

## Technology note

### The European Emissions Trading System (EU ETS)

Authors: Sylvain Cail, Mélodie Mistré (Enerdata)



#### What is it?

The European Emissions Trading System (EU ETS), in place since 2005, represents one of the main instruments of the European Union policies' mix to reduce its GHG emissions; it has been revised and extended in Directive 2009/29/EC.

The EU ETS is a market-based instrument which sets a binding limit to the emissions of greenhouse gases (GHG) in countries of the European Economic Area (EEA): the EU-28 Member States as well as Iceland, Liechtenstein and Norway. The objective of the EU ETS, combined with other measures or policies (e.g. taxes, efficiency standards, regulations), is to support the European Union in reaching its GHG reduction commitments in a cost-effective manner: a 20% reduction by 2020, in line with its Kyoto commitments, a 40% reduction by 2030, and a 80% to 95% emissions' reduction by 2050. By involving large GHG emitters in the mitigation of their GHG emissions, the EU ETS is designed to provide an incentive to invest in low carbon technologies, hence playing a key role in promoting decarbonisation in the different economic sectors considered.

#### How does it work?

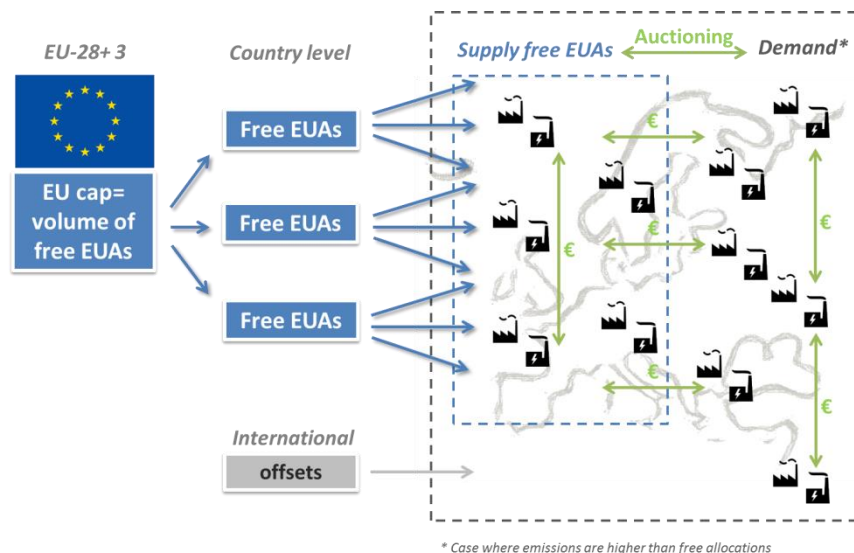
The EU ETS is a **"cap-and-trade" instrument**. An overall authorized volume of GHG emissions, also called cap, is set by the European Commission and allocated to European operators of installations covered by the system (industry facilities, power plants and airlines) under the form of permits or European Emission Allowances (EUAs). Once a year, installations have to surrender a sufficient number of EUAs corresponding to their annual GHG emissions - also measured in CO<sub>2</sub> equivalent or CO<sub>2</sub>e emissions.

EUAs, that are equivalent to a 1 ton CO<sub>2</sub>e (tCO<sub>2</sub>e) emission threshold, are distributed to participants either as free allocations or through auctioning (Figure 1) over three trading phases.

Depending on the phase of implementation considered, a given quantity of allowances is allocated for free by national governments through National Implementation Measures, also known as NIMs (previously National Allocation Plans, until 2012), submitted to the European Commission. The EU ETS entered its third trading period (Phase 3) ranging from 2013 to 2020.

With the implementation of the EU ETS, mitigation costs are in any case supported by emitters (producing installations): this is the **"polluter-pay-approach."**

To comply with their emissions' reduction objectives and to avoid paying a dissuasive fine (€100/tCO<sub>2</sub>e in 2013), installations have the flexibility to either invest in less carbon-intensive technologies (or energy sources) or buy EUAs on the market. They can also use EUAs they may have saved ("banked") from previous years. Indeed, if an installation has managed to decrease its emissions, the unused EUAs can be either sold to other emitters who need additional EUAs, or saved for a future compliance period. A last option for installation operators is to buy a certain amount of credits, called offsets, from United Nations' approved emission-saving projects in developed countries or developing countries. These offsets, arising from the Joint Implementation and Clean Development Mechanisms of the United Nations Framework Convention on Climate Change, are respectively called Emissions' Reduction Units (ERUs) and Certified Emission Reductions (CERs). Since Phase 3 of the EU ETS, overall use of these credits is limited to 50% of the EU-wide reductions over 2008-2020 (this limit is defined by each Member State by installation category and airline and then submitted to be approved by the European Commission.



**Figure 1 : Schematic representation of the Emission Trading System for European installations. EUAs: European Emission Allowances; source: Enerdata.**

### What is the scope of the EU ETS?

Today, the EU ETS covers more than 11,500 power plants and industry facilities as well as intra-European civil aviation within the EU-28 Member States and Iceland, Liechtenstein and Norway. Together, the system covers about 45% of the total GHG emissions of the EU (EC, 2013). This trading system is the largest in the world, both regarding its geographical scope (31 countries) and the quantity of emissions covered (about 2.0 GtCO<sub>2</sub>e in 2015, vs 0.6 GtCO<sub>2</sub>e for the second biggest emission trading system in South Korea).

The EU ETS focuses on precisely defined greenhouse gases and specific emitters; this scope has evolved over the different development phases of the system. Currently, an EUA gives its holder the right to emit one ton of CO<sub>2</sub> or the equivalent amount of nitrous oxide (N<sub>2</sub>O) or perfluorocarbons (PFCs). More precisely, emissions covered under the EU ETS include (EC, 2014):

- CO<sub>2</sub> from power plants (power and heat generation), from energy-intensive sectors (such as refineries, steel, iron, aluminium, metals, chemicals, cement, glass, or paper production);
- CO<sub>2</sub> from civil aviation since 2012, limited to intra EEA flights since 2014;
- N<sub>2</sub>O from the production of nitric, adipic, glyoxal and glyoxalic acids since 2013;
- PFCs from aluminium production since 2013.

	Phase 1 (2005-2007)	Phase 2 (2008-2012)	Phase 3 (2013-2020)
<b>Geographical scope</b>	EU-27	Expansion to Iceland, Liechtenstein and Norway in 2008	Expansion to Croatia in 2013
<b>Sectoral scope</b>	Power generation and energy-intensive industries	Inclusion of civil aviation from 2012	Inclusion of aluminium, petrochemicals in 2013; Amendment for limiting aviation to EEA flight since 2014
<b>Gases cover</b>	CO <sub>2</sub>	CO <sub>2</sub>	CO <sub>2</sub> , N <sub>2</sub> O, PFC from aluminium production
<b>Annual cap and trend</b>	2 058 MtCO <sub>2</sub>	1 859 MtCO <sub>2</sub>	2084 MtCO <sub>2</sub> in 2013, then linear decrease of 38 MtCO <sub>2</sub> per year

**Figure 2 : Main evolutions of the scope of the EU ETS over Phases 1, 2 and 3. Source: own representation based on figures from (EC, 2014).**

For the sectors mentioned above, participation in the EU ETS is compulsory, except for some small installations below a certain size for which transaction costs (i.e. cost of implementing the system) would be too high.

The EU ETS has progressively expanded with the following development over the succeeding phases (Figure 2).

### *What are the main challenges of the EU ETS, and how to cope with them?*

Over the different phases, the scope of the EU ETS has been enlarged, whereas the volume of allocated allowances has been further adjusted and decreased. As the level of the cap determines the number of allowances available in the system, the price of EUAs results from the balance between supply (i.e. allocated EUAs) and demand. The determination of the annual cap is therefore essential to make the emissions trading system as efficient as possible: if the allowance price (also called CO<sub>2</sub> price) is too low, no incentive is triggered for installations to invest in low carbon technologies; they would rather buy EUAs on the market. A weak CO<sub>2</sub> price can be caused either by an overwhelming amount of free allocated allowances compared to the total number of allowances needed to cover the corresponding emissions, or by a level of emissions significantly below expectations and therefore making the cap inappropriate.

In order to ensure an efficient market, the share of allowances allocated through auctioning has been recently increased: whereas most allowances were allocated for free to market participants in the first two phases of the EU ETS, from 2013 onwards allowances are auctioned by default, with a share representing at least 50% of total allowances, and with a planned increase of this share until the end of phase 3 (2020).

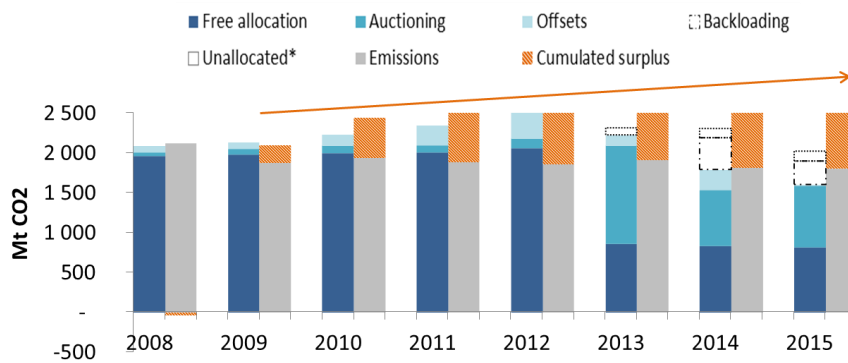
In the power generation sector, 100% of the allowances are allocated through auctioning since 2013; auctioning accounts for about 15% for the aviation sector, whose allowances are mainly allocated for free. In the industry sectors, 80% of the EUAs were allocated for free in 2013, with a target of 30% in 2020 and a view of 100% of allowances allocated through auctioning by 2027 (EC, 2014).

The allocation of shares also accounts for the “**carbon leakage**” risk for given sectors, i.e. the fact that participants may be exposed to a significant competitive disadvantage against players who are not located in the geographical scope of the EU ETS and thus possibly subject to lower emission reduction constraints. For these installations, 100% of emission allowances compared to a benchmark level continue to be delivered for free.

Since Phase 2 of the system, the balance between the yearly emissions of European installations covered by the EU ETS and the cap set previously has been difficult to maintain, due to several reasons including the economic crisis of 2008. With the general slowdown of economic activities, the amount of emissions from European installations fell significantly, leading to an oversupply and a growing durable surplus of allowances available on the market. This impacted sharply the CO<sub>2</sub> price which collapsed from about €30/tCO<sub>2</sub>e in 2008 to €15/tCO<sub>2</sub>e in 2011 and to a price range of €3-8/tCO<sub>2</sub>e over 2013-2015 (INSIGHT\_E, 2015). This surplus was further accentuated by the use of international offset credits in the EU ETS.

In order to re-equilibrate supply and demand, the European Commission introduced a measure consisting in “**back-loading**” 900 million allowances from 2014 and until 2019-2020: i.e. the auctioning of these allowances will be postponed over this period and therefore come later on the market during phase 3. However, this measure aimed only at a short-term rebalancing as the total number of allowances to be auctioned during phase 3 remains the same. Currently back-loading does not enable to reduce the cumulative surplus of EUAs (Figure 3).

In September 2015, the EU Council adopted a long-term restructuring of the EU ETS with the implementation of the **Market Stability Reserve (MSR)**.



**Figure 3 : Evolution of allocated allowances vs emissions from covered installations since 2008, and resulting growing surplus, based on data from I4CE and Enerdata (INSIGHT\_E, 2015)**

### How does the Market Stability Reserve work?

The Market Stability Reserve (MSR) is a mechanism that introduces flexibility in the EU ETS by enabling to adjust auctioned volumes to the demand, and therefore better respond to potential external shocks in demand. The MSR will be implemented from 2019 onwards.

With this mechanism, surplus allowances are automatically put into reserve or injected (EC, 2014):

- if the surplus on the market is above 833 million EUAs, 12% of this surplus is placed into the reserve;
- if the surplus is below 400 million EUAs, 100 million EUAs are released from the reserve.

The total annual number of allowances in the EU ETS is determined by the difference between total allowances issued and surrendered, also including international credit offsets and allowances already placed in the reserve.

The MSR can therefore help reduce potential future mismatches between supply and demand, hence contributing to the stabilization of the CO<sub>2</sub> price over time and sending a more consistent price signal for investors.

This framework is expected to significantly increase the reliability of the EU ETS and should help achieve European long-term emissions reduction objectives at lowest costs.

### References

European Commission (2013). The EU Emissions Trading System (EU ETS), factsheet.  
[http://ec.europa.eu/clima/publications/docs/factsheet\\_ets\\_en.pdf](http://ec.europa.eu/clima/publications/docs/factsheet_ets_en.pdf)

European Commission (2014). EU ETS Handbook.  
[http://ec.europa.eu/clima/publications/docs/ets\\_handbook\\_en.pdf](http://ec.europa.eu/clima/publications/docs/ets_handbook_en.pdf)

INSIGHT\_E (2015). Hot Energy Topic 12: The Market Stability Reserve: Assessing Reform Needs and Possible Impacts on the EU ETS [S. Cail (Enerdata), M. Jalard and E.Alberola (I4CE)].  
[http://www.insightenergy.org/system/publication\\_files/files/000/000/034/original/HET12\\_-\\_Market\\_Stability\\_Reserve\\_-\\_Final.pdf](http://www.insightenergy.org/system/publication_files/files/000/000/034/original/HET12_-_Market_Stability_Reserve_-_Final.pdf)

### Further information

For further reading, please visit the European Commission's online course:

<https://ec.europa.eu/clima/policies/ets/ets-summer-university/content/ets-e-learning-online-course>