DESIGNING A CARBON PRICING FOR THE ENERGY COMMUNITY

By Professor Pantelis Capros, E3Modelling – E3MLab

Project : Energy Community Study on Carbon Pricing

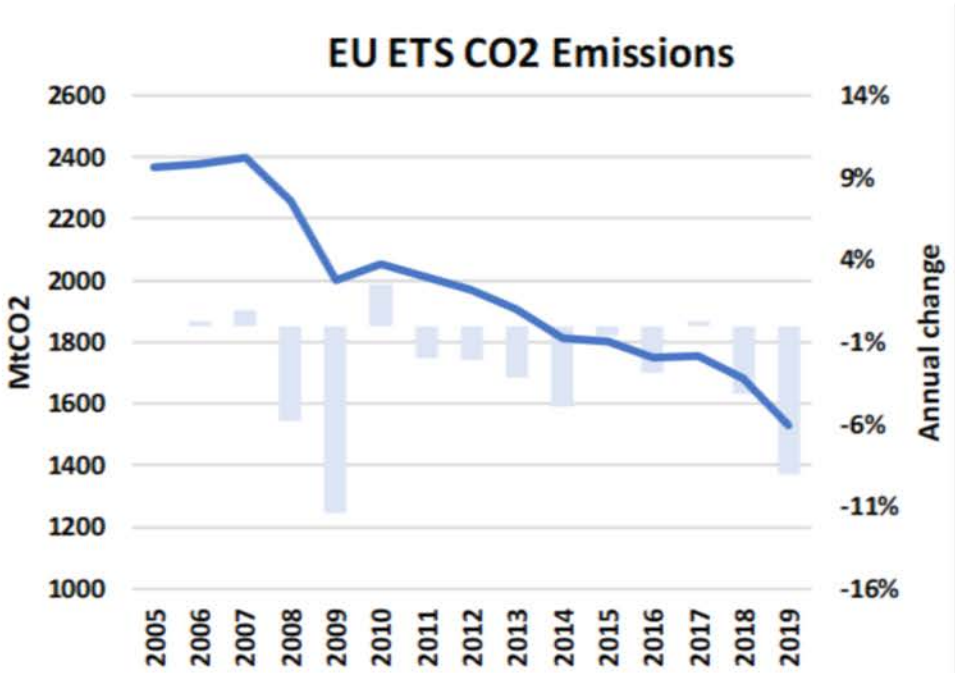
Athens Forum, June 16-17, 2020

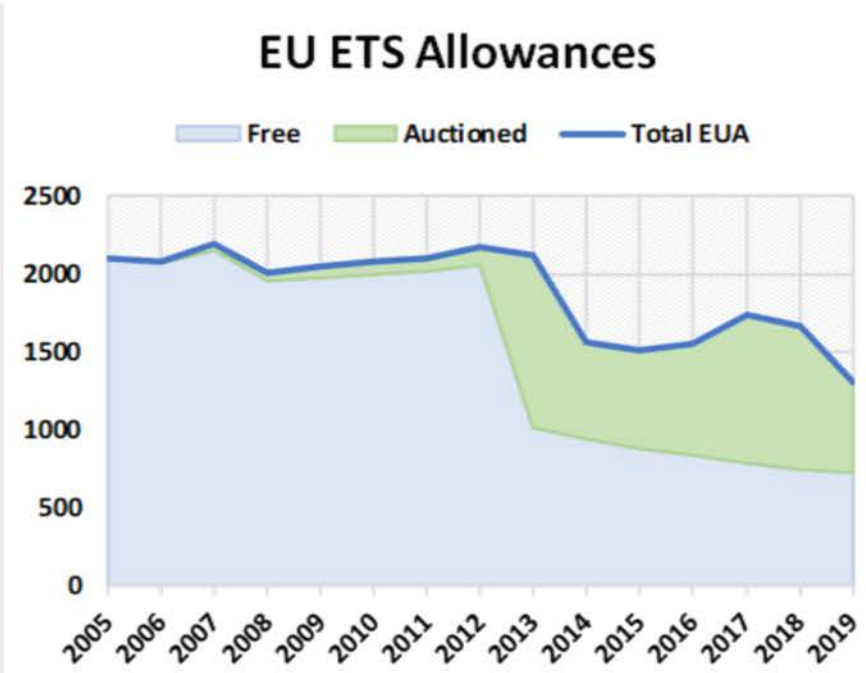
- Carbon pricing is an instrument that captures the external costs of greenhouse gas (GHG) emissions
- It puts an explicit price on GHG emissions, i.e. a price expressed as money per ton of carbon dioxide equivalent (€/tCO2).
- Emitters restructure operation and investment as a response to the price signal
- The economic impacts depend on marginal abatement costs – i.e. the price-elasticity of the emitter – *consumers are better-off when abatement is low-cost*
- *Short-term responsiveness is generally lower than long-term, as investment takes time to implement*

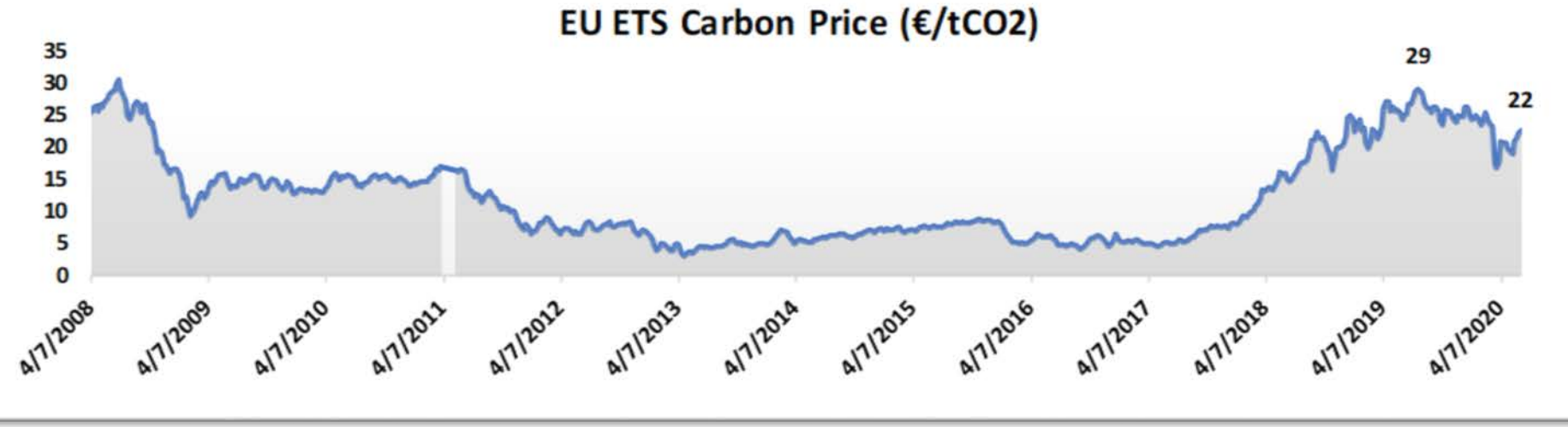
Carbon pricing schemes can be	Explicit (carbon tax) – interference with excise taxes	
	Implicit (price of tradable allowances)	
Carbon pricing may imply	Transfer payments to the state	**Tax** **Auctions**
	No transfer payments	**Internal carbon pricing** **Free allowances** **Emission standards**
Emission reduction implies additional costs, at least in the short-term	Due to the fuel mix	
	Due to investment choices	
	Stranded assets	
Impacts on economics of consumers depend on price effects and on accompanying measures	Consumer price impacts – average cost or marginal cost pricing?	
	Recycling of state revenues	

EU ETS as a powerful enabler

- 2013 Milestone: abolishing free allowances in the power sector
- 2018 Milestone: Market Stability Reserve reduces expected surplus of allowances
- Auctioning has established carbon pricing in internal accounting and costing of heavy emitters
- The reduction of allowances surplus accelerated coal phase-out in all countries







Stages of transition towards ETS

Stage 1: Internal carbon pricing – certificates

- Internal carbon pricing
- Allocation of allowances/administrated price
- No trade of allowances

Stage 2: Internal carbon pricing – traded nationally

- Bilateral transactions & allowances market
- Market-based carbon prices/price floor
- Trade of allowances

Stage 3: Cross-border trade among CPs and EU-MS

- Basic pre-conditions
- Free allowances
- Cross-border trade of allowances - bilateral

Stage 4: Adherence to EU-ETS under a transitional regime

- Full trade with EU ETS
- Free allowances allocated – accompanying measures

Stage 5: Full integration in the EU-ETS

- No free allowances – recycling of state revenues
- Ready for full integration into EU ETS

National and then regional approach: policy options as stages

- The duration of the stages may vary per country depending on:
  - the degree of responsiveness to carbon pricing,
  - the threat of social and industrial adverse effects,
  - the potential of attracting decarbonizing investment, and
  - the expected positive externalities (new industrial growth)
- Whether or not to follow all stages may also vary by CP
- The details, e.g. level of carbon price or degree of ambition of allowances cap to be defined by country
- Stage 1 requires a system monitoring and verification and a certain degree of harmonization across the CPs
- Stage 3 is a milestone requiring completion of harmonization of designs and institutional arrangements
- Stage 4 requires all pre-conditions to be fully met:
  - Market liquidity and financial regulation
  - Level-playing field in the energy sector (e.g. abolishment of direct and indirect subsidies, state-aid rules, free trade, etc.)
  - Revenue recycling rules

E3Modelling Energy Economy Environment

The main scenario options for the CPs

Baseline – Asymmetric development among CPs and EU-MS

Power and gas market coupling and integration

Without market coupling and integration

Regional Trajectory to the EU ETS

National Trajectories to the EU ETS

Energy Market Integration as a facilitation condition

- Baseline: Asymmetric carbon pricing in the power sector among the CPs and the EU-MS
  - Poor resilience versus protection of national interest
  - Trade barriers to emerge as a response of asymmetric practices
- Facilitation: Energy Market Coupling and Integration among the CPs and EU-MS
  - Sharing of low-cost and low-carbon resources
  - High resilience – flexibility thus avoidance of adverse effects on electricity prices and affordability
  - Sharing of balancing and reserve resources, as a condition for development of renewables
  - Gas market integration as a condition for gas power plant investment
  - Anticipation of enlarged market helps investment in RES, grids and storage

Degree of Resilience and Preparedness

	Flexibility	Decarb. Investment	Threats	Potential for Market Integration
ALBANIA	High	High	Few	High
NORTH MACEDONIA	Relatively High	Relatively High	Moderate	High
KOSOVO*	Poor	Poor	Significant	Poor
MONTENEGRO	High	High	Moderate	High
BOSNIA-HERZEGOVINA	Moderate	Moderate	Significant	Moderate
SERBIA	Moderate	Moderate	Significant	Moderate
UKRAINE	High	High	Moderate	Several conditions
MOLDOVA	High	Moderate	Few	Poor
GEORGIA	Moderate	Moderate	Few	No

Using the model PRIMES-IEM to quantify the scenarios

- Assumption of carbon pricing stages towards ETS – scenarios
- Assumptions about the energy market context and integration
- Run the model for each scenario, calculate restructuring of power and heat sectors, including investment, trade, costs and consumer prices

Economic and social impact assessment

- Assess the impacts of prices on
  - Private consumers – family budgets, affordability, poverty
  - Industry – competitiveness, indirect impacts on prices of industrial outputs and propagation into the economy
- Indirect effects on activity and employment due to lost domestic fuel production (e.g. lignite) and new investment (e.g. RES)
  - Recycling of state revenues from carbon pricing
  - Assessment of few revenue recycling options

Policy indicators and qualitative assessment

- Indicators based on model results as a roadmap
- Policy implementation stages – pre-conditions
- Threats and opportunities – social and economic

The PRIMES-IEM model

Fully-fledged dynamic simulation and optimization of the electricity system and markets	Optimal capacity expansion
	Individual power plant economics and technical constraints
	Unit commitment – co-optimizing demand, plant operation, ancillary services and cross-border flows
	Simulation of bidding behaviors in wholesale markets
	Determination of wholesale market prices
	Flow-based allocation of interconnectors, DC-linear power-flow, NTC constraints
	Determination of retail prices of electricity by stylized consumption sectors
Outputs	Investment in new power plants, RES and storage
	Dispatching in power generation – hourly
	Cross-border flows
	Bidding behaviors
	Wholesale market prices
	Losses and profit by power plant
	Retail prices (options on passing through carbon costs to consumer prices)

E3Modelling Energy Economy Environment