EU ETS IMPLEMENTATION IN INDUSTRY

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TERMAL POWERPLANT PLOMIN

I. INTRODUCTION

- 2009. – first MP (Monitoring Plan) was made and we applied for the GHG Permit
- 2010. – started the obligation for GHG emission reporting
- 2011.,March, – the Ministry of Enviromental Protection and Energy (MZOIE) aprroved the MP and issued GHG Permit for TE Plomin

2013 → Entering EU ETS

- New version of MP in 2013. and new GHG Permit
- Opening account in EU Registry for emissions trading
- Buying emission units allowences , EUA
- **1 EUA= 1 EUAA = 1 CER = 1 ERU = 1 tone CO2**

I. INTRODUCTION - Presentation topics

- **MONITORING PLAN** - Categorisation
  - Thier system
  - Calculation based aproach
  - Uncertainty
  - Other requirements

- **VERIFICATION AND REPORTING**
  - Annual emission report
  - Verification report
  - Improvement report

- **TRADING, COSTS**
  - Buying EUA within the HEP Group
  - Annual costs for EUA

II. TERMAL POWER PLANT PLOMIN

TOTAL 2016.

2 254 401 t CO2

TPP **Plomin 1**(1970.)

339 MWth

COMBUSTION:

COAL 364 360 t →844000 t CO2

LIGHT OIL 375 t→1200t CO2

DIESEL OIL 0,1 t→0,5t CO2

845 200,5 t CO2

TPP **Plomin 2** (2000.)

556MWth

COMBUSTION:

COAL 605 840 t →1 404 000 t CO2

LIGHT OIL 640 t → 2000 t CO2

DIESEL OIL 0,2 t→ 0,5 t CO2

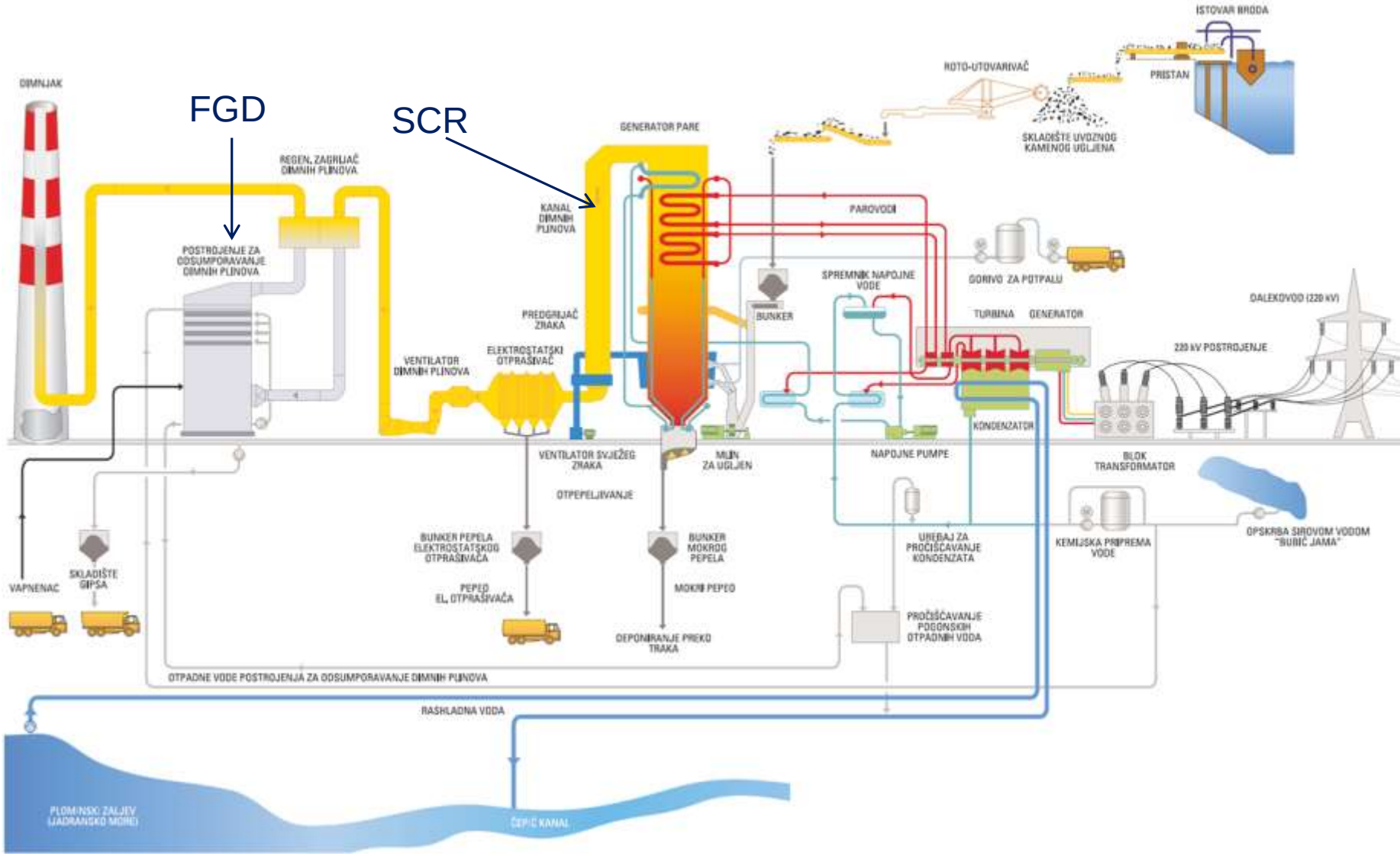
PROCESS EMISSIONS:

LIMESTONE 7300 t → 3200 t CO2

1 409 200,5 t CO2

II. TERMAL POWER PLANT PLOMIN - TPP PLOMIN 2

- Started in 2000.
- 217 MWe, 544MWt
- **8235h** (8750) in 2016.- 94%
- E.Efficiency = 36 %
- Production = **800 - 1.545** GWh
- Coal , NCV =24 do 29,3 MJ/kg
- Sulphur content = 0,3 do 1,4 %
- FGD, 2000.
- SCR, 2017.



III. MONITORING PLAN – Categorisation, source streams

- **CATEGORISATION OF INSTALATION**

  Category A: Annual average emissions ≥ 50 000 t of CO2(e);

  Category B: Annual average emissions are > 50 000 t of CO2(e) and ≤ 500 000 t of CO2(e);

  Category C: Annual average emissions are > than 500 000 t of CO2(e)

- **SOURCE STREAMS**

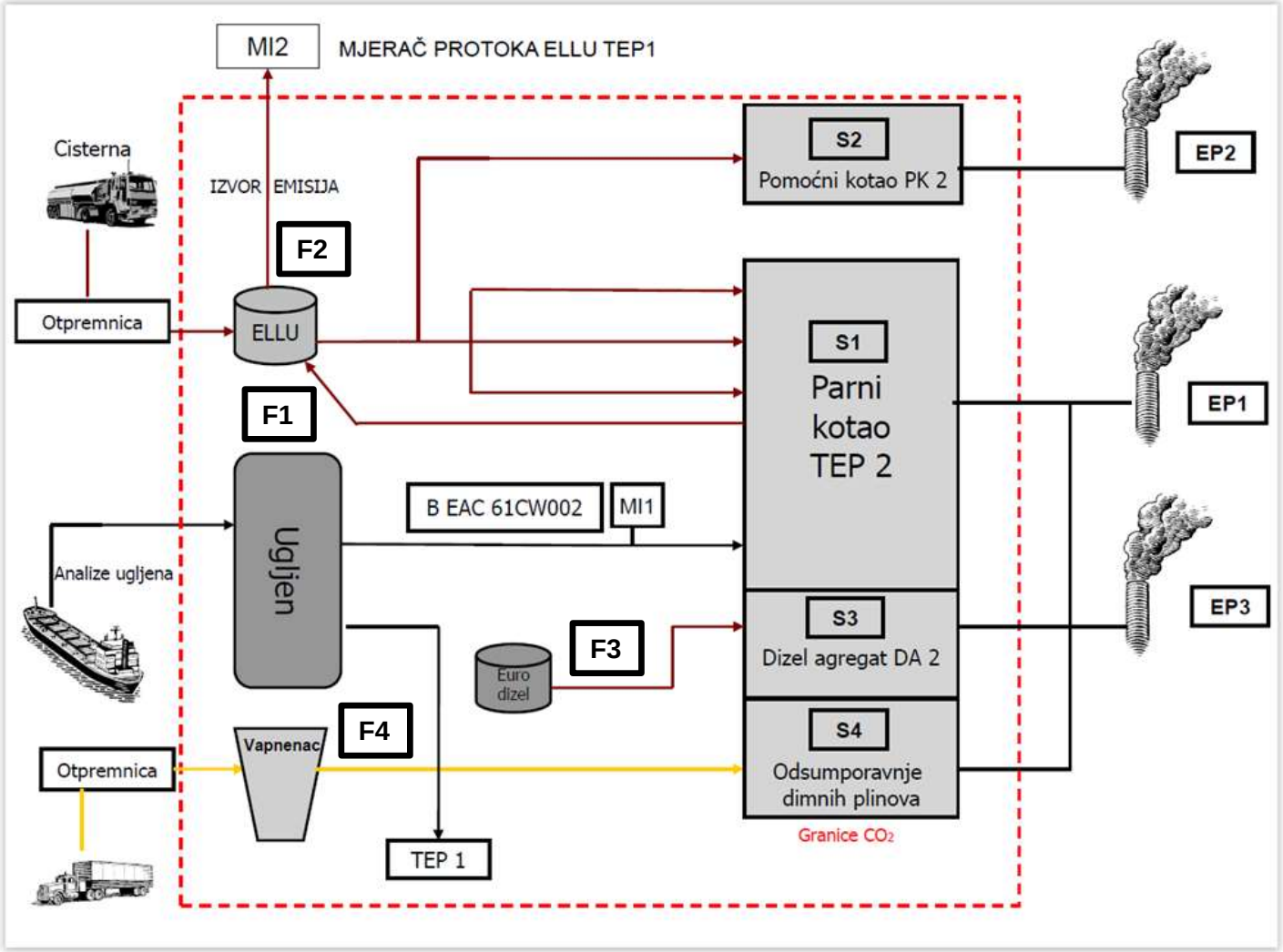
minor source streams: < 5 000 tonnes of fossil CO2 per year or to < than 10% of the "total of all monitored items", up to a total maximum contribution of 100 000 tonnes of fossil CO2 per year

de-minimis source streams: < than 1 000 tonnes of fossil CO2 per year or to< than 2% of the "total of all monitored items", up to a total maximum contribution of 20 000 tonnes of fossil CO2 per year,

All other source streams are classified as **major** source streams

Source stream F1, F2 ..	Source stream full name (name + type)	Estimated emissions [t CO2e / year]	Possible category	Selected category
F1	Coal ; Combustion: Solid fuels	1.308.205	Major	Major
F2	Light Oil ; Combustion: Commercial standard fuels	2.696	De-minimis	De-minimis
F3	Diesel oil ; Combustion: Commercial standard fuels	1	De-minimis	De-minimis
F4	Limestone ; Combustion: Cleaning flue gasses; Carbonates	6.683	De-minimis	De-minimis

III. MONITORING PLAN - Categorisation, source streams



- **SOURCE STREAM DIAGRAM**

- **F- Source stream**

F1 - Coal
F2 - Light Oil
F3 - Diesel Oil
F4 – Limestone

- **S – Emission source**

S1- Steam block
S2 - Small steam block
S3 - Diesel aggregate
S4 - FGD

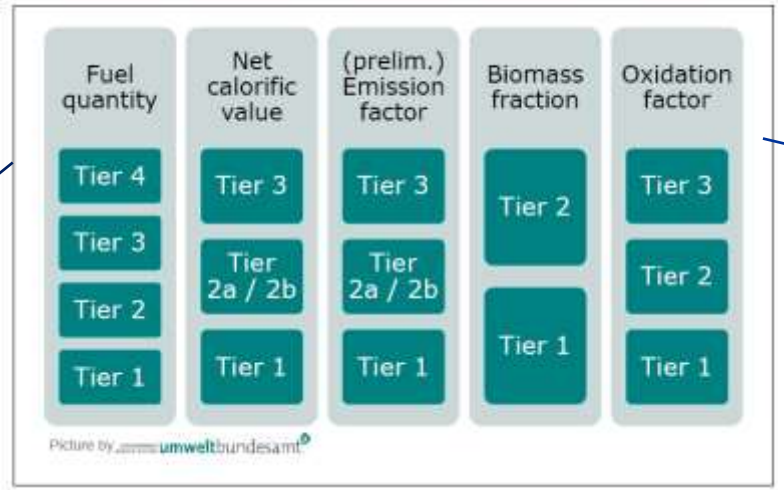
- **EP – Emission point**

EP1- Main stack
EP2 - Small steam block vent
EP3 - Diesel aggregate vent
EP1 - Main stack, process emissions

III. MONITORING PLAN - Thier system

THE THIER SYSTEM - Each parameter needed for the determination of emissions can be determined by different “data quality levels”. These “data quality levels” are called “tiers”.

MEASURING INSTRUMENT



NCV, EF, OF

Tier No.	Definition
1	Amount of fuel [t] or [Nm^3] over the reporting period[73] is determined with a maximum uncertainty of less than **± 7.5 %**.
2	Amount of fuel [t] or [Nm^3] over the reporting period is determined with a maximum uncertainty of less than **± 5.0 %**.
3	Amount of fuel [t] or [Nm^3] over the reporting period is determined with a maximum uncertainty of less than **± 2.5 %**.
4	Amount of fuel [t] or [Nm^3] over the reporting period is determined with a maximum uncertainty of less than **± 1.5 %**.

Source stream type	Factor	Tier	Tier definition
Combustion emissions and mass balance	NCV	1	Type I default values
		2a	Type II default values
		2b	purchasing records (if applicable)
		3	Laboratory analyses

Source stream type	Factor	Tier	Tier definition
Combustion emissions	EF[79]	1	Type I default values
		2a	Type II default values
		2b	Established proxies (if applicable)
		3	Laboratory analyses
Combustion emissions	OF	1	Default value OF=1
		2	Type II default values
		3	Laboratory analyses

III. MONITORING PLAN - Thier system

Caregory C; solid fuel	Tier required	Tier achieved		Requirements achieved
COAL - main source				
Consumption of fuel	4	4	Measuring instrument U = ±1,5%	±1,5%
Net Calorific value	3	3	Laboratory analysis (every 20 000t)	Every 10 000 t
Emmision factor	3	3	Laboratory analysis(every 20 000t)	Every 10 000 t
Oxidation factor	1	1	1,0	
LIGHT OIL - de minimis source				
Consumption of fuel	-	1	Estimation	Bill for lading
Net Calorific value	1	2a	Default values, NIR 2017	42,71 TJ/Gg
Emmision factor	1	2a	Default values, NIR 2017	74,07 tCO2/TJ
Oxidation factor	1	1	1,0	
DIESEL OIL - de minimis source				
Consumption of fuel	-	1	Estimation	Bill for lading
Net Calorific value	1	2a	Default values	NIR 2017 = 42,71
Emmision factor	1	2a	Default values	NIR 2017= 74,07
Oxidation factor	1	1	1,0	
LIMESTONE - de minimis source				
Consumption of fuel	-	1	Estimation	Bill
Emmision factor	1	1	Default values, Regulation	0,44

- **TPP PLOMIN 2**
  Tier requirements for all sources

NIR - National Inventory Registry

III. MONITORING PLAN – Calculation based approach

- **CO_2 from Coal**

CO_2 (COAL) = **consumption** (t) x **NCV** (TJ/t) x **EF** (tCO2/TJ) x **OF**

$$NCVcoal = \frac{\sum_{1}^{n}\left(Cons._{coal}1 \times NCV_{coal}1 + Cons._{coal}2 \times NCV_{coal}2 + \ldots + Cons._{coal}n \times NCV_{coal}n \right)}{\sum_{1}^{n} Cons._{coal}}$$

$$EF_{coal} = \frac{\sum_{1}^{n}\left(Cons._{coal}1 \times EF_{coal}1 + Cons._{coal}2 \times EF_{coal}2 + \ldots + Cons._{coal}n \times EF_{coal}n \right)}{\sum_{1}^{n} Cons._{coal}}$$

OF = 1, const.value

Fuel Consumption –
Measured cotinuosly,
by **conveyor belt scale**
15 ships per year, 1 ship ≈ 70 000t
Open storage ≈ 250 000 t
Monthly 2- 5 different coals

III. MONITORING PLAN - Calculation based approach

2017	Siječanj						
	Ugljen	ELLU	Vapnenac	Hd	EF	CO2	Napo
	t	t	t	MJ/kg	kgCO2/MJ	t/dan	
1	1820			24,960	0,0931	4.229,27	
2	1840			24,960	0,0931	4.275,75	
3	1830			24,960	0,0931	4.252,51	
4	1900			24,960	0,0931	4.415,17	
5	1745			24,960	0,0931	4.054,99	
6	1805			24,960	0,0931	4.194,42	
7	1875			24,960	0,0931	4.357,08	
8	1900			24,960	0,0931	4.415,17	
9	1872			24,960	0,0931	4.350,11	
10	902			24,31	0,0906	2.053,95	2 UGLJENA
11	1863			24,31	0,0906	4.103,23	
12	1810			24,31	0,0906	3.986,50	
13	1710			24,31	0,0906	3.766,25	
14	1945			24,31	0,0906	4.283,84	
15	1710			24,31	0,0906	3.766,25	
16	1875			24,31	0,0906	4.129,66	
17	1730			24,31	0,0906	3.810,30	
18	1480			24,250	0,0949	3.303,46	2 UGLJENA
19	0			24,250	0,0949	0,00	
20	0			24,250	0,0949	0,00	
21	0			24,250	0,0949	0,00	
22	0			24,250	0,0949	0,00	
23	0			24,250	0,0949	0,00	
24	1570			24,250	0,0949	3.613,08	
25	1750			24,250	0,0949	4.027,32	
26	1730			24,250	0,0949	3.981,29	
27	1790			25,070	0,0931	4.158,79	2 UGLJENA
28	1850			25,070	0,0931	4.317,93	
29	1720			25,070	0,0931	4.014,51	
30	1890			25,070	0,0931	4.411,29	
31	3810			25,070	0,0931	8.892,60	
SUMA	47.722,0	0,000	664,92			109.164,7	

Example for CO_2 calculation from coal

MONTHLY

YEARY

		2017	UGLJEN					
MJ.		utrošeno	Hd	EF	OF	CO2	Zemlja	Brod
		tone	MJ/kg	tCO2/TJ		tone		
	1	17.141,960	24,960	0,0931	1	39.834,075	Kolumbija	E.LUCK
	2	14.027,041	24,31	0,0906	1	30.894,361	Rusija	NORD PLUTO
	3	6.077,317	24,250	0,0949	1	13.985,882	Kolumbija	LOWLANDS
1	4	10.475,682	25,070	0,0931	1	24.450,420	Rusija	AELION VISION
	5	703,377	25,070	0,0931	1	1.641,694	Rusija	AELION VISION
	6	867,579	25,090	0,0933	1	2.030,913	Rusija	BLUE WAVE
	7	5.735,244	25,040	0,0942	1	13.528,110	Rusija	HEINA
	8	16.098,800	24,780	0,0929	1	37.060,436	Rusija	DOLPHIN
	9	18.388,000	24,530	0,0933	1	42.083,678	Rusija	GLADSTONE
2	10	10.826,000	24,870	0,0930	1	25.039,564	Rusija	PETER
	11	29.882,877	24,870	0,0930	1	69.116,405	Rusija	PETER
3	12	25.868,123	24,530	0,0933	1	59.203,054	Rusija	GLADSTONE
	13	14.878,674	24,530	0,0933	1	34.052,062	Rusija	GLADSTONE
	14	1.091,326	24,780	0,0929	1	2.512,300	Rusija	DOLPHIN
	15	6.981,000	25,220	0,0926	1	16.303,232	Rusija	AGNES
	16	11.977,000	25,620	0,0925	1	28.383,693	Rusija	SUE
4	17	20.072,000	25,350	0,0929	1	47.269,861	Rusija	SEAGUARDIAN
5	18	26.353,000	25,350	0,0929	1	62.061,710	Rusija	SEAGUARDIAN
9	19	14.847,000	26,040	0,0912	1	35.259,368	Rusija	PONTEVREMON
	20	18.915,000	26,040	0,0912	1	44.920,250	Rusija	PONTEVREMON
10	21	12.050,000	24,630	0,0928	1	27.542,251	Kolumbija	MEDI MATSUURA
	22	25.747,000	26,040	0,0912	1	61.145,211	Rusija	PONTEVREMON
11	26	30.000,000	24,630	0,0928	1	68.569,920	Kolumbija	MEDI MATSUURA
	24	6.833,084	26,040	0,0912	1	16.227,536	Rusija	PONTEVREMON
	25	5.000,000	24,630	0,0928	1	11.428,320	Kolumbija	MEDI MATSUURA
	26	27.016,178	25,620	0,0925	1	64.024,289	Rusija	SUE
12	27	17138,738	25,220	0,0926	1	40.025,329	Rusija	AGNES
	28				1	0,000		
	29				1	0,000		
	30				1	0,000		
	31				1	0,000		
	32				1	0,000		
	33				1	0,000		
	34				1	0,000		
	35	394.992,00				918.593,925		
		Ponderirano	25,118	0,092598	1	918.704,820		
	UK	394.992,00	25,118	0,092598	1	918.702,636		

III. MONITORING PLAN - Calculation based approach

- **CO_2 from Light oil and Diesel oil**

CO_2 (LO/DO) = **consumption** (t) x **NCV**(TJ/t) x **EF** (tCO2/TJ) x **OF**

Light Oil Consumption –

Two connected fuel tanks for both TTP,

Rotor meter (TTP1), once in 10years calibrating

Consumption TTP2 = Inventory – consumption TTP1(MI2)

Diesel Oil Consumption –

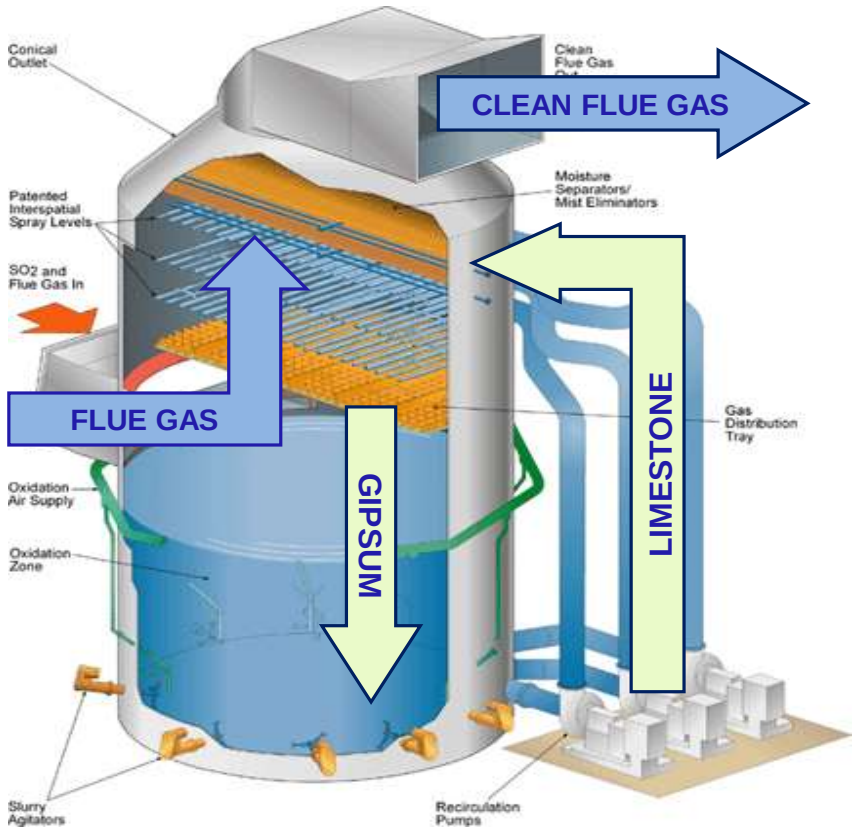
Consumption from the capacity of aggregat, t/h

NVC = 42,71 TJ/Gg
EF = 74,10 tCO2/TJ → National Inventory Report, **NIR 2017**

III. MONITORING PLAN - Calculation based approach

PROCESS EMISSIONS

FGD Plant



Overall Reaction Mechanism

$CaCO_3 + SO_2 + 2H_2O + \frac{1}{2}O_2 \rightarrow CaSO_4 \cdot 2H_2O + CO_2$ ↑

- **CO_2 from Limestone**

CO_2 (Limestone) = consumption (t) x EF = consumption (t) x **0,440**

2. Emisijski faktori povezani s emisijama iz proizvodnih procesa

Tablica 2.: Stehiometrijski emisijski faktor za emisije iz procesa razgradnje karbonata (metoda A)

Karbonat	Emisijski faktor (t CO_2/t karbonata)
$CaCO_3$	0,440
$MgCO_3$	0,522
Na_2CO_3	0,415
$BaCO_3$	0,223
Li_2CO_3	0,596
$K2CO_3$	0,318
$SrCO_3$	0,298
$NaHCO_3$	0,524
$FeCO_3$	0,380
Općenito	Emisijski faktor = $[M(CO_2)]/\{Y * [M(x)] + Z * [M(CO_3^{2-})]\}$

III. MONITORING PLAN - Calculation based approach

- **Total CO_2**

$$CO_2 \text{ All fuels} = CO_2 \text{ coal} + CO_2 \text{ LO} + CO_2 \text{ DO} + CO_2 \text{ Limestone}$$

- TPP producing only electricity must buy EUA for every tonne of CO2 relesed in a year :

  1 tonne CO2 = 1 EUA

- TPP producing electricity and termal energy can receive ERU /CER

III. MONITORING PLAN- Uncertainty for calculation based approaches

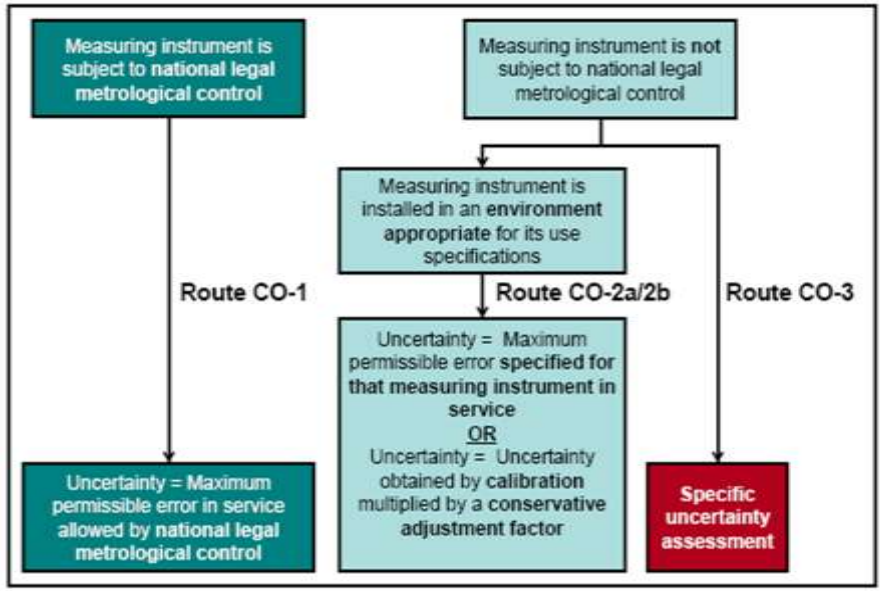
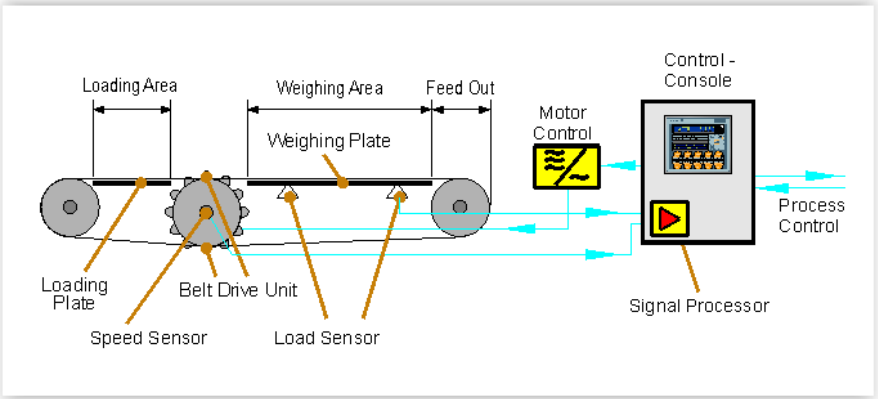


Figure 3: Activity data for calculation-based approaches: Approaches for determination of the uncertainty achieved ("C" means calculation based, "O" means instrument is under operator's own control)

3 approaches for uncertainty assesment:

1. MI under legal metrological control, **Route CO-1**
2. MI installed in an enviroment appropriate for its use:
   I. OU = Max. Permissible Error in Service (MPES), **Route CO-2a**
   II. OU = Uk x Conservative adjustment factor (F= 2), **Route CO-2b**
3. Specific uncertainy assesment **Route CO-3**



TPP Plomin – Measuring instrument : **CONVEYOR BELT SCALE**

– Overall uncertainty – ROUTE CO 2a

– MPES – defined as overall ucertainty

III. MONITORING PLAN- Uncertainty for calculation based approaches

- The information source for the MPES :

- the manufacturer's specifications
- specifications from legal metrological control,
- and guidance documents such as the Commission's guidance

TTP Plomin - we have MPE, defined by the producer os the MI ,

- *in that case*: **UO = MPE x Conservative adjustment factor (=2)**

The operator can assume he meets the MRR requirements in such cases, if he shows evidence that :

- **Operating conditions regarding relevant influencing parameters are available**

The manufacturer's specification for that measuring instrument contains operating conditions, i.e. description of the environment appropriate for its use specifications, regarding relevant influencing parameters (e.g. flow, temperature, pressure, medium etc.) and maximum permissible deviations for these influencing parameters.

III. MONITORING PLAN- Uncertainty for calculation based approaches

- **Step 2: Operating conditions regarding relevant influencing parameters are met**

The result for this step should be an assessment that

- the measurement instrument is installed appropriately,
- the measuring instrument is appropriate to measure the medium of interest,
- there are no other factors that could have adverse consequences on the uncertainty of the measurement instrument.

- **Step 3: Performing quality assured calibration procedures**

The operator shows evidence that the regular calibration is performed using the instrument manufacturer’s recommended procedure and the results comply with the manufacturer's specifications

III. MONITORING PLAN – Other requirements

MANAGEMENT AND CONTROL (Sheet K of MP)

- **Identify the responsibilities** for monitoring and reporting emissions from the installation

Job title/post	Responsibilities
HSEQ deputy head of unit	Overall responsibility for Monitoring & Reporting, contact point for CA, personnel management, competence management, coordination with other units involved
Active shift manager	Tracking and documenting of well-functioning of the production process and regular reporting to other units
Measurement & Control head of unit	QA/QC of meaurement instruments
IT Solutions head of unit	IT system availability and security

- **Procedures**:

- procedure used for managing the assignment of responsibilities for monitoring and reporting within the installation and for managing the competencies of responsible personnel
- procedure used for regular evaluation of the monitoring plan's appropriateness, covering in particular any potential measures for the improvement of the monitoring methodology.
- procedures used to manage data flow activities
- procedures used to assess inherent risks and control risks – **Risk Assesment document**
- procedures used to ensure quality assurance of measuring equipment
- Please provide details about the procedures used to ensure quality assurance of information technology used for data flow activities
- …..

III. MONITORING PLAN – Other requirements

- **For calculated based approach**


RAAD VOOR ACCREDITATIE

Inrolab Services B.V.
Laboratory
Oud-Beijerland

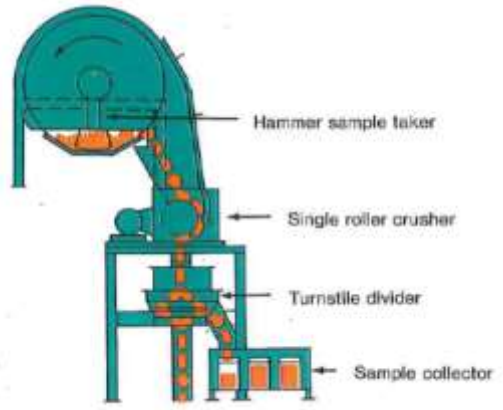
L 050

1 December 2017

11 November 1993

Procedures for fuel analyses : - applicable if you have you own laboratory for this analyses
- Accredited laboratory in Rotterdam
- Accreditation – ISO\IEC 17025:2005

- **Procedure for the sampling plans for the analyses**



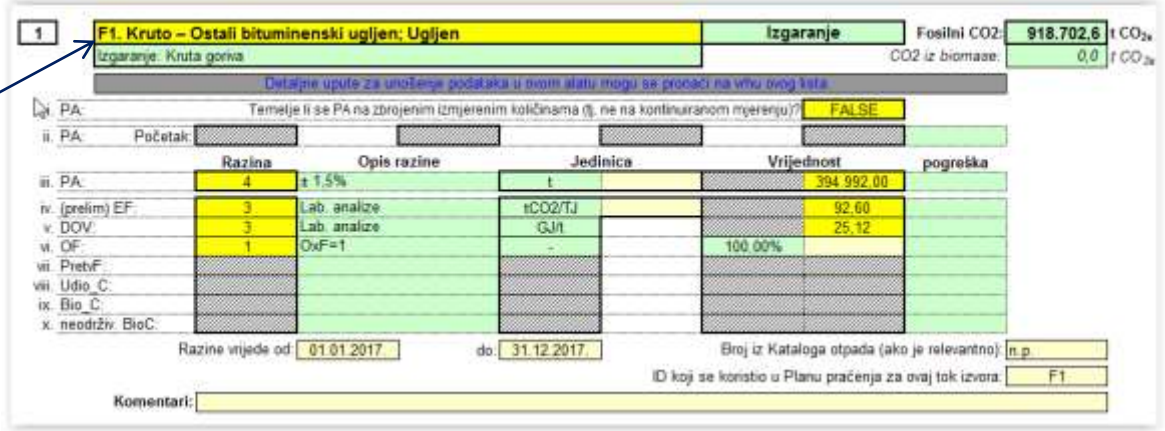
- **Procedure used to estimate stocks** at the beginning/end of the reporting year
  - Only if the measuring metod of fuel **is batch!**

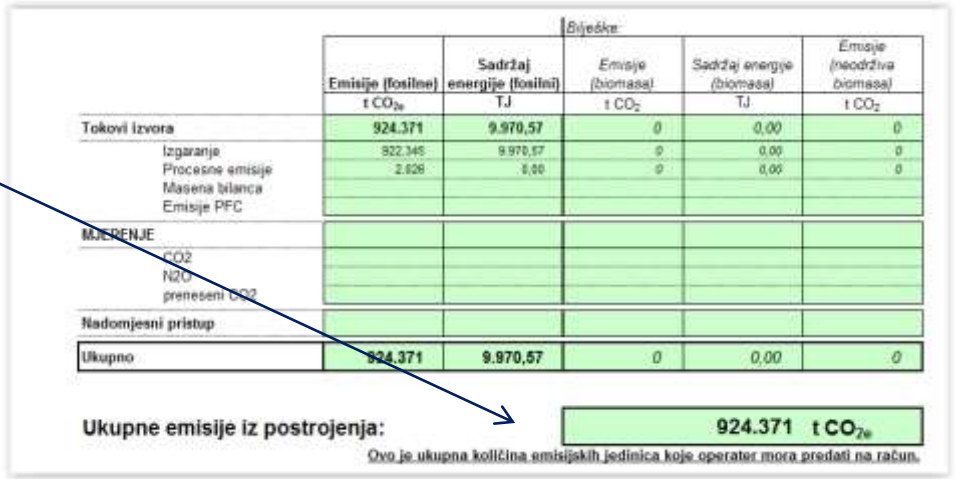
IV. VERIFICATION AND REPORTING – Annual emission report

- **Annual emission report**, excell form

CONTENT:

- A. Identification: Operator, Installation and Verifier
- B. Installation Description
- C. Source Streams (LO,DO,Limestone, Coal)
- H. Additional information (production MWh, changes in the instalation)
- I. Summary – Total annual emissions





IV. VERIFICATION AND REPORTING – Verification report

- **Verification**

What does the verifier do?

I. Check if EU ETS requirements are met? (GHG permit issued, MP approved)

II. Check if monitoring emissions are according to MP? (procedures,dana flow..)

III. Check if calculating emissions is according to MP? (calculating by himself)

IV. Check if required tiers for every source streams (dana quality leves) are achieved

example: COAL **- Fuel**, uncertainty of MI is whithin the ±1.5%, documents related to coveyor belt scale…

- NCV,EF - procedure for sampling plan,all coal analysis, laboratory accreditation …

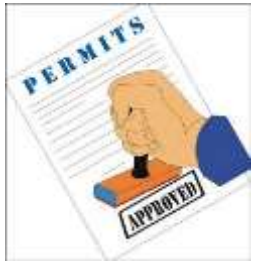
- OF =1

IV. Site visit – Measuring instruments, fuel tanks...

V. Check if annual emission report is filled properly

……

If everything is ok ⟶ Verification report

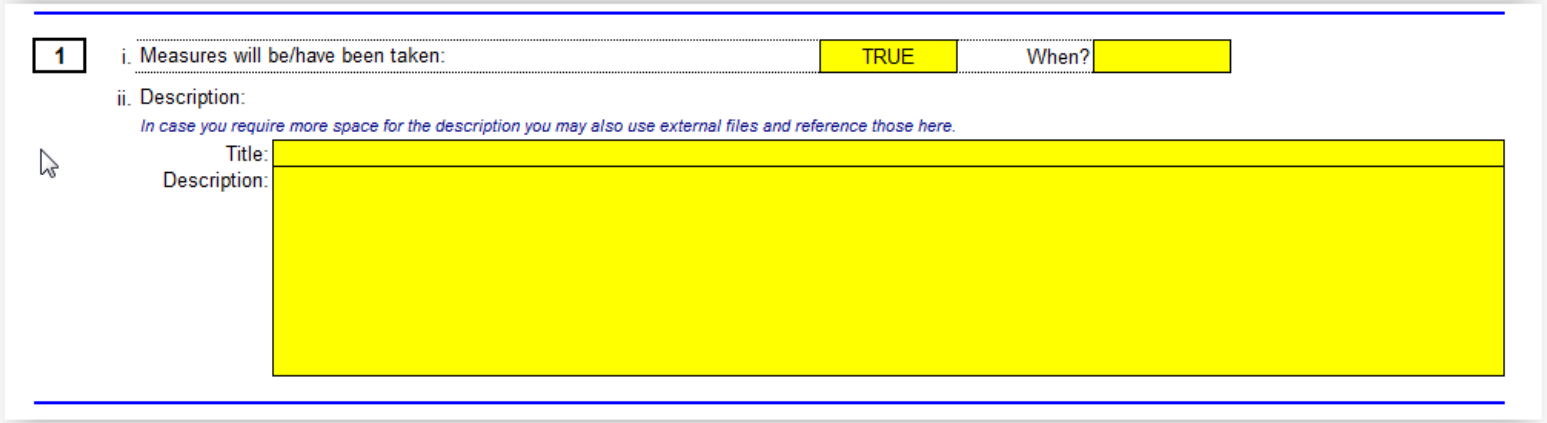


IV. VERIFICATION AND REPORTING – Improvement report

- **Improvement report**

Where the verification report established ***any non-conformities or recomendation of improvements*** , the operator shall submit to the competent authority an improvement report for approval.

This report has to be submitted by 30 June of the year in which that verification report is issued by the verifier.



Category C instalation - must submitt the improvement report every year ! (even if no non-conformities or recomendation of improvements are found during the verification)

V. TRADING, COSTS

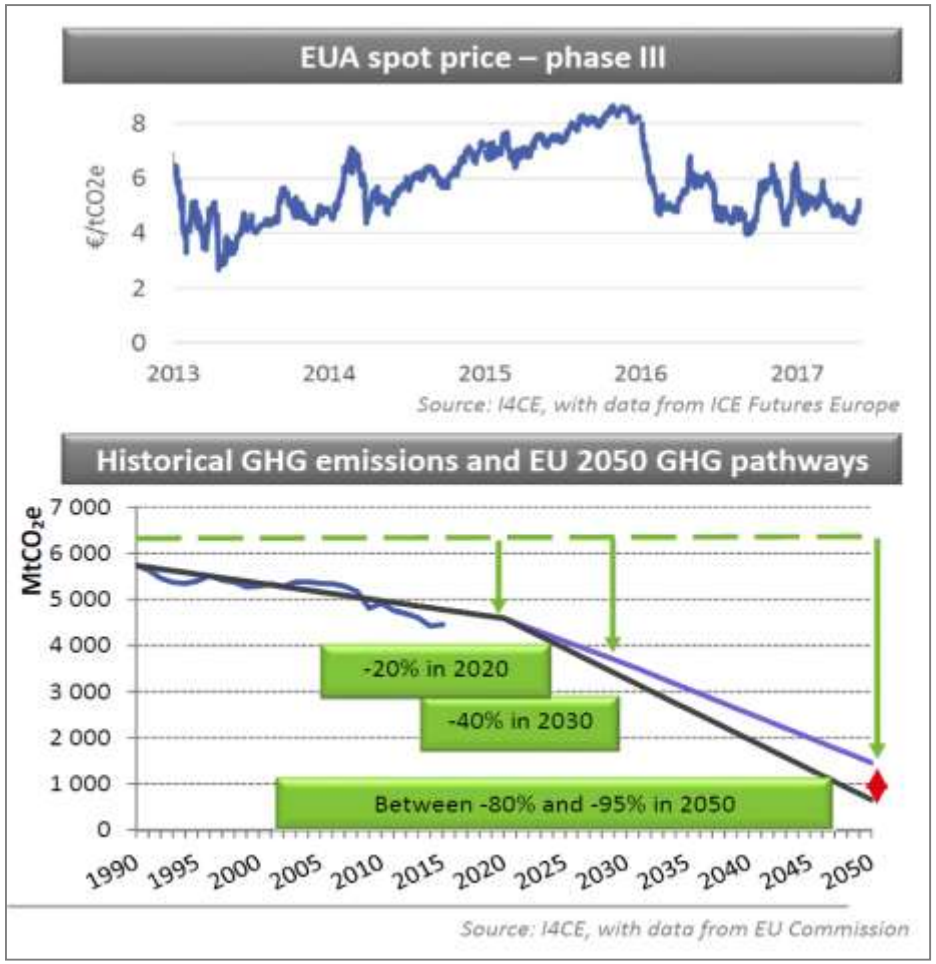
- HEP d.d. - appointed HEP Trade d.o.o. for GHG emission trading and managing the Account in EU Registry
  - buying EUA for every TTP in HEP group and surrender allowences in time

WHEN?	WHO?	WHAT
February-March	Verifier	Verification of annual emission on site
31.March	Authorised representative of the Account	Entering dana about CO2 emission for the previos year
31. March	Verifier	Enter verified emissions figure in the verified emissions table in Registry
30.April	Authorised representative of the Account	Surrender allowances
31.December	Account owner	Confirming the autenticity of all account dana

V. TRADING, COSTS

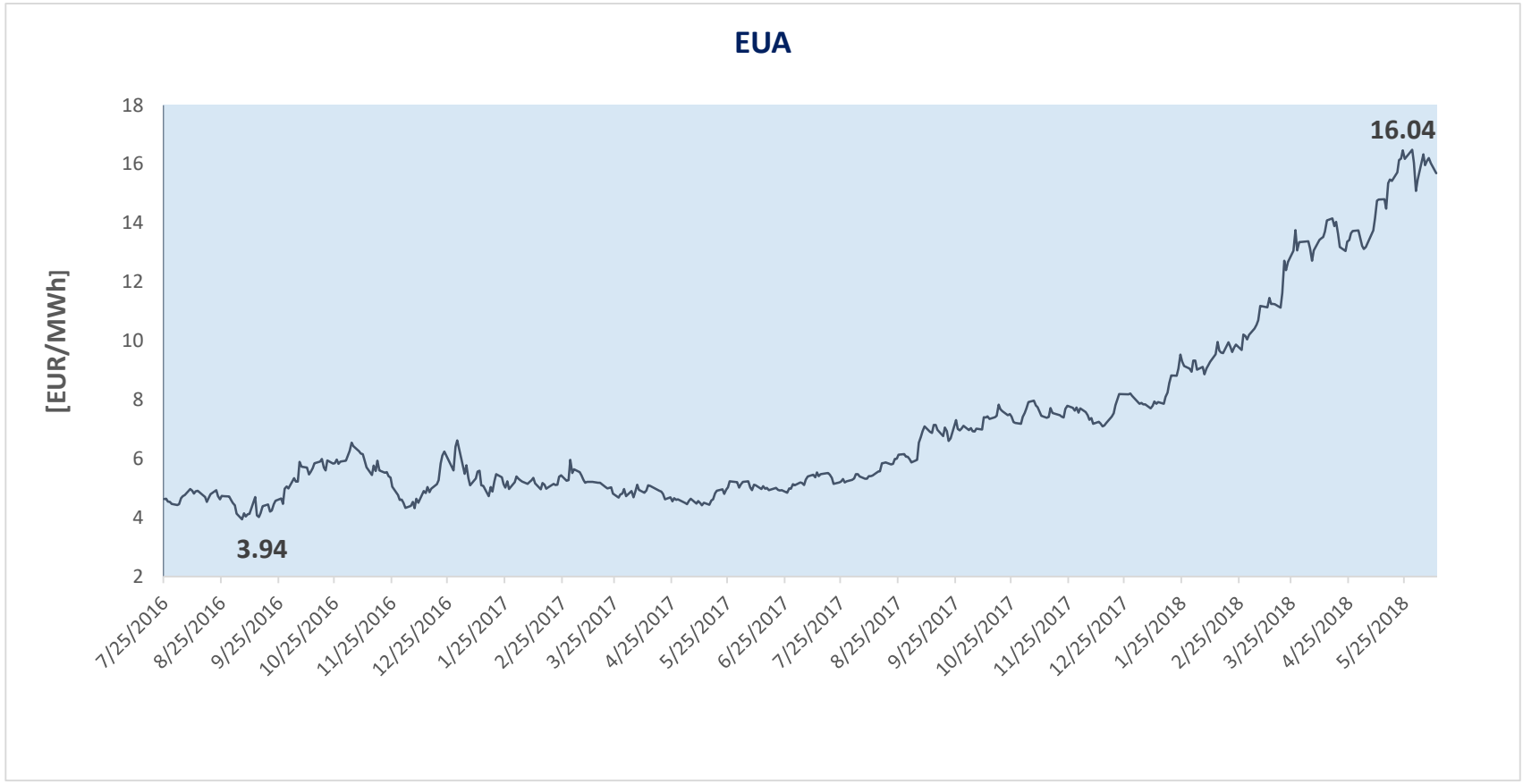
- EUA Price 2006. – 2016.

The evolution of the EU carbon price: From a high of €29.20 in July 2008, at lunchtime today the price reached €3.91.



V. TRADING, COSTS

- EUA 2016. - 2018. (*HEP Trade),
- 25/05/2018 – Price : 16,04 EUR ↑



V. TRADING, COSTS

- **TP Plomin CO2 emissions, 2013 - 2017**

Year	TPP1	TPP2	TPP Plomin
2013	788 766	1 396 827	2 185 593
2014	734 550	1 417 565	2 152 115
2015	797 450	1 233 310	2 030 760
2016	847 420	1 409 891	2 255 311
2017	306 432	924 371	1 230 803

- **EUA costs for TP Plomin, 2013 - 2017**

Year	TPP1 / EUR	TPP2 / EUR	TPP Plomin / EUR
2013	3,447,464.95	6,148,382.34	9,595,847.29
2014	4,229,997.64	8,290,917.75	12,520,915.39
2015	5,122,162.12	7,921,563.89	13,043,726.01
2016	5,162,177.08	8,608,867.00	13,771,044.08
2017	1,895,377.41	9,173,351.88	11,068,729.29

Thank you !