

# PILOT ANALYSIS OF THE BEHAVIOUR OF COMPANIES WITHIN THE 3<sup>RD</sup> TRADING PERIOD OF THE EU ETS IN THE CZECH REPUBLIC

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## Abstract

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This paper is focused on the first ex-post analysis of the EU ETS in its 3<sup>rd</sup> trading period in the Czech Republic, based on the analysis of the behaviour of the key EU ETS sector – combustion processes – and the decision making of Czech electricity and heat producers within the EU ETS. Firstly, the general overview of the EU ETS is presented, including the important scientific studies in this area. The characteristics of the EU ETS in the Czech Republic are described. The second chapter, methodology and data, describes the method, the questionnaire survey. The key chapter, results, focuses on the most important outputs obtained from the questionnaire survey. The discussion part deals with particular characteristics of the EU ETS in the 3<sup>rd</sup> trading period in the Czech Republic. Focusing on the behaviour of Czech companies in the analyzed period, it is obvious, that the companies within the combustion processes group understood the EU ETS much more as an additional environmental tax or fee, instead of commodity, which can be traded on the exchange. Moreover, the EU ETS had no impact on their environmental investments planning in years 2013 and 2014.

Keywords: EU ETS, 3<sup>rd</sup> trading period, decision making, combustion processes, ex post analysis, questionnaire survey, Czech Republic

## INTRODUCTION

### Emission Allowances Trading Background

The European Union established a scheme for CO<sub>2</sub> and other greenhouse gases' emission allowances trading, so called the EU Emissions Trading System (EU ETS). The initial EU ETS was based on Directive 2003/87/EC, which established a fundamentally decentralized system for the pilot phase of emissions trading (2005 to 2007) and the Kyoto Protocol commitment phase (2008 to 2012). Currently, there is the post-Kyoto commitment period (2013–2020), based on Directive 2009/29/EC.

The EU ETS covers both European Emissions Allowances – EUAs (since 2005) and European

Aviation Allowances – EUAAs (since 2012). The market price of the allowances is determined by supply and demand at the exchange. In current trading period, there is one significant big exchange, where the auctions can be organized – European Energy Exchange EEX (EEX, 2015). The beginning of the third trading period in 2013 brings changes in common rules which should strengthen the system. Since the EU emission allowances were previously grandfathered<sup>1</sup> (Wettstad *et al.*, 2012), from year 2013 the significant yield of the emission allowances is auctioned. Grandfathering was widely criticized, mostly because it introduced significant distortions to the EU ETS (Falbo *et al.*, 2013). Auctioning is the most transparent method of allocating

<sup>1</sup> Grandfathering = for free

allowances and puts into practice the polluter pays principle (European Commission, 2013).

Regarding the EUA spot price, it fluctuated significantly both in the first and the second trading period (2005–2012); however, the EUA auction price in the 3<sup>rd</sup> trading period is more stable, it has been fluctuating in the range 2,65 EUR/tCO<sub>2</sub> in April 2013 and 7,62 EUR/tCO<sub>2</sub> in February and May 2015 (EEX, 2015).

Focusing on the Czech Republic, the EU ETS is a part of the mix of economic instruments within environmental and climate policy, precisely we can find it besides environmental taxes, charges and subsidies (Pavel and Vitek, 2012; Zimmermannová and Menšík, 2013; Solilová and Nerudová, 2014).

The Fig. 1 shows us the development of CO<sub>2</sub> emissions in the Czech Republic within the EU ETS and the share of particular sectors of national economy on total CO<sub>2</sub> emissions production. Regarding precise evaluation of the development of greenhouse gas emissions in the industry of the Czech Republic, Solilová and Nerudová (2015) found, that although greenhouse gas emissions of the Czech Republic are deeply below the Kyoto targets, there are areas for improvements e.g. in case of energy intensities, carbon intensity and carbon productivity.

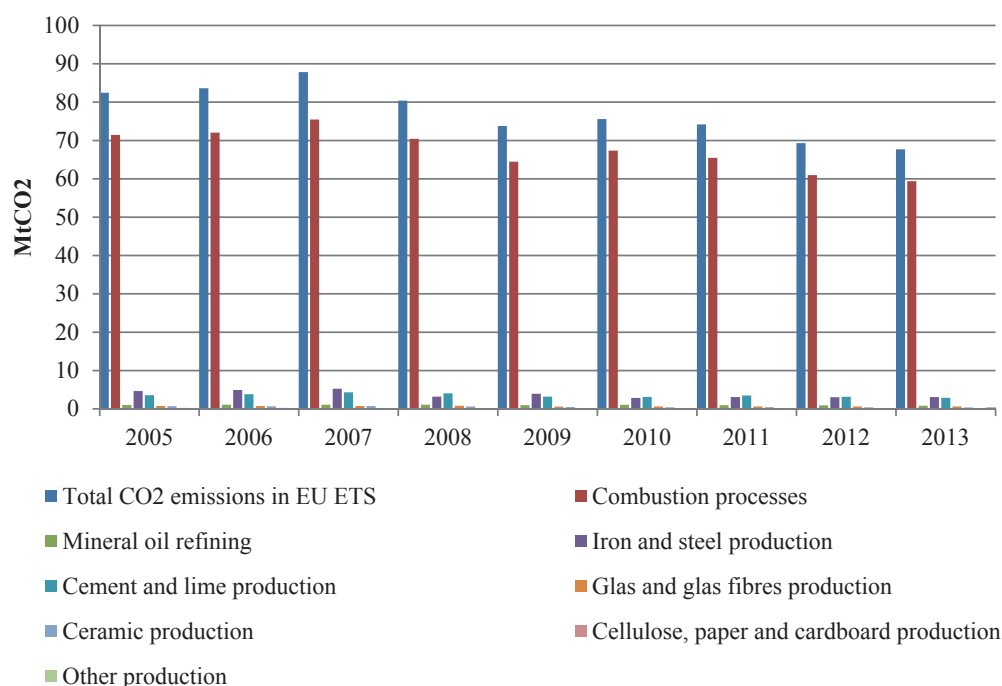
Focusing on Fig. 1, it is obvious, that the most significant share of CO<sub>2</sub> emissions on total CO<sub>2</sub> emissions production in the Czech Republic within the EU ETS has been produced by the combustion processes sector. This sector emitted almost 88% of total CO<sub>2</sub> emissions in year 2013. You can see that the curve of total CO<sub>2</sub> emissions within the EU

ETS has similar development as the combustion processes emissions curve itself; moreover the CO<sub>2</sub> emissions produced by the other sectors are negligible in comparison with CO<sub>2</sub> emissions produced by combustion processes sector.

Based on this development of CO<sub>2</sub> emissions in the Czech Republic, the following research of the EU ETS is based on the analysis of the behaviour of the most significant CO<sub>2</sub> emissions producer in the Czech Republic – the combustion processes sector.

### Literature Overview

Since emission allowance trading has primarily started in the US, the majority of publications dealing with tradable emission allowances assess the market for SO<sub>2</sub> emissions under the Acid Rain Program (Benz and Trück, 2009). Regarding the EU ETS, the authors of scientific papers have used various methods for their research connected with the EU ETS. We can find scientific studies, which describe particular models of the EU ETS, created with different methods and different targets. For example, Li *et al.* (2011) used fuzzy modelling (an interval-fuzzy two stage stochastic programming model) for planning CO<sub>2</sub> emission trading in industry systems under uncertainty, Conrad *et al.* (2012) used GARCH models for modelling the adjustment process of EUA's prices to scheduled macroeconomic and regulatory announcements. Aatola *et al.* (2013) created an equilibrium model of the emission trading market for the purposes of the EU ETS price determination, Falbo *et al.* (2013) created model based on the profit function for



1: CO<sub>2</sub> emissions history in the Czech Republic within the EU ETS 2005–2013

Source: CHMI, 2015; author

tracking of impacts of EUAs on the optimal policy of a competitive electricity producer. Garcia – Martos *et al.* (2013) used both ARIMA and VARIMA models for building a multivariate model for the aforementioned prices and comparing its results with those of univariate ones, Lecuyer and Quirion (2013) created analytical and numerical model of the EU energy and carbon market for implications of the possibility of a nil carbon price on optimal policy instrument choice. Lutz *et al.* (2013) used Markov regime-switching GARCH model for examination of the non-linear relationship between the EUA price and its fundamentals. Čermák *et al.* (2015) created broker simulation model which integrates different original soft computing and decision making methods.

Focusing on empirical studies, based on official data, questionnaire surveys and interviews, we can find particular studies in the area of the innovation impacts of the EU ETS in Germany (Rogge *et al.*, 2011), the impacts on the investments in Sweden (Lofgren *et al.*, 2014) or empirical ex post analyses of the EU ETS in the EU as a whole (Feng *et al.*, 2012; Lovell *et al.*, 2013; Martin *et al.*, 2014).

### The Main Goal and Hypotheses

Currently, there is no analysis focused on the behaviour of the companies within the 3<sup>rd</sup> trading period of the EU ETS in the Czech Republic, except of the comparison of particular characteristics of emission trading and environmental taxation in the Czech Republic (Zimmermannova and Čermák, 2015). The main goal of this paper is to analyse the behaviour of the companies within the combustion processes sector in the period 1/2013–6/2014. For the purposes of this analysis, the following two hypotheses are defined:

H1: In the analysed period, the companies actively traded with emission allowances on the exchange.

H2: In the analysed period, emission trading was such economic instrument, which supported planning of environmental investments and innovations in companies.

### MATERIALS AND METHODS

Focusing on CO<sub>2</sub> emission allowances price and its development, data from EEX exchange (EEX, 2015), the leading energy exchange in Europe, was used, particularly the EU emission allowances (EUAs) auction prices in particular auctioning days. For the purposes of CO<sub>2</sub> emission statistics, data from Czech Hydrometeorological Institute (CHMI, 2015) was used.

Dealing with the behavior of the companies within the combustion processes in the Czech Republic and their decision-making; 2 sources of data were used. The first data set was based on the consultations and interview with the expert from Association for the District Heating of the Czech Republic – Association of Entrepreneurs in the Field of Heat Supply (ADH CR), who is responsible for the emission allowances trading. The second step of data mining and obtaining more precise data set was based on the questionnaire survey, which was distributed to the key electricity and heat producers, members of working group on the EU ETS and environmental taxation within ADH CR.

The yield of returned questionnaires represents such survey respondents with 72% of CO<sub>2</sub> emissions on total verified CO<sub>2</sub> emissions in the Czech Republic in the whole second trading period 2008–2012. You can see that it provides us sufficient information content of the questionnaire survey.

For the purposes of the questionnaire survey evaluation, the respondents were divided to the 3 groups based on the combustion processes size – big sources “BS” (more than 100 MW of rated power consumption), medium sources “MS” (50–100 MW of rated power consumption) and small sources “SS” (up to 50 MW of rated power consumption). However, there are sources controlled by the same management, therefore the results of the questionnaire survey were also analyzed according to the owners of particular sources of combustion processes. Based on the total number of returned questionnaires, there is 9 general owners of particular sources, which represent 27 big sources, 6 medium sources and 9 small sources. For the purposes of the presented ex post analysis, all owners, which have in their portfolio at least 1 big source, are classified as “BS” (totally 6 owners).

### RESULTS

The questionnaire survey consisted of 13 questions in total. For the purposes of this paper and for the purposes of the hypotheses evaluation, the results of 7 selected questions will be presented.

1. *Did you have to buy additional emission allowances on the exchange for the purposes of covering of all of your emissions in year 2013 and 1–6/2014?*

Tab. I shows the results of the questionnaire survey in the analyzed period 1/2013–6/2014. We can see that all of the big sources had to purchase the additional emission allowances for the purposes of their CO<sub>2</sub> emissions covering. Regarding medium and small sources, the final decision depended on particular situation in a particular source, the result

I: Purchases of additional emission allowances in 1/2013–6/2014

	Big sources	Middle sources	Small sources	Results based on the owner
Yes	27	2	5	6
No	0	4	4	3

Source: author

were also related to the policies and strategies of particular owners.

Focusing on the results based on the owners, it is obvious, that all of the owners, which have in their portfolio at least 1 big source, had to purchase the additional emission allowances.

2. Did you find the price of the emission allowances during year 2013 and the first half of year 2014 as a motivation for trading or speculation on the exchange?

The Fig. 2 shows us the answers on this question. You can see, that in the analysed period, the EUA price was evaluated as motivating and rather motivating mainly by owners of big sources. Based on the precise results, the EUA price was motivating and rather motivating for 4 owners of big sources and 1 owner of small and medium sources. On the other hand, the EUA price represented no motivation for trading or speculation on the exchange for 2 owners of big sources and 2 owners of small and medium sources.

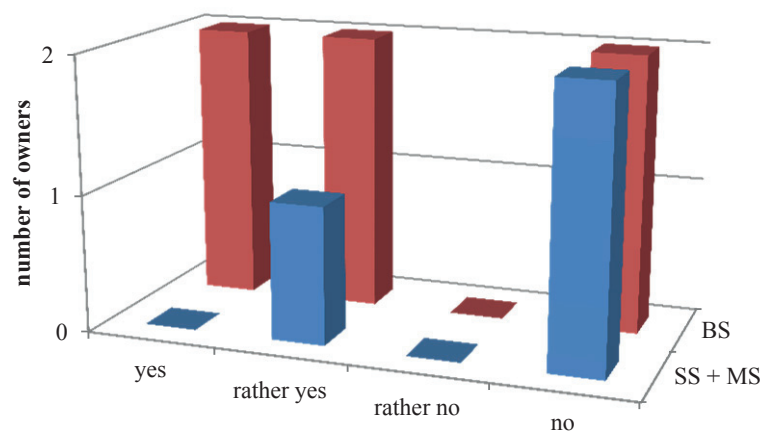
Based on more precise analysis of the questionnaires, it is obvious, that all of the owners, which indicate the price as motivating or rather motivating, really bought additional emission

allowances on the exchange in the analysed period; it is obvious that low price of the EUAs represented sufficient motivation factor for the EUA purchases. However, for the purposes of speculations only one owner traded on the exchange. The other owners bought the EUAs for the purposes of covering of all of their CO<sub>2</sub> emissions.

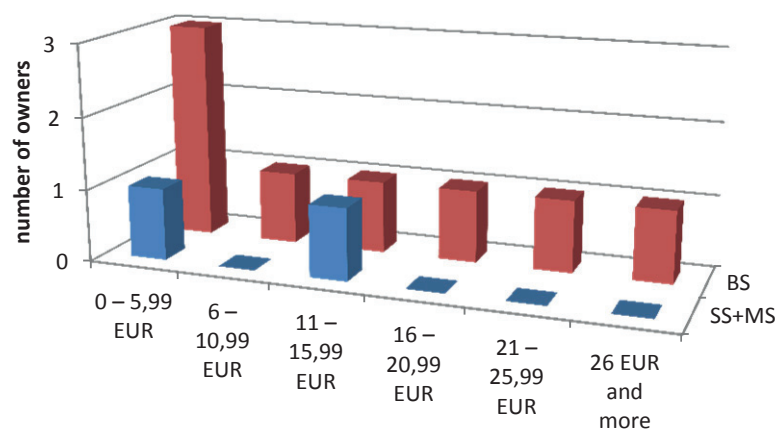
3. At which level of emission allowances' price would you start to think about active trading on the exchange?

This question was not answered by all respondents; however this kind of respondents explicitly specified, why they did not answer. There are 2 reasons – 1) their policy and strategy prevents them from active trading, they are allowed only to buy emission allowances to cover all of their emissions; 2) the strategy of the management of particular companies is not to provide information about their behaviour on the exchange and the motivation price.

Due to these reasons, the following results are rather tentative. In total, the question was answered by 5 owners, precisely 3 big sources and 2 small and medium sources.



2: The EUA price as a motivation for active trading 1/2013–6/2014  
Source: author



3: The ideal EUA price as a motivation for active trading and speculations  
Source: author

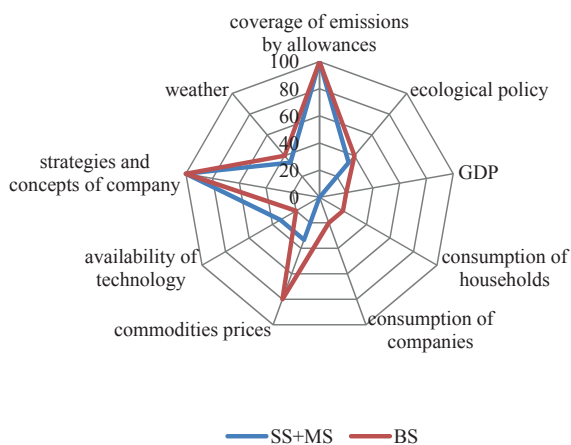
The Fig. 3 shows us that one owner is indifferent between the EUA price – the owner actively trades the EUAs on the exchange regardless of the price. The other owners, precisely 1 owner of small and medium sources and 3 owners of big sources, prefer the lowest EUA price (0–5,99 EUR) only for the purchases. Regarding the sales, only one owner of small and medium sources would sell the EUA on the exchange in case the EUA price is in the range 11–15,99 EUR.

4. *Do you trade on the exchange directly or through a broker?*

This question was answered by 8 from 9 owners. All owners of small and medium sources trade on the exchange through a broker. Regarding the owners of big sources, the most of them trade on the exchange through a broker, one owner has own trading department and one owner combines the broker with own trading department.

5. *Which indicators can influence your decision making regarding emission allowances purchases and sales? You can select more indicators.*

This question was answered by 8 from 9 owners. For the purposes of the comparison of particular



4: Indicators with influence on active trading of companies  
Source: author

answers of all of the owners, the results of this question are in percentage expression.

The Fig. 4 shows us that the most significant influence on the active trading of particular companies on the exchange have their actual coverage of CO<sub>2</sub> emissions by the EUAs and strategies and concepts of their company. These two answers were highlighted by all of the respondents, regardless their type. The important indicator is also the development of prices of particular commodities on the exchange, but only for owners of big sources.

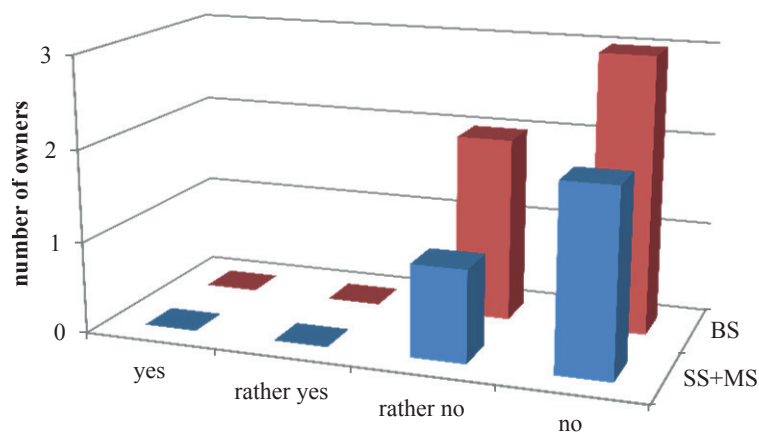
6. *Did you find the price of the emission allowances during year 2013 and the first half of year 2014 as a motivation for starting or planning of environmental investments for the purposes of greenhouse gas emissions cutting?*

This question was answered by 8 from 9 owners. The Fig. 5 shows us the results. What is a surprise, the answer is similar for all respondents, regardless it is small and medium-sized source or big source. Precisely, 5 owners (3 BS and 2 SS+MS) answered “no” and 3 owners (2 BS and 1 SS+MS) “rather no”. Based on these results, it can be said that the EUA price in the analyzed period did not motivate companies to start or even to plan their investments to reduce greenhouse gas emissions.

7. *Which indicators – tools of the economic policy of the Czech Republic – can influence your decision making regarding planning of investments and innovations in your company? You can select more indicators.*

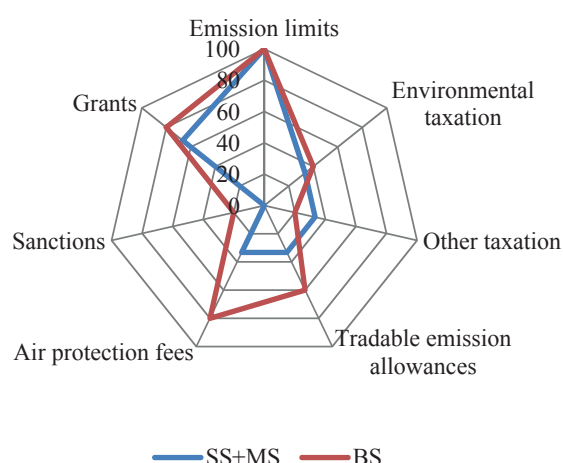
This question was answered by 8 from 9 owners. For the purposes of the comparison of particular answers of all of the owners, the outputs of this question is in percentage expression. The Fig. 6 summarizes the results.

It is obvious that the greatest influence on the planning of investments and innovations in particular companies have emission limits, regardless of size of sources of particular owners. This indicator was highlighted by all of the respondents who answered this question. Regarding big source owners, the important policy instruments for the investments planning are also air protection



5: The EUAs as a motivation for additional investments in 2013–2014  
Source: author





6: Indicators with influence on additional investments  
Source: author

fees, grants and tradable emission allowances. Focusing on small and medium source owners, besides emission limits, the most motivating policy instruments are grants.

## DISCUSSION

The main goal of this paper was to analyse the behaviour of the combustion processes' companies within the 3<sup>rd</sup> trading period of the EU ETS in the Czech Republic, precisely in the period 1/2013–6/2014. At first, the hypotheses should be evaluated.

H1: In the analysed period, the companies actively traded with emission allowances on the exchange.

This hypothesis can be rejected. Based on the above described results of the analysis, it is clear, that only one company actively traded on the exchange during the analysed period. However, it is the company with own trading department. It is obvious, that the companies within the combustion processes group understood the EU ETS much more as an additional environmental tax or fee, instead of commodity, which can be traded on the exchange.

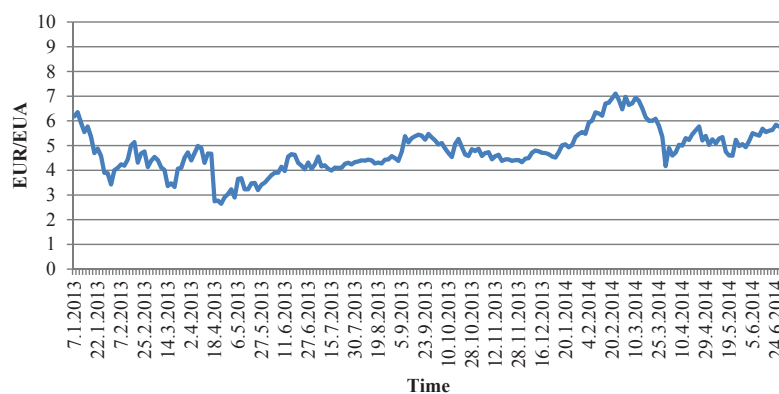
H2: In the analysed period, emission trading was such economic instrument, which supported planning of environmental investments and innovations in companies.

This hypothesis can be also rejected. Focusing on the results, mainly the last Figs. 5 and 6, it is obvious, that the EUA price in the analysed period did not motivate companies to start or even to plan their investments to reduce greenhouse gas emissions. However, the emission trading is understood by owners of big sources as the economic instrument, which can influence their decision making regarding planning of investments and innovations. On the other hand, the emission trading represents very weak motivation for owners of small and medium sources to realize or plan additional environmental investments.

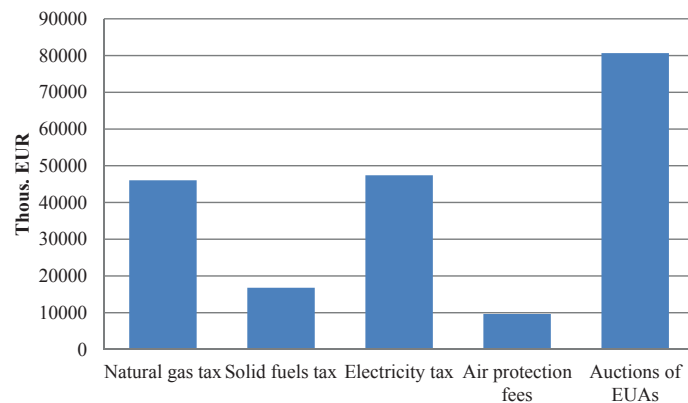
The following Fig. 7 shows us the EUA auction price development in the analysed period. You can see that the price fluctuated between 2,65 EUR/EUA in April 2013 and 7,1 EUR/EUA in February 2014. The average EUA auction price in the analysed period was 5,93 EUR/EUA, the median 4,69 EUR/EUA.

Based on the results, we can say that the EUA auction price was suitable mainly for the purchases, it represented no motivation for active trading on the exchange or the environmental friendly investments.

It is also important, that the companies within the combustion processes group understood the EU ETS much more as an additional environmental tax or fee, so the EUAs can represent additional costs for them. It is necessary to realize changing economic situation and business conditions of particular companies. Companies are constantly under pressure of reducing costs and finding of cost reserves. This is result of global expansion and developing Information Society, which asks still new requirements. That has important impact to structure of performed activities and so to structure and development of different cost groups. That causes problems and difficulties with their appropriate and exact allocation in relation to



7: The EUA Auction Price in 1/2013–6/2014  
Source: EEX, 2015; author



8: *Environmental taxes and EUA auction's revenues in CR in Y2013*  
Source: Zimmermannová and Čermák, 2015

performance of production (Novák and Popesko, 2014).

For the purposes of providing complex analysis of the beginning of the 3<sup>rd</sup> trading period in the Czech Republic, the revenues obtained from the EUA auctions and other economic instruments revenues (air protection fees and general energy taxation, based on current Directive 2003/96/EC) should be compared. The following Fig. 8 shows us the comparison of all revenues from environmental taxes and charges in the air and climate protection area and the EUA auction's revenues in the Czech Republic in year 2013.

It is obvious, that contrary to the low EUA auction price, the revenues from the EUA auctions in year 2013 were higher than revenues obtained from all of the air protection fees; furthermore it exceeded revenues obtained from particular energy taxes – natural gas tax, solid fuel tax and electricity tax. We

can say that the auctioned EUAs were important source of public budgets revenues in the Czech Republic in year 2013. Moreover, it is evident, that this kind of revenues will be more important in the future depending on increasing share of total EUAs determined for the auctions.

Despite of public budgets positive impact, it is clear, that the system of emission trading behaved in the Czech Republic in the analysed period in different way, than the policy makers expected. However, the EU ETS is relatively young in comparison with US Acid Rain Program; therefore its weaknesses can be adjusted or changed. Definitely, for the purposes of the correct design of the environmental and climate policy instruments, the ex post analyses or any feedbacks are necessary.

Regarding the following research in the EU ETS area, the additional ex post analysis should be done, for example in the middle of the 3<sup>rd</sup> trading period.

## CONCLUSION

The paper presented the pilot ex-post analysis of the EU ETS in its 3<sup>rd</sup> trading period in the Czech Republic, based on the analysis of the behaviour of the key EU ETS sector – combustion processes – and the decision making of Czech electricity and heat producers within the EU ETS.

It is obvious, that the companies within the combustion processes group in the Czech Republic understood the EU ETS emission allowance rather as an additional environmental tax or fee, instead of commodity, which can be traded on the exchange. Moreover, the EUA price development did not motivate companies to start or even to plan their investments to reduce greenhouse gas emissions in the analysed period.

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