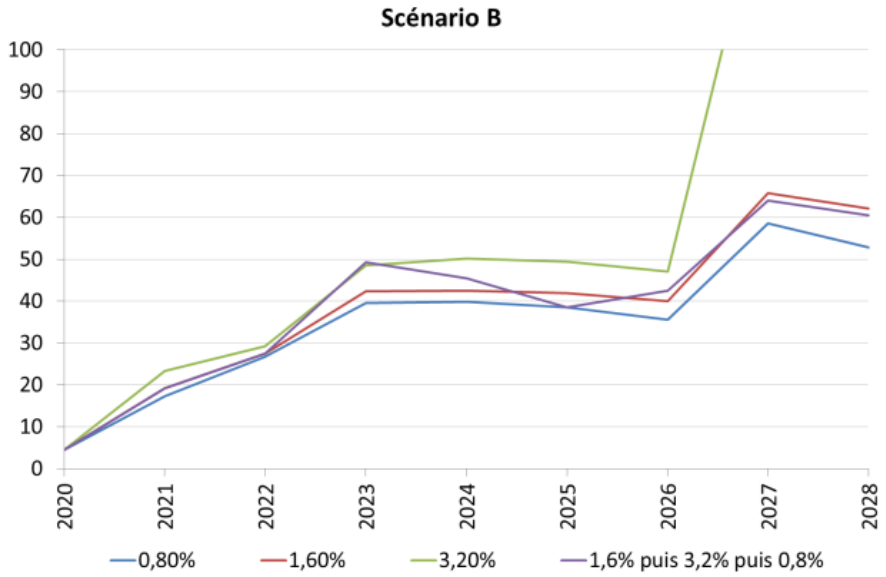

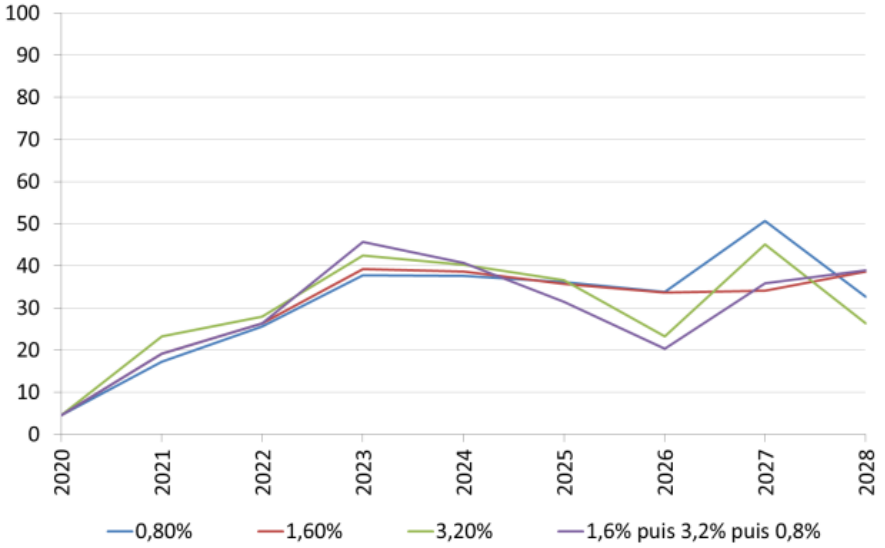

Related documents

- Answer from the CEC to EC public consultation on structural reform
http://ec.europa.eu/clima/consultations/0017/organisations/climate_chair_en.pdf

- EU ETS reform in the Climate-Energy Package 2030: First lessons from the ZEPHYR model, Raphael Trotignon, Frédéric Gonand and Christian de Perthuis, Climate Economics Chair Policy Brief n°2014-01, January 2014
http://www.chaireeconomieduclimat.org/wp-content/uploads/2014/03/14-03-07-Policy-Brief-2014-01-EN-v2.pdf

- De Perthuis, C. and Trotignon, R. (2014), CO_2 markets governance: lessons from the EU ETS, Energy Policy, Special Issue on Emission trading in Asia
http://www.sciencedirect.com/science/article/pii/S0301421514003322

- « In Search of the Carbon Price. The European CO_2 Emission Trading Scheme: From ex ante and ex post analysis to the projection in 2020 », PhD Thesis of Raphael Trotignon, Paris-Dauphine University, October 2012
http://www.chaireeconomieduclimat.org/?page_id=3554&lang=en

- « Climate Policy Foundations: Science and Economics with Lessons from Monetary Regulation », by William C. Whitesell, Cambridge University Press, 2011
http://www.cambridge.org/us/academic/subjects/economics/natural-resource-and-environmental-economics/climate-policy-foundations-science-and-economics-lessons-monetary-regulation?format=HB