



POTSDAM INSTITUTE FOR
CLIMATE IMPACT RESEARCH

Fit for climate neutrality? The EU carbon market in 2030 and beyond

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joint work and thinking with: C. Guenther, S. Osorio, J. Sitarz, R. Pietzcker, S. Quemin,
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Abstract

The EU ETS is currently reformed to make it fit for 55 by 2030, with the cap designated to go down to zero by around 2040. It is thus widely believed that the next decade will mark the “ETS endgame”: when supply approaches zero, the market will undergo fundamental changes, or cease to function at all. In this talk, I will address the question which endgame challenges may come up for the ETS with the reformed design. In the first part, I conduct a ceteris paribus analysis based on the numerical ETS model LIMES-EU to characterize the state of the market in the next decade. In the second part, I present a framework to structure the analysis, including the consideration of new developments to go beyond ceteris paribus. The vast range of developments suggests that the ETS may as well not be in an endgame, implying that ambiguity about the long-term nature of the market further exacerbates long term price uncertainty. This puts into doubt that the ETS is fit for climate neutrality, and raises the question how governance and stability mechanism must be adjusted to account for it.

Background and main research question

- EU ETS currently to be reformed to make it “fit for the 55%” emission reduction target by 2030
 - Main changes relate to **tighter cap**:
 - Increase of linear reduction factor (LRF) from 2.2% to 4.2%
 - Prolonged higher intake rate (24%) for Market Stability Reserve (MSR)
 - Reform implies that **cap will be zero ~2040** => ETS “endgame” in the next decade, may overlap with current **investment horizons**
- **Will the ETS still work (as usual, at all) when cap approaches zero?**

Literature on “future” of ETS

- **Forward looking research** (theoretical analysis, numerical modelling) can be grouped into **two categories**:
- **Ceteris paribus** analysis of **market**, e.g. extrapolation of current adjusted design:
 - Energy mix and carbon prices, e.g. Pietzcker et al. (2021)
 - MSR, e.g. Perino et al. (2022), Osorio et al. (2021)
- Analysis of **specific policy aspects**:
 - CDR, Franks et al. (2022), Kalkuhl et a. (in prep.)
 - Behavior of non-compliance traders, e.g. Quemin & Pahle (2022)
 - Linking & international, e.g. Verde & Borghesi (2022), Doda et al. (2019)
- Very little research specifically on **“endgame”**:
 - carbon removal reserve to manage prices (Rickels et al. 2022)
 - vanishing cost heterogeneity (Newell & Stavins 2003)
 - increasing price corners (Goodkind & Coggins 2015)

Methods

- Part I: **Ceteris paribus analysis** using the LIMES-EU model
- Part II: **Qualitative exploration** (*thinking through*) of factors that may determine the “endgame”, and if it exists at all

LIMES-EU in a nutshell

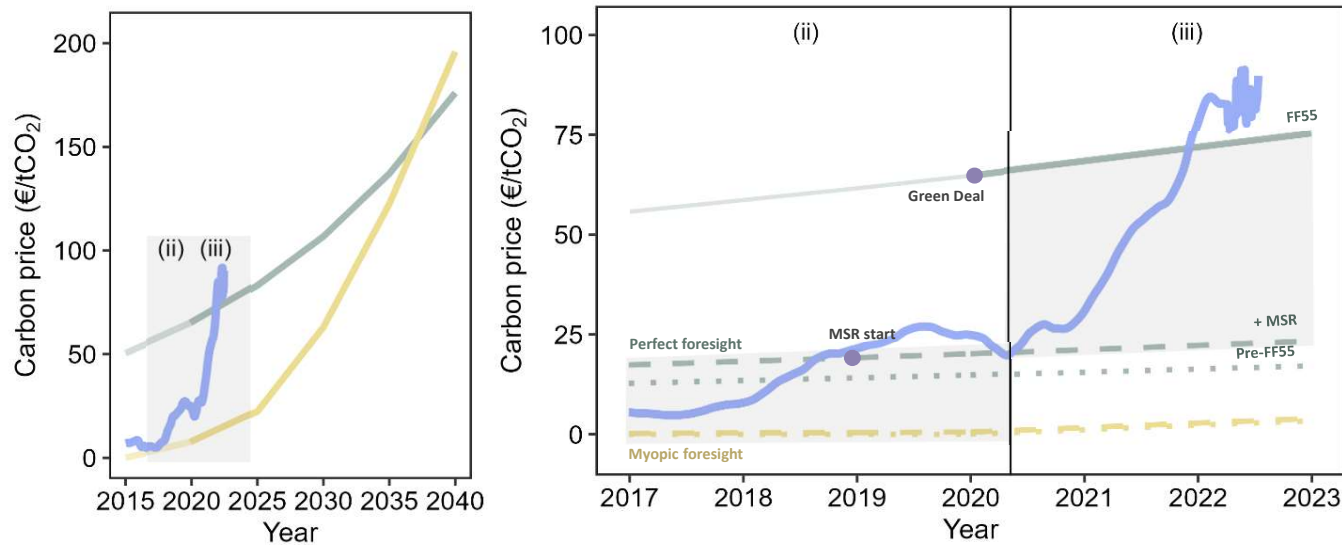
- Linear optimization model
- Temporal resolution:
 - From 2010 to 2070 in 5-year steps
 - 6-10 representative days per year
 - 8 time slices per day
 - Perfect foresight
- Geographical scope: Europe (29 model regions)
 - EU (w/o MT and CY) + CH + NO + aggregated Balkan
- 33 generation and storage technologies
- EU ETS energy-intensive industry: MACC
- Policy focus: EU ETS and MSR



PART I: CETERIS PARIBUS ANALYSIS



Is a perfect foresight model actually suited?



Modelled foresight

- Perfect foresight
- Myopic foresight

Modelled targets

- Fit for 55
- - Pre-Fit for 55, with MSR
- ... Pre-Fit for 55, no MSR

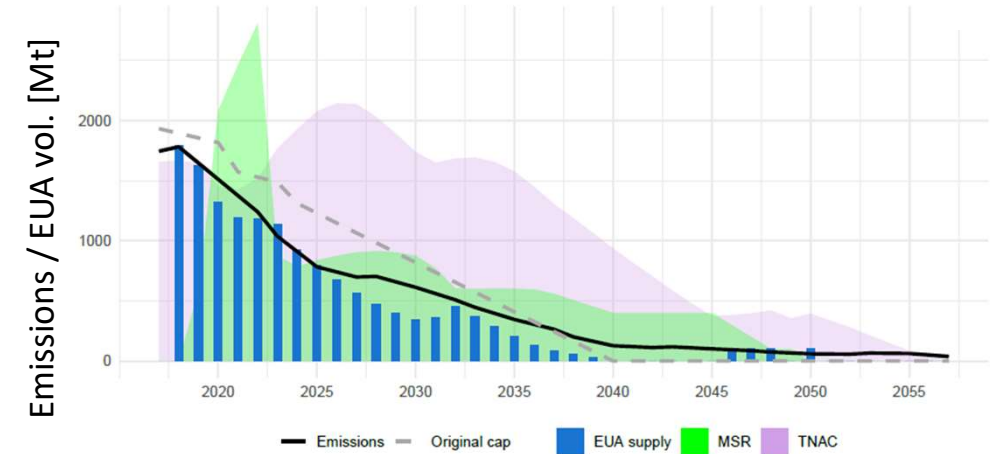
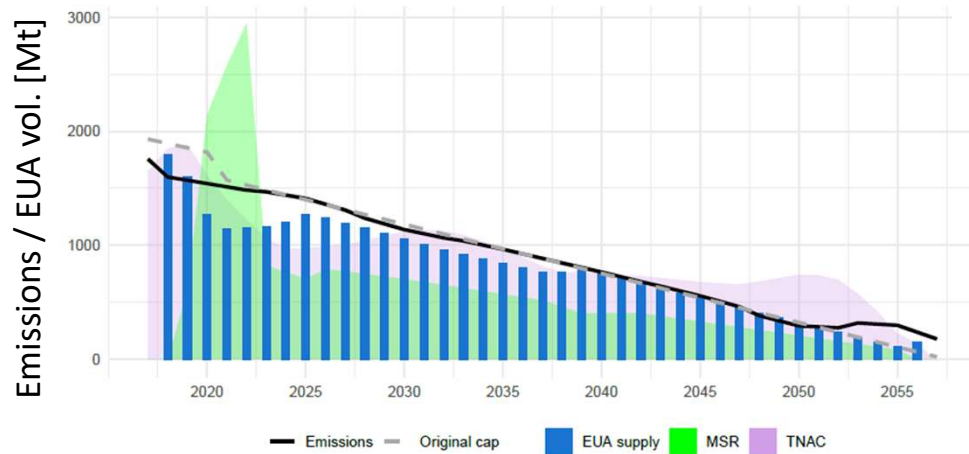
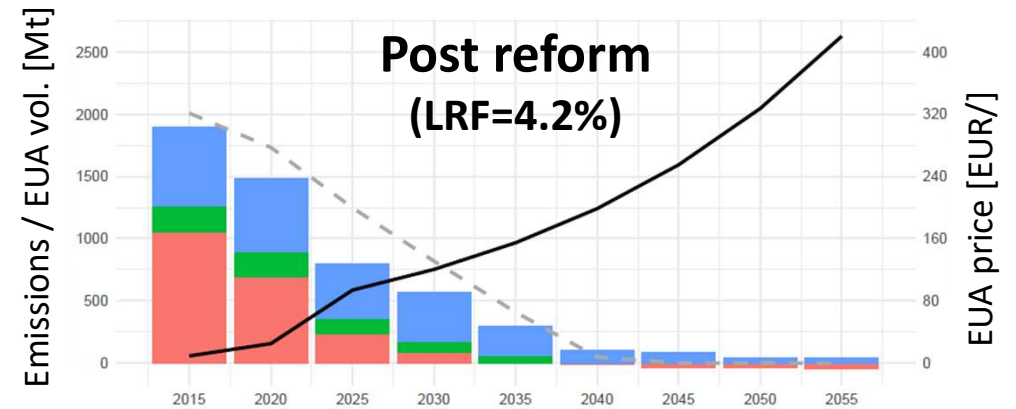
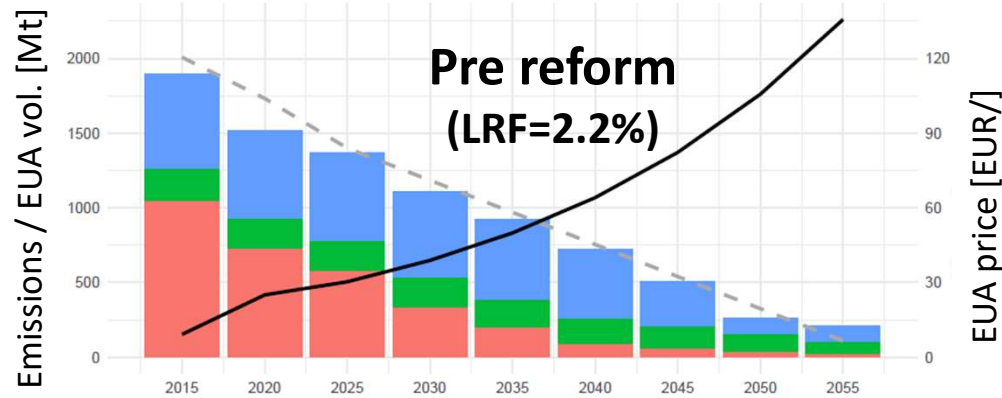
Real developments

- Actual EU ETS prices
- Important policies

- Myopic version of LIMES (10y horizon) captures actual prices before 2018 quite well
 - Perfect foresight version performs better from 2022 onwards
- Market (much?) more forward looking

Source: Sitarz et al. (in preparation)

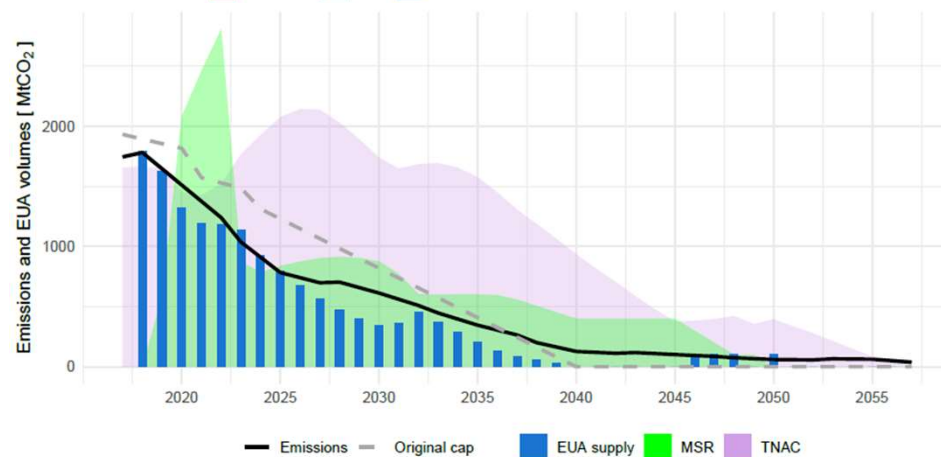
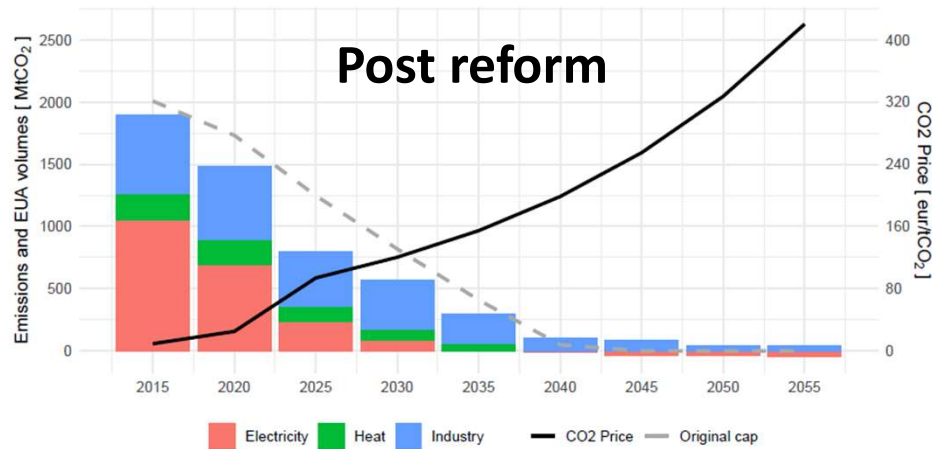
Market dynamics pre/post Fit-for-55 reform



— Emissions — Original cap ■ EUA supply ■ MSR ■ TNAC

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Endgame may start around 2030 already...



- ETS increasingly price set by residual emissions: **industry MAC** and **electricity CCS**
- **TNAC (bank) to rise again, peaking ~2025**
 - Anticipation of much costlier abatement in later decades
 - Highly dependent on discount rate
- High MSR intake, supply as small as **500 Mt by 2030** already

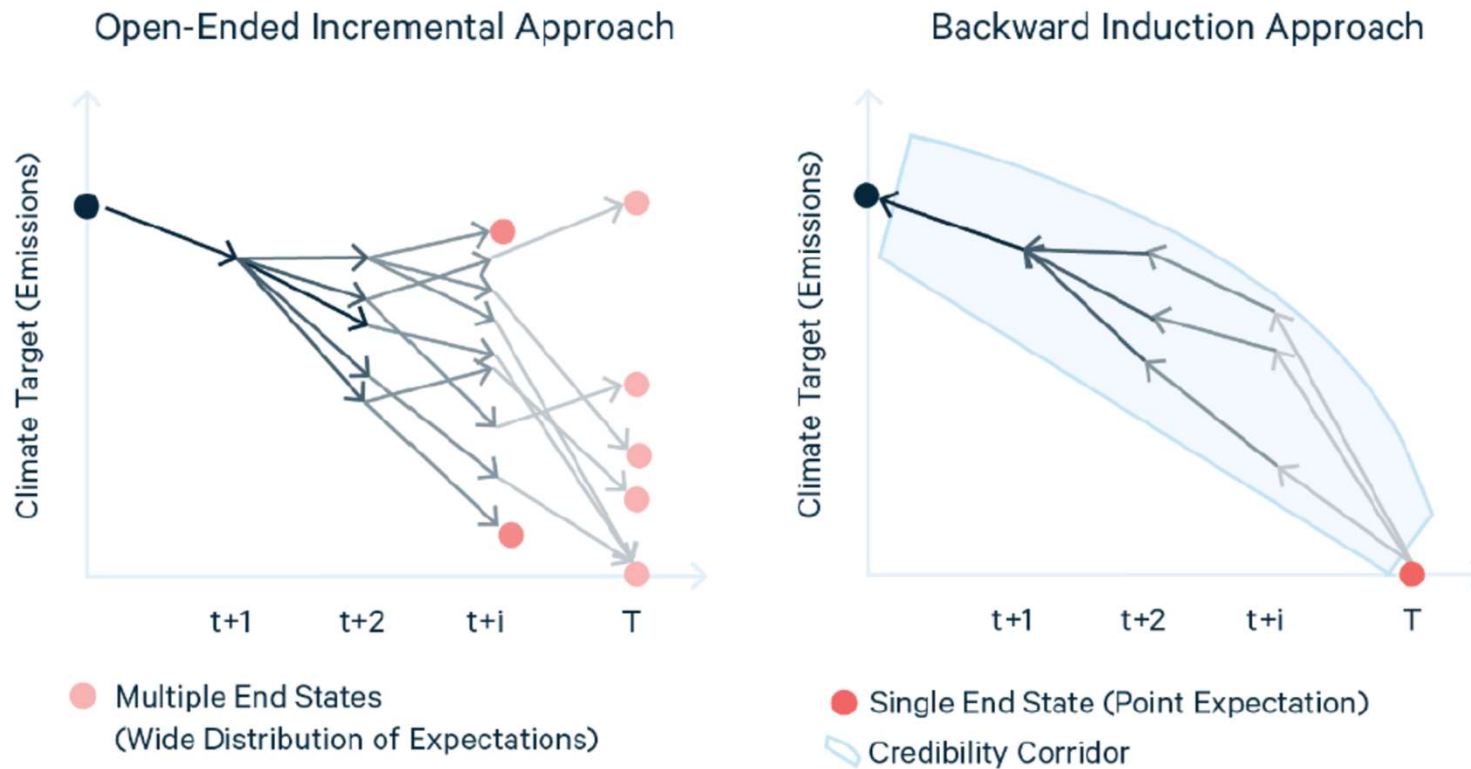
Slide 9

MP2

How much CCS in later decades?

Michael Pahle, 29/11/2022

...and credibility compels to care about it now



Source: Dolphin et al. (under review)

Some progress already on CR certification



European Commission - Press release



European Green Deal: Commission proposes certification of carbon removals to help reach net zero emissions

Brussels, 30 November 2022

Today the European Commission adopted a proposal for a **first EU-wide voluntary framework to reliably certify high-quality carbon removals**. The proposal will boost innovative carbon removal technologies and sustainable carbon farming solutions, and contribute to the EU's climate, environmental and zero-pollution goals. The proposed regulation will significantly improve the EU's capacity to quantify, monitor and verify carbon removals. Higher transparency will ensure trust from stakeholders and industry, and prevent greenwashing. Carbon removals can and must bring clear benefits for the climate, and the Commission will prioritise those carbon removal activities which will provide significant benefits for biodiversity. Moving forward, the Commission, supported by experts, will develop tailored certification methods for carbon removal activities delivering on climate and other environmental objectives.

PART II: EXPLORATION BEYOND CETERIS PARIBUS*

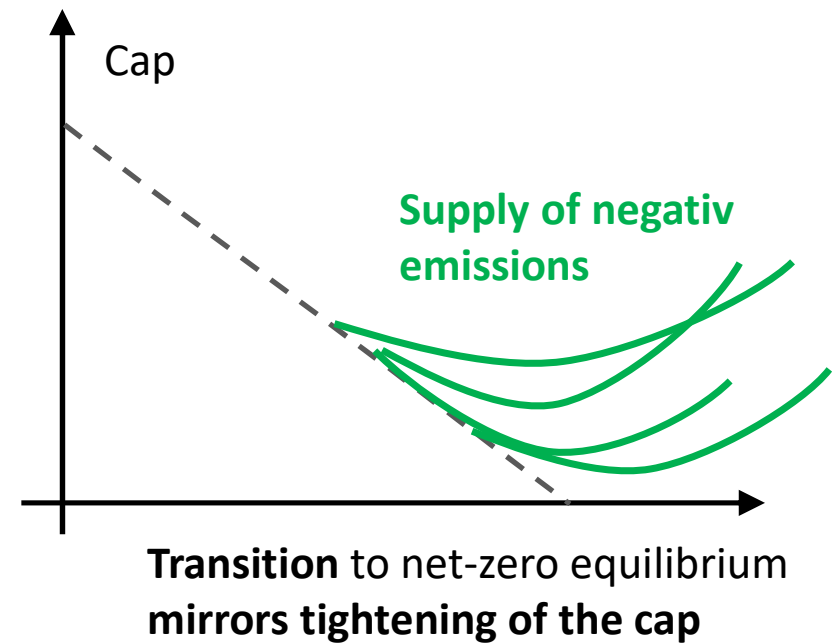
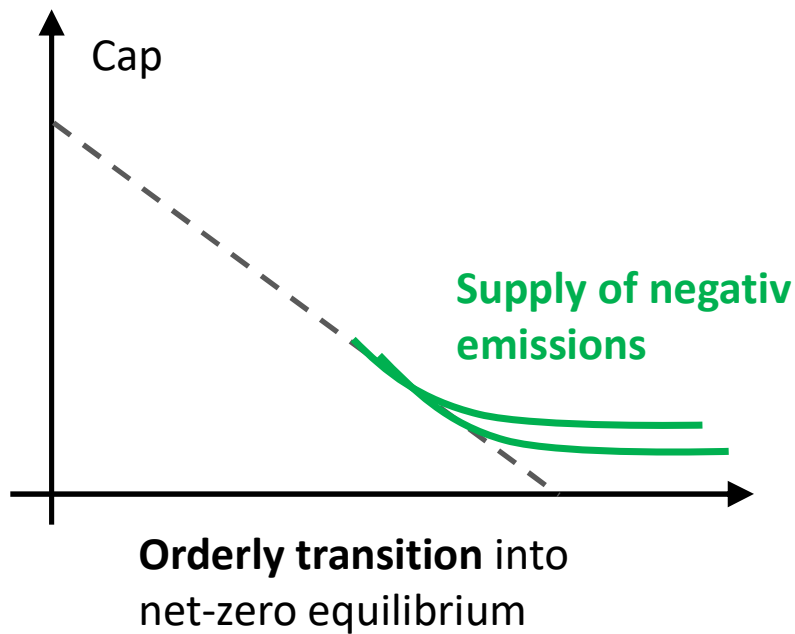
*VERY EARLY STAGE!!!



Will the market function?

- Elicitation of colleagues' views:
 - Agreement: Major change is from (single) public to (multiple) private sellers
 - Disagreement: ETS suitable mainly for **transition towards** net zero vs. also suitable **for net-zero management**
- Management → **stable equilibrium & non idiosyncratic market?**
 - Volume:
 - How large will be the demand for/supply of negative emissions, or offsets?
 - How permanent will CDR be? Will there be multiple products?
 - Scope: Will the market grow through physical or financial linking?
 - Failures: Will there be market power and/or low liquidity issues?

Two hypotheses about transition of supply from positive to negative: asymptotic vs. contract-and-expand



- **Actual “endgame” challenge ambiguity** about transition to net zero?
- ETS fitness for climate neutrality will hinge on it

Conclusions

- Pending ETS reform will substantially tighten supply by around 2030 already → ETS approaching “**endgame**”?
- “Endgame” characterized by **transition from positive to negative supply equilibrium**, could take substantially different forms
- **Ambiguity about transition** likely a major factor to determine ETS function in the **post-2030 period**
- Very little research yet, high time to **address this question** → this (collection of) work about **which specific questions to ask**