COMPARATIVE ANALYSIS OF CO_2 EMISSIONS ALLOCATED AND VERIFIED UNDER EU-ETS FOR THE ROMANIAN IRON AND STEEL SECTOR

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Action to tackle effects of climate changes start to be developed in the whole world. European Union developed and implemented an Emissions Trading System (EU-ETS) as a policy tool in order to promote investment in clean, low-carbon technologies and thus the GHG emissions reduction. In the EU-ETS, mainly units from energy production and manufacturing industry are included.

In the paper CO_2 emissions allocated and verified for Romanian iron and steel sector under all of the three phases of EU-ETS will be analyzed and a comparative analysis with those from other EU countries will be presented.

Keywords: climate change, EU-ETS, iron and steel production, CO_2 emissions allocated and verified

1. Introduction

Through United Nations Framework Convention on Climate Change (UNFCCC) and under Kyoto Protocol (KP) [1], Doha Amendment (DA) [2] and Paris Agreement (PA) [3], Romania had assumed some reductions of the Greenhouse Gases (GHG) compared to established base years. Also, as a Member State of the European Union, Romania is a part of the European Union – Emissions Trading System (EU-ETS) [4].

Once with enter into force on 4 November 2016 of the Paris Agreement and given his legal binding character, EU and its Member States must prepare to honor the assumed Intended Nationally Determined Contribution (INDC) through a jointly agreement [5]. The EU INDC includes a binding domestic reduction of GHG emissions of at least 40% in 2030 compared to 1990. To meet this target, the emissions in the EU- ETS should be reduced by 43% compared to 2005.

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The EU ETS is a policy tool used to promote investment in clean, low-carbon technologies and has placed climate change on the company's agenda by putting a price on carbon. The EU ETS cap and trade concept was the first policy tool used and implemented in the world for the GHG emissions. Presently, there are 17 emissions trading systems in operation across four continents, covering 35 countries, 12 states or provinces, and 7 cities. Together all these ETS account for 40% of global Gross Domestic Products (GDP) [6].

The EU-ETS started in 2005 with a 3 years testing period (2005-2007) and was followed by another two implementation phases (2008–2012, 2013-2020), corresponding with the first and second commitment period under KP. During the first two phases of the EU ETS, the regulatory framework was largely unchanged. The free allocation was based on historic data (emissions and production data) and the emissions allocation was established at national level. In order to avoid the distorsions introduced by this type of allocation system, in phase III a significant number of architectural and regulatory changes were made. The main change is that instead of use historic emissions as base for allocations, each plant receives a number a free allowance determined mainly by performance benchmarks. These benchmarks represent a value in CO_2 emissions per tone of product, reflecting the GHG emission performance of the best installations in the EU producing a specific product. Allocation to each industrial plant is calculated by multiplying the benchmark for the product it makes with its production data.

The manufacture of iron and steel has a complex industrial structure and represent an important contributor to the national and EU GHG emissions. Almost all the EU steel production is realized in units included in EU-ETS.

Steel is produced in EU through two flow types: integrated flow and electric flow. The first one is equipped with Blast Furnaces and Basic Oxygen Furnaces (BF-BOF) and produces steel from iron ore. The second one is equipped with Electric Arc Furnaces (EAF) that produces steel from steel scraps.

The steel production in the EU decreased with 13.5% between 2005 and 2014, i.e. from 195681 Mt in 2005 to 169301 Mt in 2014 with the lowest value in 2009 - 139436 Mt [7]. The steel production in Romania follows almost same path. The Romanian steel production had decrease between 2005 and 2014 with 50% and has reached the lowest production level in the 2009 (2761 Mt) because of economic crises.

2. Methodology

To estimate the effects of applying EU ETS in the iron and steel sector, the analysis of an allocation indicator was made. This indicator was calculated as being the ratio between the numbers of allowances allocated and number of verified emissions, and it is expressed as percentage. The number of allowances,

respective the number of verified emissions represents the sum for each phase of EU-ETS. In the Phase III are included allowances allocations and verified emissions from the first 3 years (2013, 2014 and 2015). The results of the allocation indicator are grouped in 5 categories (<100%, 100-150%, 150-200%, 200-300% and >300%).

The data used are collected from European Union Emissions Trading System database. In the present analysis are included a number of 54 plants from 14 countries. From Romania are included the most important 8 iron and steel plants. The flows types used in the plants included in analysis are BF-BOF and EAF.

Distributions per phases of EU-ETS and flow types of the plants considered in analysis are presented in Table 1. Because some plants are not included in all the phases of the EU-ETS with the same installation name, some differences in the number of plants taken into consideration may appear.

Table 1

Number of plants included in analysis splited per flow type and EU-ETS phase

Flow type	Phase I	Phase II	Phase III
BF-BOF	13	16	17
EAF	33	35	37
Total	46	51	54

3. Results and Discussion

The results obtained for the all three phases of EU-ETS after applying the methodology presented above were presented and analyzed.

EU-ETS Phase I

Figure 1 presents the distribution of the allocation indicator per type of flow. From the total of 46 plants considered, 21 % emitted more than the number of allocated allowances. More than half from plants emitted less than 150% from the number of allocated allowances and for 9 plants the allocation was with 150% - 200% higher than the verified emissions. Also 2 plants emitted half of the number of allowances allocated.

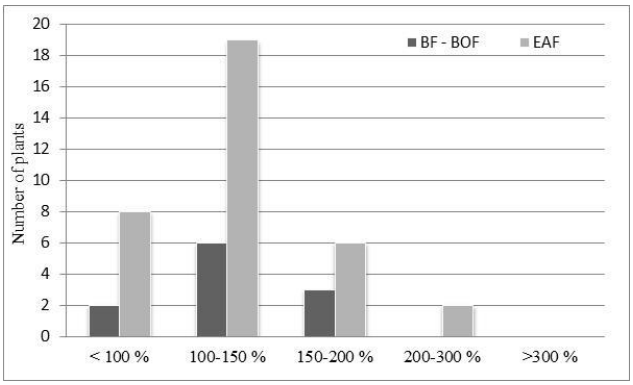

Fig. 1. Distribution of the allocation indicator per flow type for Phase I of the EU-ETS

The distribution of indicator per countries show that plants who emitted more than the allocated allowances number are from UK, Netherland, Italy, Germany and France (figure 2). The plants with allocation more than double compared with the verified emissions were in Romania.

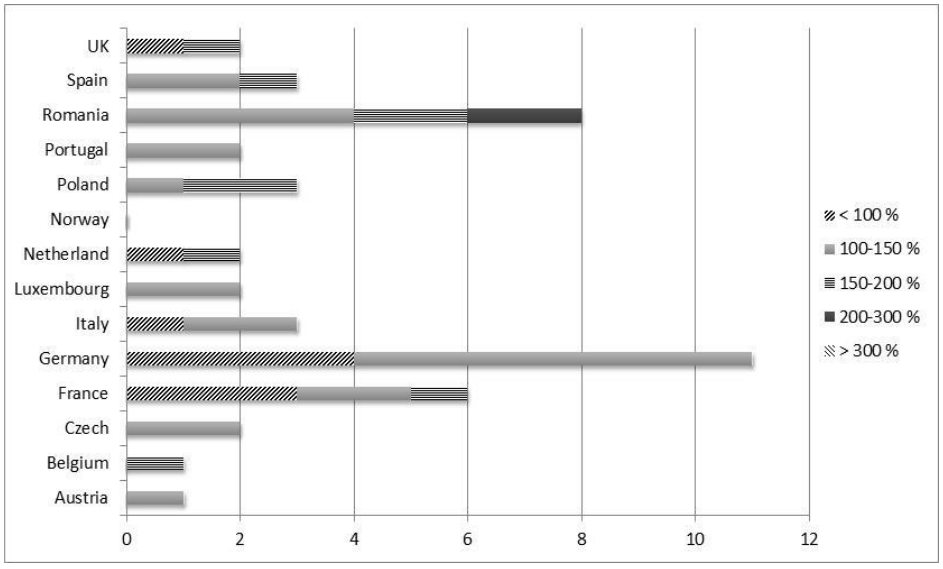

Fig. 2. Distribution per countries of the allocation indicator for Phase I of the EU-ETS

EU-ETS Phase II

The distributions of the allocation indicator per flow type are presented in the figure 3. From the total number of 51 plants considered, only 5 % had emitted more than number of allocated allowances and almost 10% had emitted one third of the allocated allowances number. In the range of 100% -150% 39% of the

numbers of plants considered are situated and for another 27% the allocation was with 150% - 200% higher than the verified emissions.

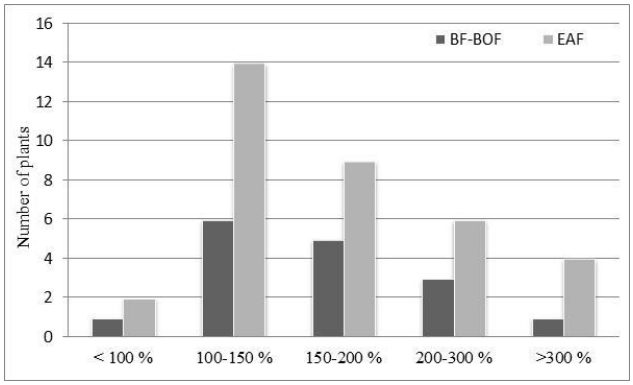

Fig. 3. Distribution of the allocation indicator per flow type for Phase I of the EU-ETS

The distribution of the indicator per countries (figure 4) show that plants who emitted more than allocated allowances number are situated in Italy, Germany and Norway (figure 2). The plants with allocation more than triple compared with the verified emissions were from Romania (3 plants) and Germany (2 plants).

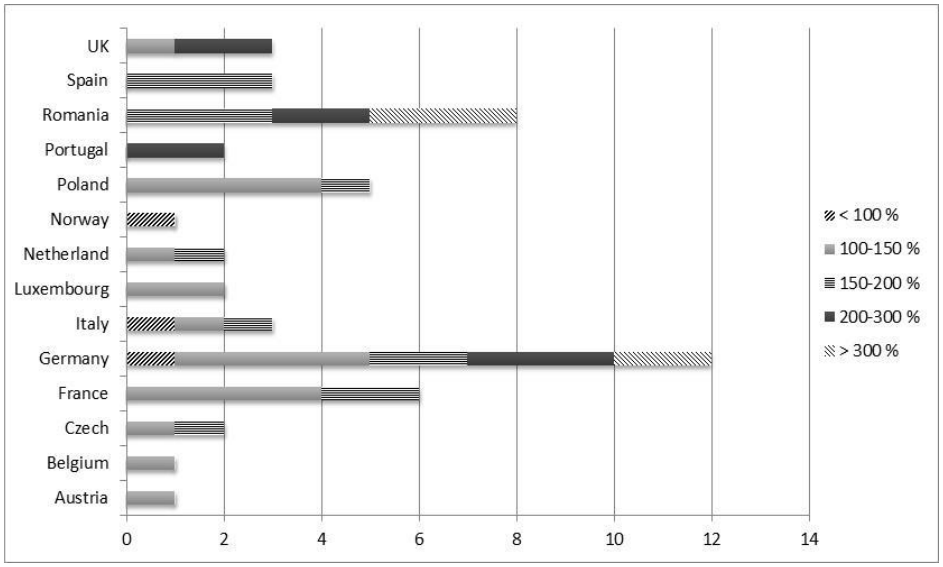

Fig. 4. Distribution per countries of the allocation indicator for Phase II of the EU-ETS

EU-ETS Phase III

In the figure 5 are presented the distribution of the allocation indicator per type of flow. From the total of 54 plants considered, 40 % had emitted more that allocated allowances number and 37% have the allocation indicator in the range of 100% - 150%. Also 3 plants had emitted a third of the number of allowances allocated.

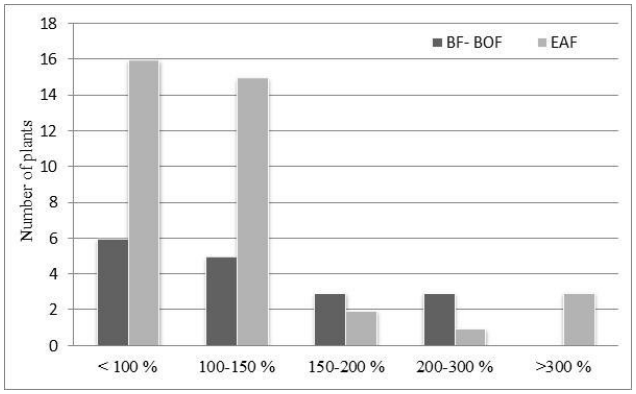

Fig. 5. Distribution of the allocation indicator per flow type for Phase III of the EU-ETS

The distribution of allocation indicator per countries show that plants who emitted more than the number of allowances allocated are located in 10 of the 14 considered countries. The plants with allocation more than triple compared with the verified emissions are situated in Romania and Italy (figure 6).

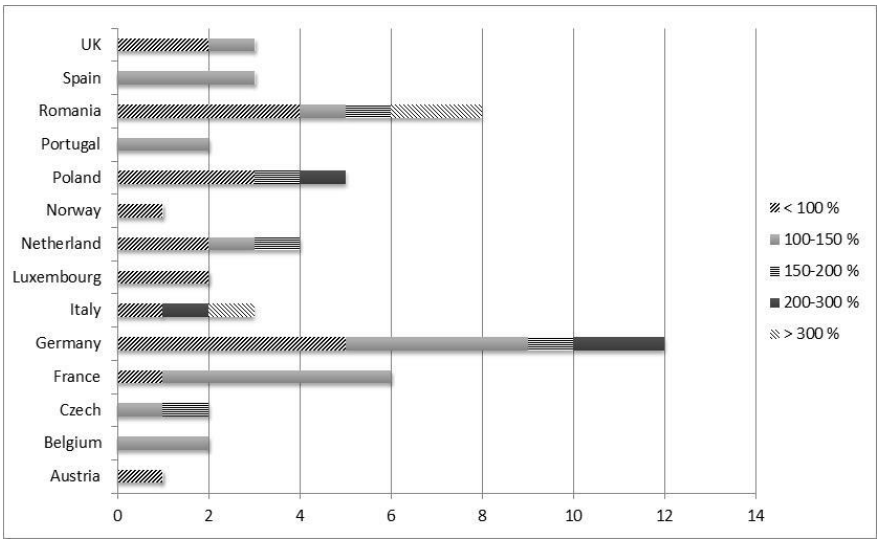

Fig. 6. Distribution per countries of the allocation indicator for Phase III of the EU-ETS

A comparative analysis for the 3 Phases of EU-ETS of the allocation indicator for Romanian plants with those of other countries included in this analysis was made. Results show (figure 7) that there is a significant change in the current phase, because more than half of the Romanian units need for the first time to buy supplementary allowances.

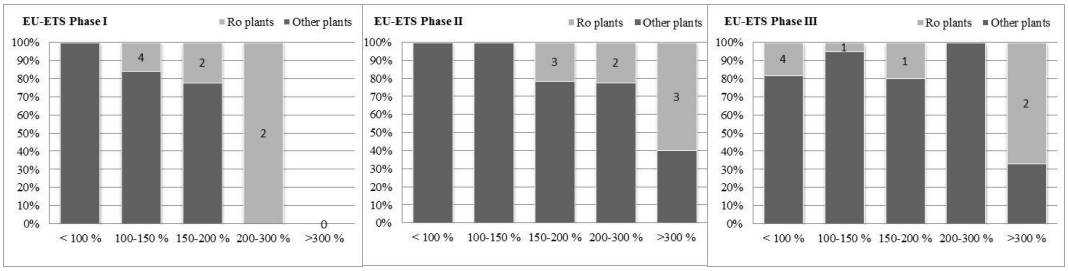

Fig. 7. The distribution of allocation indicator for the Romanian iron and steel plant

6. Conclusions

Results show that the percentage of plants that do not have to buy supplementary allowances evolved from 89% in Phase I, to 95% in Phase II, and to 60% in Phase III (i.e. current phase). The reason behind high percentage from the first and second phase is the allocation methodology (based mainly on historical data) that do not reflect the future economic evolution like the economic crisis.

Considering that the iron and steel production was included in the sectors exposed to carbon leakage and they were granted a generous free allocation in the first two phases of the EU-ETS, results show that the targets of the ETS for this sector were not achieved. The results of the correction made in Phase III by introducing the CO_2 product benchmarks and the implication of Paris Agreement show that there is a need for the companies in the iron and steel sector to assume stronger commitments to reduce GHG emissions. For the Romanian iron and steel sector there is a critical need to invest in low carbon technology and increase energy efficiency of their processes.

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