AgroBioHeat

Promoting the penetration of agrobiomass heating in European rural areas

D5.4: Technical recommendations for agrobiomass emission & efficiency limits for the Ecodesign Regulation review

Lead Beneficiaries

Bioenergy Europe

CERTH
CENTRE FOR RESEARCH & TECHNOLOGY HELLAS

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Deliverable Factsheet	
Full title	Report with technical recommendations for agrobiomass emission & efficiency limits
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Ecodesign Regulation 2015/1189

Ecodesign Regulation 2015/1189

COMMISSION REGULATION (EU) 2015/1189 of 28 April 2015 implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to ecodesign requirements for solid fuel boilers

- Establishes Ecodesign requirements for placing on the market and putting into service solid fuel boilers with a rated heat output of **up to 500 kW**
- **Compulsory fulfilment by 1st January 2020** (for new boilers sold in the market)
- For solid biomass boilers, applicable only to **woody biomass; non-woody biomass is out of scope**

Feeding Method	Nominal heat output	Seasonal space heating energy efficiency	Seasonal space heating emission limits (mg/m³ at a 10 % oxygen concentration)			
			Carbon Monoxide, CO	Organic Gaseous Compounds, OGC	Particle Matter , PM	Nitrogen Oxides, NOx
Manual	≤ 20 kW	≥ 75 %	700	30	60	200
	> 20 kW	≥ 77 %				
Automated	≤ 20 kW	≥ 75 %	500	20	40	
	> 20 kW	≥ 77 %				
Benchmarks for Best Available Techniques (BATs)		90 % condensing 84 % non-condensing	6	1	2	97

Note: At the time of entry into force of the Regulation, no single solid fuel boiler was identified meeting all the benchmark values. Several solid fuel boilers met one or more of these values.

Definitions of woody and non-woody biomass in Ecodesign Regulation

Article 2 / Definitions

- ‘biomass’ means the biodegradable fraction of products, waste and residues from biological origin from agriculture (including vegetal and animal substances), forestry and related industries including fisheries and aquaculture, as well as the biodegradable fraction of industrial and municipal waste;
- ‘woody biomass’ means biomass originating from trees, bushes and shrubs, including log wood, chipped wood, compressed wood in the form of pellets, compressed wood in the form of briquettes, and sawdust;
- ‘non-woody biomass’ means biomass other than woody biomass, including straw, miscanthus, reeds, kernels, grains, olive stones, olive cakes and nut shells;

Potential issue for agrobiomass:

- The definition of “woody biomass” includes wood of non-forest, agricultural origin (e.g. orchard prunings) that often has different properties (e.g. higher ash, higher nitrogen content) from the forest wood biomass used for the production of graded wood pellets (ISO 17225-2), graded wood briquettes (ISO 17225-3) and graded wood chips (ISO 17225-4)

Preamble / justification for non-woody biomass exclusion

"Non-woody biomass boilers are exempted, because at present there is insufficient European-wide information to determine appropriate levels for the ecodesign requirements for them and they may have further significant environmental impacts, such as furan and dioxin emissions. The appropriateness of setting ecodesign requirements for non-woody boilers will be reassessed when reviewing this Regulation."

Article 7 / Review

1. The Commission shall review this Regulation in the light of technological progress and present the result of that review to the Consultation Forum no later than 1 January 2022. In particular, the review shall assess whether it is appropriate:
   a) **to include solid fuel boilers with a rated heat output of up to 1 000 kilowatt;**
   b) **to include non-woody biomass boilers, with ecodesign requirements for their specific types of pollutant emissions;**
   c) to set stricter ecodesign requirements beyond 2020 for energy efficiency and for emissions of particulate matter, organic gaseous compounds and carbon monoxide; and
   d) to vary the verification tolerances.
2. The Commission shall review whether it is appropriate to introduce third party certification for solid fuel boilers and present the result of that review to the Consultation Forum no later than 22 August 2018.

The AgroBioHeat approach regarding Ecodesign Review

AgroBioHeat position on Ecodesign Review

Revised Ecodesign Regulation for solid fuel boilers

Option 1 / non-woody biomass continues to be out of scope

- Business as Usual, but…
- … heavy discussion on air quality across Europe
- → member-states or regional / local authorities may be prompted to take (non-informed) action on their own (see Northern Italy example of banning sales of wood pellets A2 quality)

Option 2 / adoption of very strict / unrealistic non-woody biomass emission limits

- Market is “killed”: agrobiomass boilers become impossible to install or require very expensive air emission control measures

Option 3: Ecodesign adopts informed emission limits for agrobiomass boilers

- Possible to be met with modern installations and appropriate fuels
- Manufacturers that have already worked in this direction have a head start
- Time is given to manufacturers to comply with the new requirements

  Example: for wood boilers, a 5-year period was provided from adoption of the Ecodesign Regulation in 2015 till compliance for new products that enter the market is mandatory by 2020

The AgroBioHeat approach for Ecodesign Regulation review (I)

AgroBioHeat intends to influence the process of the review of the Ecodesign Regulation by proposing “informed” emission limits for agrobiomass / non-woody biomass boilers. Several project activities have produced data based on which the “informed” emission limits / AgroBioHeat recommendations will be drafted:

1. Test results using different agrobiomass fuels with different, state-of-the-art biomass boilers (< 1,000 kW)

- The test procedure follows the EN303-5 standard for biomass boiler testing
- The purpose is to evaluate the technical feasibility of meeting the current emission limits for woody biomass fuels in appliances already available on the market
- A public summary of the test results is presented by BIOS in the following section

The AgroBioHeat approach for Ecodesign Regulation review (II)

AgroBioHeat intends to influence the process of the review of the Ecodesign Regulation by proposing "informed" emission limits for agrobiomass / non-woody biomass boilers. Several project activities have produced data based on which the "informed" emission limits / AgroBioHeat recommendations will be drafted:

2. Organization of workshops and direct contacts with boiler manufacturers & other stakeholders

- Two dedicated virtual workshops were organized on 15 November 2021 (closed, invitation-only) and on 19 May 2022 (open)
- The purpose is to have a preliminary assessment of the stakeholders' opinions and potential market impact of the introduction of emission limits for agrobiomass
- In addition, opinions of several boiler manufacturers regarding potential emission limits for agrobiomass boilers were collected through a technology survey contacted by CERTH
- A public summary of the results is presented by Bioenergy Europe and CERTH in a following section

AgroBioHeat

Promoting the penetration of agrobiomass heating in European rural areas

AgroBioHeat test results regarding agrobiomass combustion in boilers below 1 MW

BIOENERGIESYSTEME GmbH

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Contents

Boiler testing within AgroBioHeat – objectives

- **AgroBioHeat project - Task 4.2: Operational compliance for Ecodesign**
- **Objective**
  - Investigate the emissions and efficiencies of selected small-scale (<500 kW_{th}) agrobiomass heating systems during test stand tests
  - Thereby consider the upcoming review of the Ecodesign regulation for biomass combustion equipment

Relevant aspects associated with agrobiomass combustion (I)

- Agrobiomass fuels typically show (compared with chemically untreated woody biomass) significantly **higher contents of certain elements/species**, which **may cause problems during combustion**
- **Nitrogen (N)**
  - Elevated NO_x emissions
  - Emission limit according to **Ecodesign** for wood fuels:
    - **200** mg/Nm³ (as NO_2, related to dry flue gas and 10 vol% O_2)
  - Emission limit according to the **MCP (Medium Combustion Plant) Directive** for plant capacities of 1-5 MW
    - existing plants: **650 mg/Nm³** (as NO_2, related to dry flue gas and 6 vol% O_2) corresponds with about 480 mg/Nm³ related to 10 vol% O_2
    - new plants: **500 mg/Nm³** (as NO_2, related to dry flue gas and 6 vol% O_2) corresponds with about 370 mg/Nm³ related to 10 vol% O_2

Relevant aspects associated with agrobiomass combustion (II)

- **Sulphur (S)**
  - Elevated SO_x emissions
  - Ecodesign Regulation: no emission limit defined
  - Emission limit according to the MCP Directive (1-5 MW)
    - existing and new plants: **200 mg/Nm³** for all fuels else than wood
      for straw: **300 mg/Nm³** (as SO_2, related to dry flue gas and 6 vol% O_2)
  - Certain risk for low temperature corrosion (acid dew point corrosion)
- **Chlorine (Cl)**
  - Elevated HCl emissions
    - no limit values defined in the Ecodesign Regulation and in the MCP Directive
  - Risk for elevated PCDD/F emissions
    - no limit values defined in the Ecodesign Regulation and in the MCP Directive
    - German limit value for small-scale combustion of agricultural fuels according to the 1.BImSchV (Federal Emission Control Act): 0.1 ng/Nm³ (at 13 vol% O_2).
  - Increased risk for high temperature and low temperature corrosion

Relevant aspects associated with agrobiomass combustion (III)

- **Ash content (in general)**
  - Deposit formation on boiler tubes
    ➔ reduced efficiency
    ➔ more boiler cleaning efforts
  - Elevated fly ash emissions
  - Risk for slagging and ash agglomeration on the grate and on furnace walls
    ➔ operational problems with the grate and the de-ashing system
    ➔ increased CO and OGC emissions due to streak formation in the fuel bed (disturbs the primary air distribution over the grate and the burnout in the secondary combustion zone)
- **Si and K contents**
  - Fine particulate matter emissions (formation of K-salts)
  - Reduced ash melting temperatures (due to K-silicates) which may lead to slagging problems

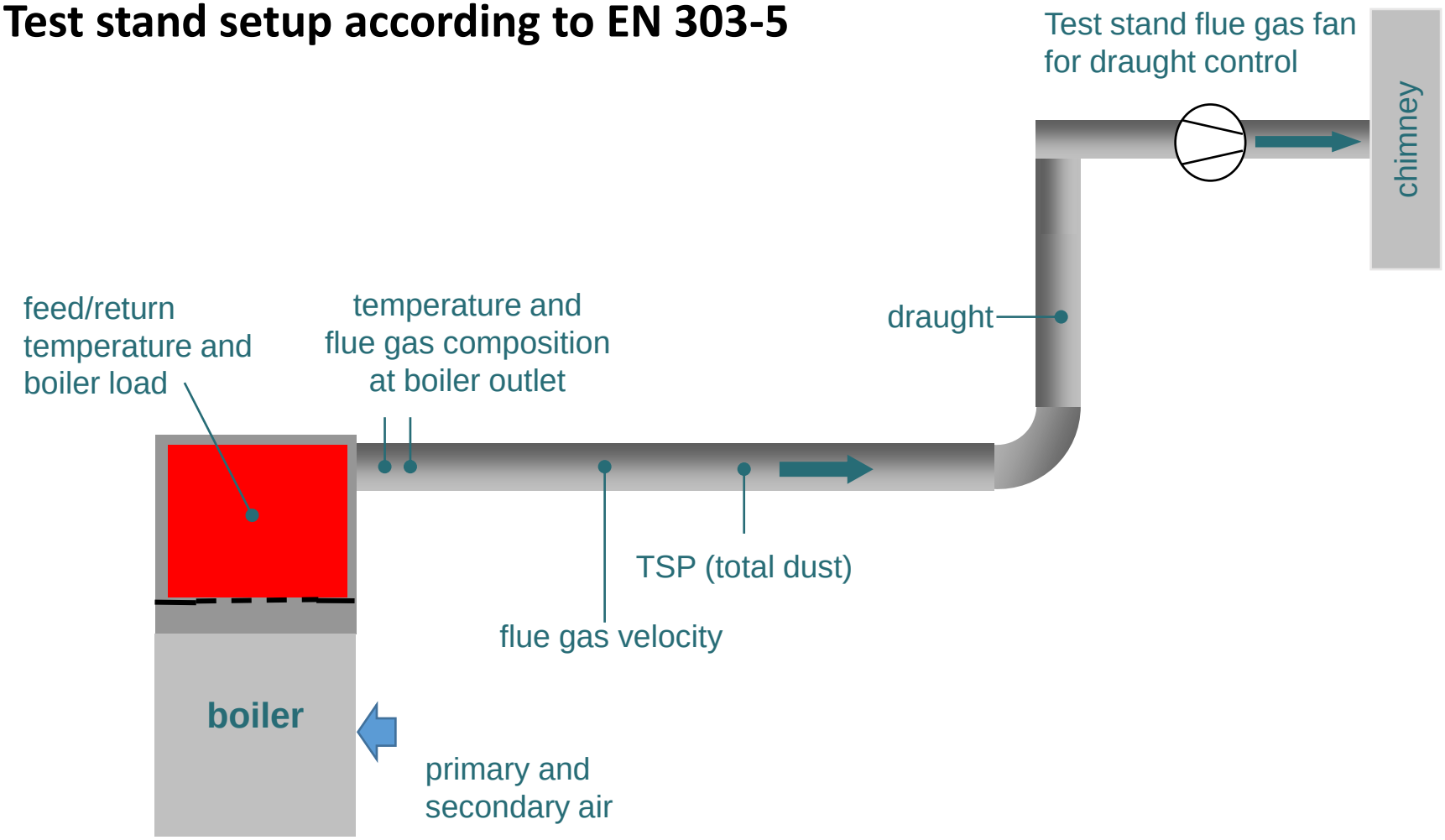
Methodology applied during boiler testing

Methodology – test stand tests (I)

- **General approach**
  - Different systems have been tested at three partners
    - State-of-the-art wood pellet and wood chip boilers have been selected
    - Some of the boilers are also commissioned for utilization of selected agrofuels
  - Different agrofuels have been tested at each boiler
  - Test runs at full and partial load (30 % of nominal load)
  - Operation stability, efficiencies and emissions (CO, OGC, NO_x, HCl, SO_x and particulate matter) have been assessed
  - Where applicable the test stand tests followed the specifications of boiler testing defined within EN303-5
  - Flue gas cleaning devices (e.g. ESPs) were coupled to the boilers when needed

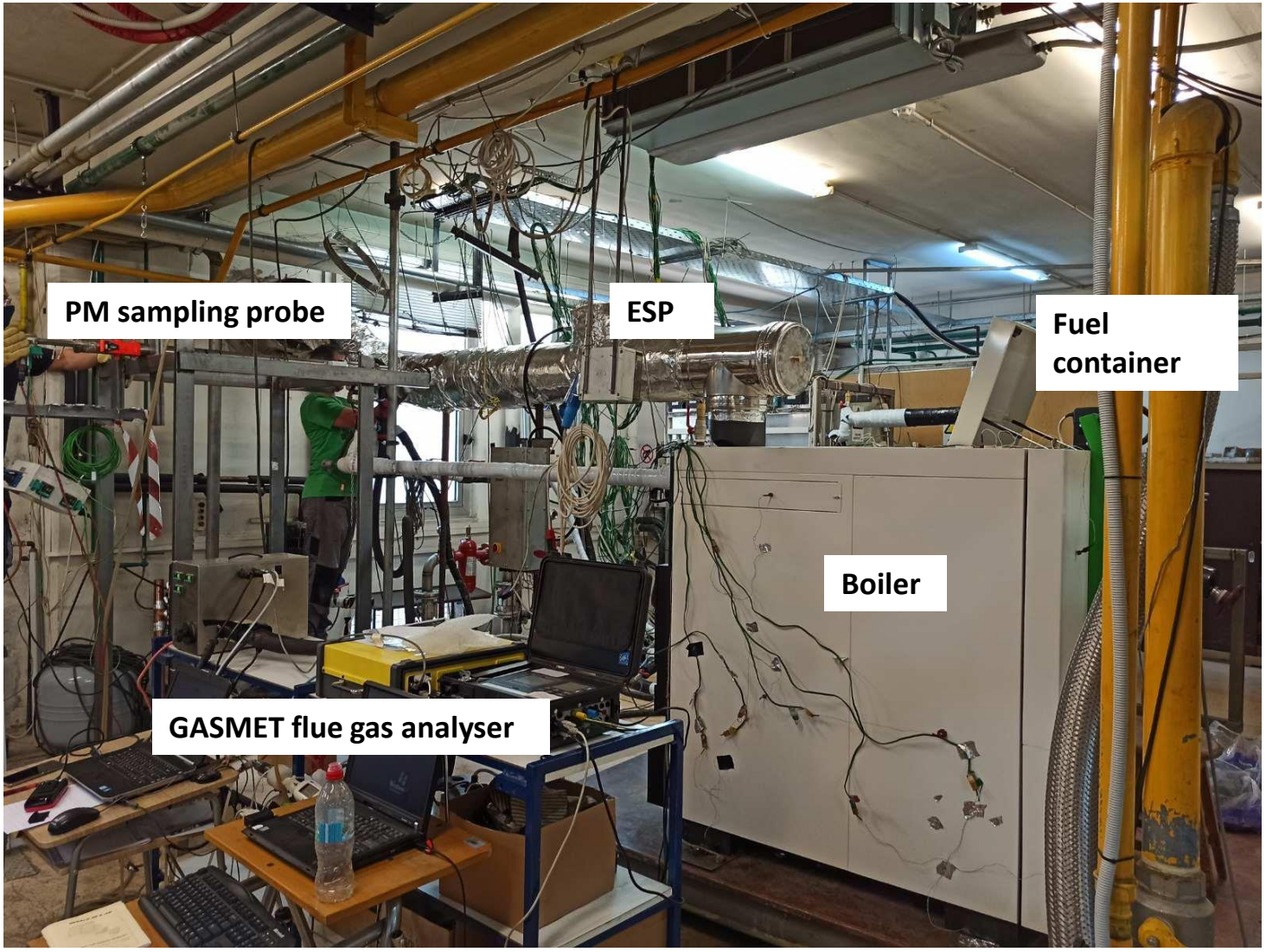
Methodology – test stand tests (II)

- **Test stand setup according to EN 303-5**



Methodology – test stand tests (III)

- **Test stand at CERTH**



Methodology – test stand tests (IV)

- **Discontinuous sampling and measurements**
  - Fuel sampling and subsequent chemical analyses
  - Grate ash sampling and subsequent chemical analyses
  - Filter ash (if applicable) sampling and subsequent chemical analyses
  - Total particulate matter emissions (at least 3 measurements per test run)
  - HCl and SO_x emissions
    (e.g.: according to VDI 3480, Sheet 1 resp. EN14791 - at least 3 measurements per test run)
  - During selected test runs: PCDD/F (acc. to EN 1948)
- **Continuous measurements**
  - Heat output
  - Flue gas temperature at boiler outlet
  - Flue gas emissions (moisture content, O_2 and/or CO_2, CO, NO_x, OGC)

Boilers and agrobiomass fuels tested

Boilers tested

Partner	Technology	Additional ESP	Nominal capacity	Agrobiomass Fuels
Boiler 1	Extremely staged fixed-bed combustion	No	50 kW	1. Short Rotation Coppice chips 2. Sunflower husk pellets 3. Agro-pellets 4. Maize cobs
Boiler 2	Moving grate	Yes	50 kW	1. Maize residues 2. Miscanthus (chopped) 3. Olive stones
Boiler 3	Moving grate	Yes	135 kW	1. Olive stones 2. Sunflower husk pellets 3. Olive tree prunings
Boiler 4	Moving grate	Yes	60 kW	1. Wheat straw pellets 2. Sunflower husk pellets 3. Miscanthus
Boiler 5	Moving grate	Yes	50 kW	1. Olive stones 2. Almond shells 3. Vineyard pruning pellets
Boiler 6	Sliding grate	No	20 kW	1. Almond shells 2. Olive stones

Agrobiomass Fuels tested (I)

Sunflower husk (SFH) pellets

Tested at
- Boiler 1
- Boiler 3
- Boiler 4

Olive stones

Tested at
- Boiler 2
- Boiler 3
- Boiler 5
- Boiler 6

Miscanthus

Tested at
- Boiler 2
- Boiler 4

Almond shells

Tested at
- Boiler 5
- Boiler 6

Agrobiomass Fuels tested (II)

Poplar chips

Tested at
- Boiler 1

Agropellets

Tested at
- Boiler 1

Maize cobs

Tested at
- Boiler 1
- Boiler 2

Olive tree pruning pellets

Tested at
- Boiler 3

Agrobiomass Fuels tested (III)

Vineyard pruning pellets

Tested at
- Boiler 5

Wheat straw pellets

Tested at
- Boiler 4

Fuels tested (IV)
Selected fuel analyses results

		moisture wt% w.b.	ash wt% d.b.	N wt% d.b.	S mg/kg d.b.	Cl mg/kg d.b.	K mg/kg d.b.
Poplar chips	**Boiler 1**	21.3	**2.1**	**0.36**	320	53	**2,815**
Olive stones	**Boiler 2**	12.4	0.6	0.11	100	236	1,610
Olive stones	**Boiler 3**	12.6	0.9	0.20	120	180	**3,825**
Olive stones	**Boiler 5, 6**	14.4	0.6	0.19	90	150	**2,499**
SFH pellets	**Boiler 1**	11.6	**2.9**	**0.66**	**1,245**	327	**8,680**
SFH pellets	**Boiler 3**	10.5	**4.1**	**1.02**	**1,370**	**650**	**14,111**
SFH pellets	**Boiler 4**	11.1	**3.2**	**0.79**	**1,500**	**900**	**7,300**
Agropellets	**Boiler 1**	12.4	**5.8**	**0.93**	**1,735**	**895**	**10,025**
Miscanthus	**Boiler 2**	12.4	**1.9**	0.17	396	**483**	**3,305**
Miscanthus	**Boiler 4**	14.6	**2.2**	0.25	400	**1,500**	**3,600**
Wheat straw pellets	**Boiler 4**	8.3	**5.0**	**0.61**	**1,000**	**1,500**	**11,000**
Maize cobs	**Boiler 2**	12.4	**2.0**	**0.30**	275	**2,960**	**10,200**
Almond shells	**Boiler 5,6**	13.3	**1.5**	**0.30**	110	40	**8,460**
OTP pellets	**Boiler 3**	6.5	**5.6**	**1.04**	**720**	**600**	**11,200**
VYP pellets	**Boiler 5**	10.9	**3.5**	**0.66**	**440**	130	**7,525**
Softwood	**Database**		0.24 - 1.21	0.08 - 0.23	43 - 223	8 - 128	240 – 1,700
Class A1 pellets	**Database**		0.28 - 0.7	0.06 - 0.21	<150	<60	372 - 680

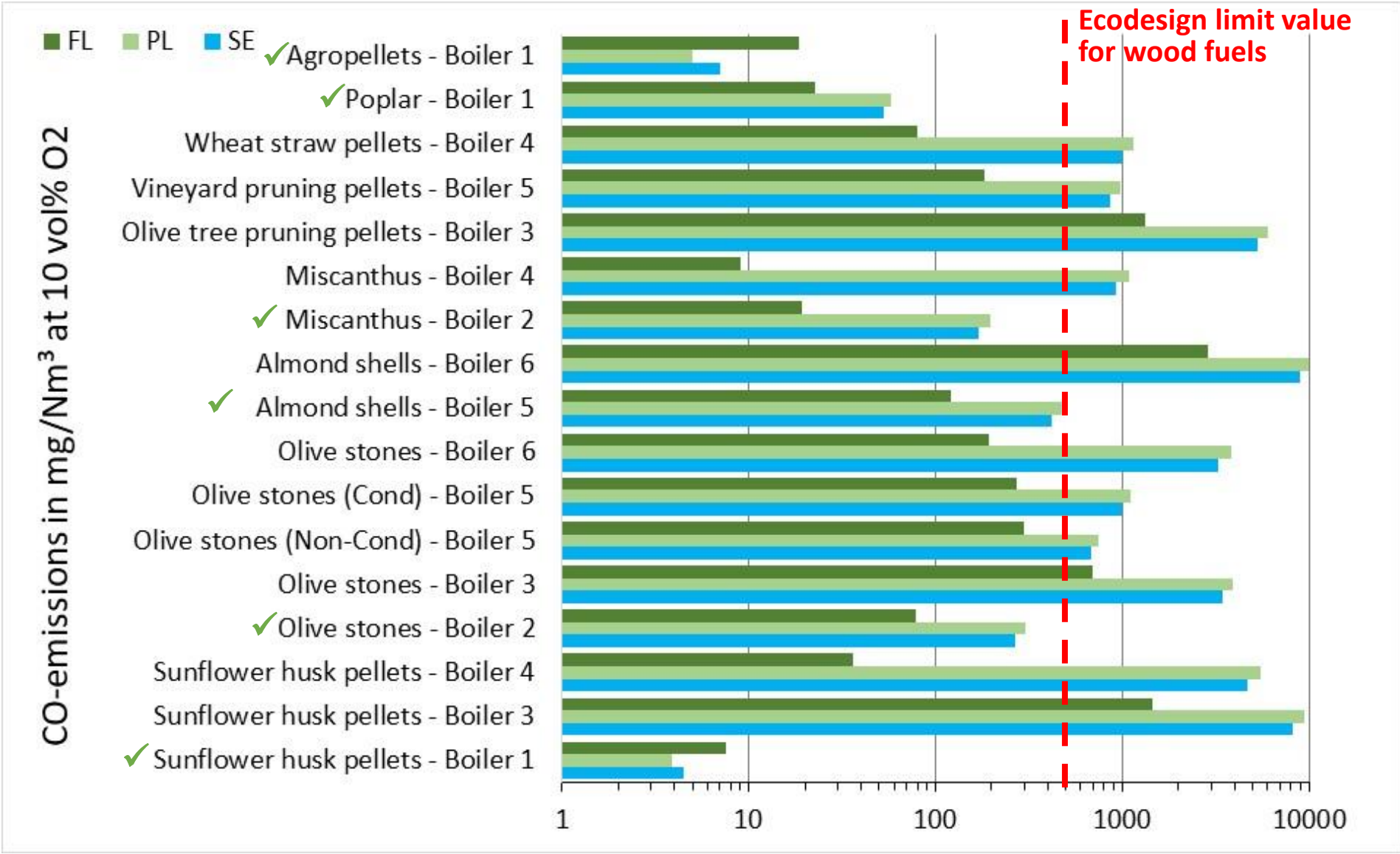
Explanations: w.b. … wet basis; d.b.… dry basis; SFH … sunflower husk; OTP … olive tree prunings; VYP … vineyard prunings; **Bold numbers**: value exceeds the typical range of wood fuels; Grey cells: database values for wood fuels taken from the fuel database at BIOS BIOENERGIESYSTEME GmbH, Graz (AT)

Results of the test runs

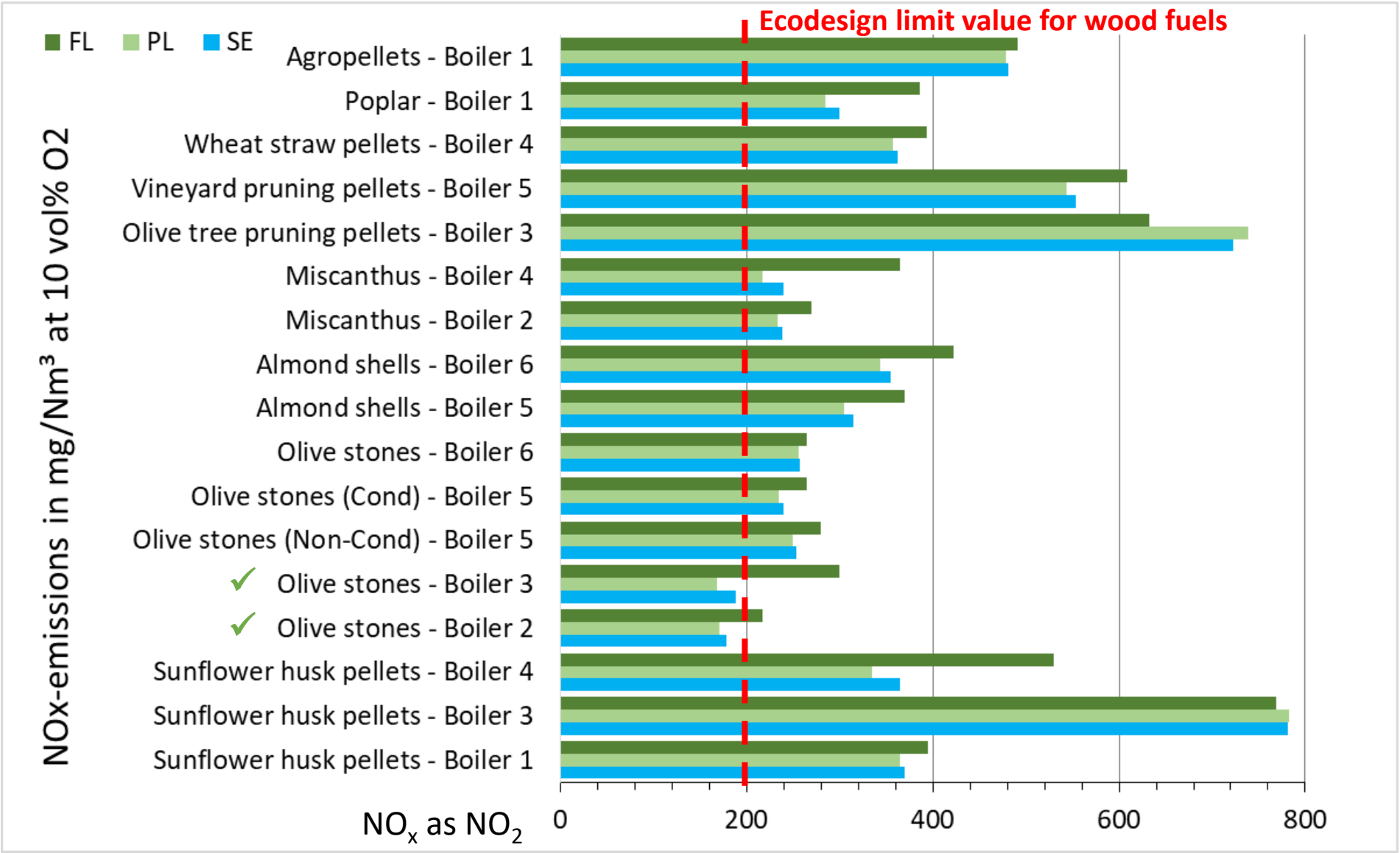
Test run results – general issues and emissions

- **No major problems** regarding the **general operation/function** (fuel feeding, de-ashing, ash melting) of the different boilers when fed with the agrobiomass fuels tested have been reported
- On the next slides the result of the test runs regarding gaseous and particulate emissions are summarized and compared with the Ecodesign limit values for wood fuels.
- FL … Full load
  PL … Partial load (30%)
  SE … Seasonal emissions = 0.85 * E_{PL} + 0.15 * E_{FL}
- All emissions related to dry flue gas and 10% O_2

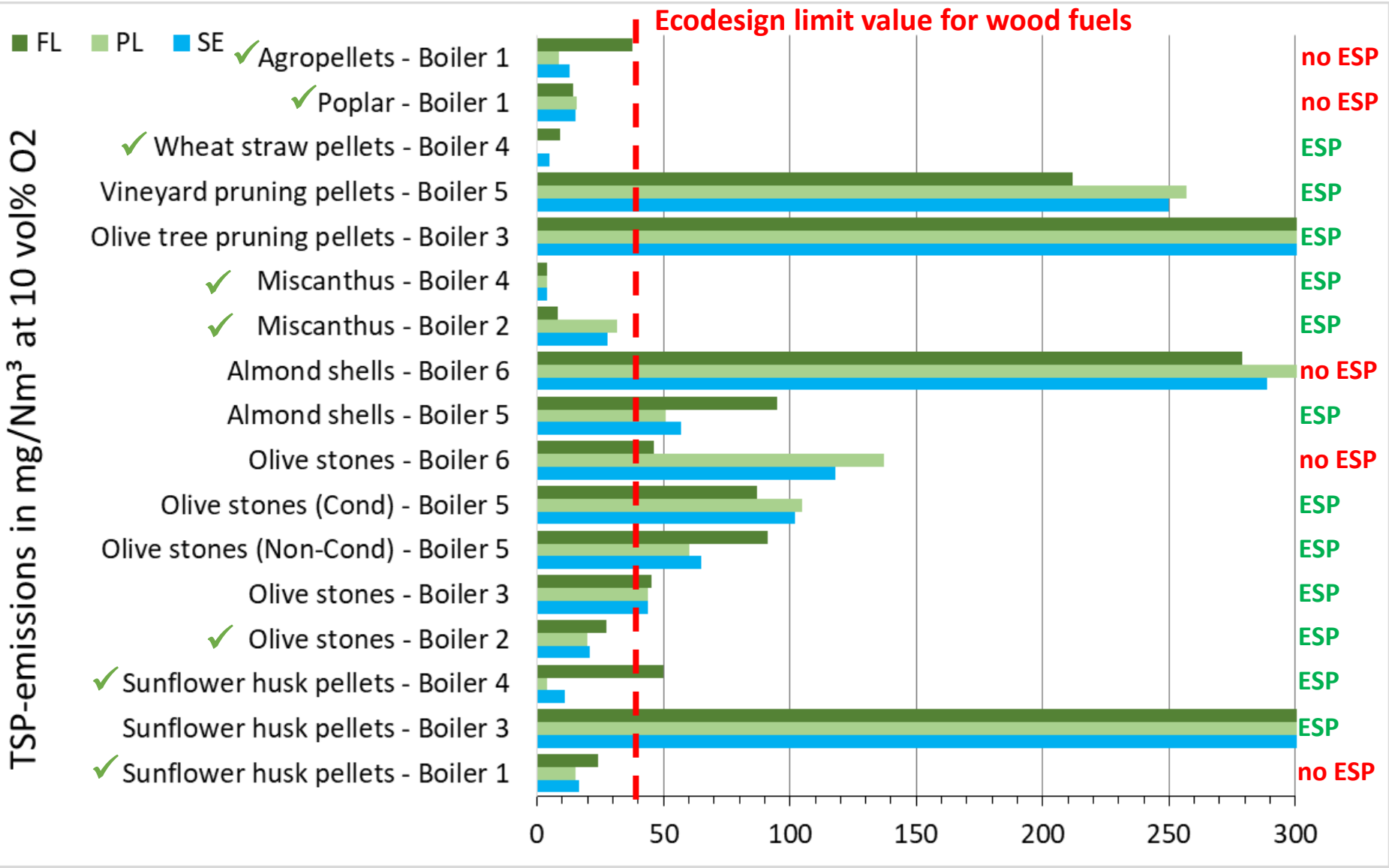
Results of the testing campaigns – CO emissions



Results of the testing campaigns
NO_x emissions



Results of the testing campaigns – TSP emissions



Summary and conclusions

Summary & conclusions- general operation

- Even though significant performance differences of the different boilers tested have occurred, the following general aspects can be derived from the test runs
  - No problems with fuel feeding and de-ashing
  - No significant problems with ash melting
  - Depending on the bulk density (resp. energy density) of the fuel, somewhat varying power output compared to operation with wood chips/pellets

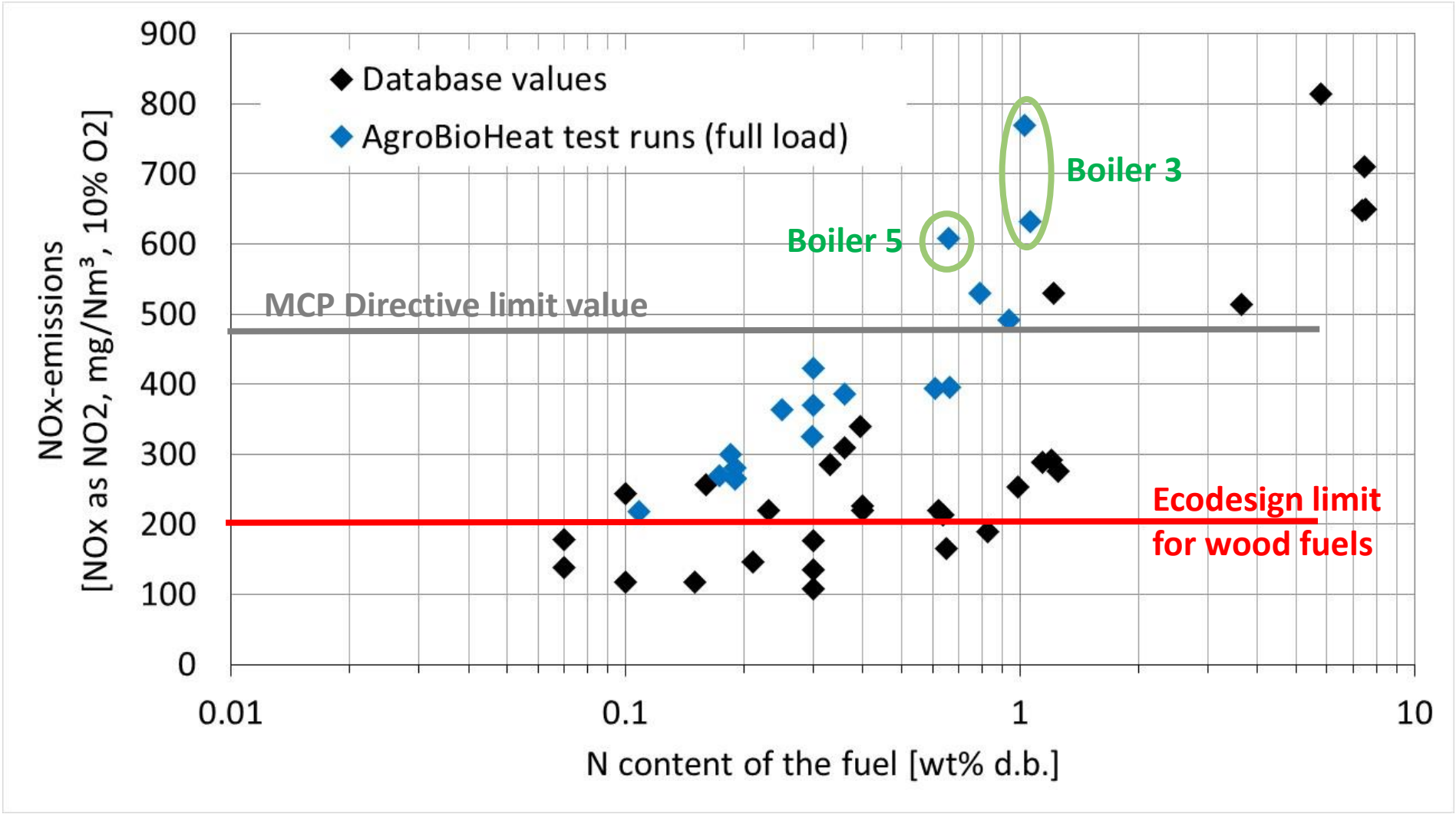
Summary & Conclusions – CO emissions

- **Boiler 1** and **Boiler 2** as well as **Boiler 5** (for almond shells):
  Ecodesign **CO and OGC emission limits (for wood fuels) could be kept** without any need for adaptations/optimisation of the boiler

- **Boiler 4, Boiler 5 and Boiler 6** (remaining fuels)
  Ecodesign emission limits **regarding CO were exceeded**
  - At full load the **emission limits were kept**
    (except for boiler 6 with almond shells)
  - At **partial load generally** higher emissions occurred
  - As a consequence of the 85% weighing of partial load in the calculation of the seasonal emissions, the bad partial load operation hinders to keep the Ecodesign limit values
  - Optimized air staging at partial load and an improved combustion control are expected to solve this problem in most cases

- **Boiler 3** showed the highest CO emissions. This technology needs significant improvements in order to keep the Ecodesign emission limit for CO and OGC

Summary & conclusions- NO_x emissions (I)



Database values derived from the BIOS-internal test run database

Summary & conclusions- general operation and NO_x emissions (II)

- With the exception of olive stones, **NO_x emissions of all boilers exceed the Ecodesign emission limit value** for wood fuels
- The high NO_x emissions are mainly due to the **elevated N-contents of the fuels**
- However, **test runs with Boiler 3 utilizing sunflower husk pellets and olive tree prunings** do not follow the general trends regarding N content of the fuels and NO_x emissions. Since also the test runs with olive stones show comparably high NO_x emissions it can be assumed that the air staging concept of the boiler needs to be improved.
- At **Boiler 5 vineyard prunings** show somewhat higher NO_x emissions than expected due to the N content of the fuel
- With the exceptions mentioned above, all boilers showed **NO_x emissions close to or below** the limit value of the **EU-MCP Directive** of 650 mg/Nm³ at 6 vol% O_2 resp. about **480 mg/Nm³** at 10 vol% O_2

Summary & conclusions- PM emissions

- Most of the fuels tested show **elevated ash and especially K contents** leading to **increased inorganic particulate emissions**. Therefore, for most of the fuels tested for conventional boilers an **ESP is mandatory**.
- **Boiler 1** however can utilize also these fuels **without any need for an ESP**
- **Not all ESP models tested turned out to be suitable** for PM separation during agrobiomass combustion as most of them have been developed for wood combustion.
  Consequently, also the **filters and their settings** (voltage, current, frequency of automated cleaning cycles) have to be adapted to the needs of the respective agrobiomass.
- **However, PM emission results have to be treated with care.**
  In cases of bad gas phase burnout (high CO and OGC emissions) high amounts of carbonaceous PM (organic particles and soot) may be emitted which significantly increases the total PM emissions and also reduces the precipitation efficiency of ESPs.
  However, when the CO and OGC emissions levels to fulfill the Ecodesign requirements are kept, these carbonaceous PM plays a minor role.

Summary & conclusions- Other parameters

- In general, the **boiler efficiencies** were comparable with those achieved during the combustion of wood fuels in the same boilers
  (not shown in the presentation)
- During the test runs with **miscanthus at boiler 2**, additionally the **PCDD/F emissions** have been determined.
  - **Total PCDD/F emissions** (gas and solid phase): **0.004 and 0.007 ng/Nm³** (toxicity equivalents - TE, related to dry flue gas and 13 vol% O_2)
  - For comparison: German limit value for application of agricultural fuels in residential scale boilers: 0.1 ng/Nm³ TE (acc. to 1. BImSchV)
  - From that result it can be concluded that elevated PCDD/F-emissions seem not to be an issue as long as a good gas phase burnout is achieved (low CO and OGC emissions as requested by Ecodesign)

Summary & conclusions

- The results of the test runs show that there are **biomass boilers on the market**, which **during operation with agrobiomass fuels** can **keep the CO, OGC and PM emission limits** for wood fuels of the current Ecodesign Regulation.
- Some of the boilers tested showed **elevated emissions during partial load** operation resulting in too high seasonal emissions of CO and OGC. However, this could in most cases be overcome by minor adaptations of the boilers and optimizations of the process control system.
- **Regarding NO_x emissions,** the approach in the latest version of EN303-5, e.g. **recalculating the NO_x emissions based on the fuel N-content and stating the recalculated value in the test report**, is supposed to be a meaningful option for agrobiomass fuels.
- **PM emissions** during agrobiomass combustion can be kept on a low level either by application of **novel low PM emission combustion technologies** (extremely staged combustion) or by the **application of ESPs**. However, the ESPs must be designed with respect to the particle loads and the characteristics of PM emissions (chemical compositions) from agrobiomass combustion.

AgroBioHeat

Promoting the penetration of agrobiomass heating in European rural areas

Thank you for your attention!

Contact information:

BIOENERGIESYSTEME GmbH

Visit us at: www.agrobioheat.eu Agrobioheat #AgroBioHeat AgroBioHeat

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Main results of workshops and direct contacts with stakeholders

"Closed" Online Workshop on 15 November 2021

- Targeted communication to boiler manufacturers (e.g. Bioenergy Europe members and other partner contacts)
- More than 40 registered attendees and high participation rate
- Aim: present initial AgroBioHeat recommendations and have an interactive discussion with agrobiomass boiler manufacturers

Agenda

Time	Subject	Speaker
14:00	Welcome and beginning of the workshop	Bioenergy Europe, tbc
14:10	Tour de table among participants	All participants
14:30	AgroBioHeat overview & general approach on Ecodesign Regulation 2015/1189 Review	CERTH, Manolis Karampinis
15:00	AgroBioHeat test results regarding agrobiomass combustion in boilers below 1 MW	BIOS, Thomas Brunner
15:45	Initial AgroBioHeat recommendations	CERTH, Manolis Karampinis
16:00	Open discussion	All participants
16:55	Closing remarks and next steps	Bioenergy Europe, Irene di Padua
17:00	End of workshop	-

"Open" Online Webinar on 19 May 2022

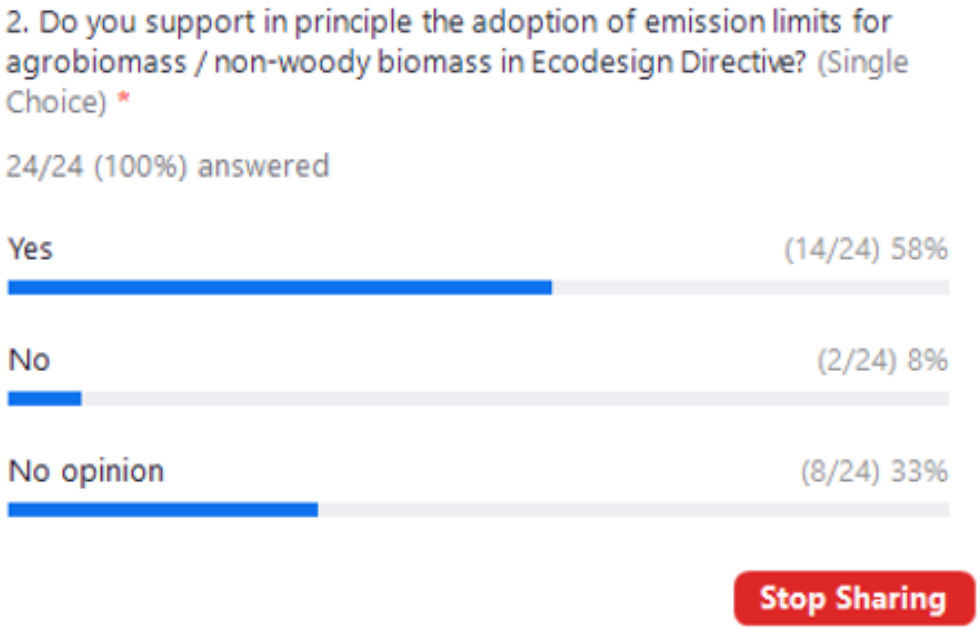
- Open event, advertised on Bioenergy Europe website, social media and newsletter
- Participation of key policy makers (European Commission)
- Aim: Present the updated recommendations of the project and have a high-level discussion

Agenda		
Time	**Subject**	**Speaker**
14:30	Welcome and opening	Bioenergy Europe, Irene di Padua
14:40	Overview on Ecodesign	European Commission, Bernardo Martinez
15:05	Presentation of the project results	BIOS, Thomas Brunner
15:25	Overview on project recommendations	CERTH, Manolis Karampinis
15:45	Roundtable with experts: LINKA, Thomas Gaardbo / Domusa, Jon Makibar / VÖK, Elisabeth Berger / DG ENER, Bernardo Martinez	Moderator: Irene di Padua Bioenergy Europe
16:45	Closing remarks	All participants
17:00	End of workshop	-

This project has received funding from the Horizon 2020 EU Framework Programme for Research and Innovation under Grant Agreement No 818369.

https://bioenergyeurope.org/events/11-events/317-agrobioheat-workshop-ecodesign.html

Ecodesign webinar - takeaways



Participants came from a wide variety of actors, but mostly:

- → Biomass Associations
- → Boiler manufacturers
- → Research & Academia

75% of them agreed that Agrobiomass has a **significant role in their activities**

And more than half said that <u>Ecodesign has a direct impact on that</u>

Ecodesign webinar – takeaways (II)

Participants and speakers agreed on the future increase of agrobiomass role

- Divergent opinion whether for heating or other purposes (energy and non-energy field)
- Need for increased mobilisation
- No need to extend Ecodesign to 1MW plants, better to lower MCP to 500kW

There are a few challenges ahead...

- Different type of agrobiomass so specificities need to be considered
- Small-scale (little fuel required) this can cause issues (emissions) but still feasible

…and opportunities

- Rural EU several opportunities for these applications to phase out fossil fuels
- Importance of the bottom up approach
- Dynamic market and R&D improvements

→ Overall optimism for the future of the sector

Final AgroBioHeat recommendations for Ecodesign Regulation Revision

Summary of views on Ecodesign Regulation revision

- The majority of the biomass boiler manufacturers with whom the project has interacted is in favour of the adoption of EU-wide emission limits for non-woody biomass fuels
- Harmonized emission limits through Ecodesign are also preferable to different emission limits on a national or even regional level
- As expected, manufacturers may disagree on the exact level of emission limits to be adopted
- Referring to established measurement methods and standards – especially EN 303-5 – is preferred over ad hoc formulations
- With some exceptions – e.g. the olive stone market in Spain and straw in Denmark – the agrobiomass heating market is still undeveloped. However, good prospects for further development are expected
- Considering these factors, AgroBioHeat has developed different options for the final recommendations regarding emission limits from agrobiomass / non-woody biomass boilers. It is envisaged that these will be the main starting point for the impact assessment study to be launched by the European Commission as part of the Ecodesign Regulation review process

AgroBioHeat recommendations (I)

Differentiate forest woody and agricultural woody biomass

- Several agricultural woody biomass fractions exhibit higher ash, nitrogen, etc. contents compared to the chemically untreated wood fractions usually utilised for heating applications

AgroBioHeat recommendation:

- Clarify that the current (or future) Ecodesign emission limits for woody biomass apply only to graded wood pellets (ISO 17225-2), graded wood briquettes (ISO 17225-3) and graded wood chips (ISO 17225-4)
- Other woody biomass assortments should be treated in the same way as non-woody biomass in the revised Ecodesign Regulation

Note: in the following recommendations, the term “agrobiomass fuels” is used to describe both non-woody biomass & agricultural woody biomass fuels

AgroBioHeat recommendations (II)

CO & OGC emissions

- The AgroBioHeat test results have confirmed that current Ecodesign seasonal CO & OGC emission limits for woody biomass fuels can be met by agrobiomass fuels with modern combustion systems & appropriate combustion settings
- Some systems exhibit higher emissions during part load operation; improvements in design and combustion control would be needed to keep these limits
- Most biomass boiler manufacturers support the introduction of CO & OGC emission limits for non-woody biomass fuels

AgroBioHeat recommendation:

- Current Ecodesign seasonal emission limits of 500 mg/Nm3 for CO and 20 mg/Nm3 for OGC @ 10% O_2 could be adopted for agrobiomass fuels, with a 5-year period for compliance following adoption of the revised Regulation

AgroBioHeat recommendations (III)

PM emissions

- The AgroBioHeat test results have confirmed that current Ecodesign seasonal PM emission limits for woody biomass fuels can be met by agrobiomass fuels with the following options:
  - Coupling of grate-fired systems with properly dimensioned PM control devices (ESPs). Coupling of biomass boilers with secondary PM control systems is not covered by EN 303-5:2021. Standards and test methods for PM control systems would need to be developed
  - Combustion systems using innovative extreme air staging concepts (without secondary PM control)
- Without the use of secondary PM control or innovative designs, PM emissions from agrobiomass fuels exceed the current limit of Ecodesign

AgroBioHeat recommendation:

- Option 1: Current Ecodesign seasonal PM emission limits of 40 mg/Nm^3 @ 10% O_2 could be adopted for agrobiomass fuels, with a 5-year period for compliance following adoption of the revised Regulation and the development of suitable standards for PM control systems required
- Option 2: Adopt as a starting point the current PM emission limits included in EN303-5 relaxed limit for non-woody biomass: maximum value of 200 mg/Nm^3 @10% O_2

AgroBioHeat recommendations (IV)

NOx emissions

- The AgroBioHeat test results have confirmed that current Ecodesign seasonal NOx emission limits for woody biomass fuels cannot be met by agrobiomass fuels with few exceptions (e.g. olive stones)
- When low emissions of unburnt pollutants are achieved, the NOx emissions are primarily a function of the fuel and not of the biomass boiler performance which is the focus of Ecodesign

AgroBioHeat recommendation:

- Option 1: Keep the current Ecodesign NOx seasonal limit of 200 mg/Nm^3 @10%, but with the clarification that it corresponds to a reference fuel-N content as per EN 303-5:2021. Recalculate NOx emission results for agrobiomass fuel assortments using the formula of EN 303-5:2021
- Option 2: Adopt more relaxed limit for agrobiomass assortments, aligned with MCP (~ 500 mg/Nm3 @10% O_2)
- Option 3: Remove NOx limit from Ecodesign Regulation altogether (in line with some EU member states national legislation)

AgroBioHeat recommendations (V)

Dioxins & Furans

- Limited evidence from the AgroBioHeat tests suggests that emissions of dioxins & furans are below the low limits of the German legislation
- Emissions of dioxins & furans are expected to be low when the CO & OGC emissions are below the Ecodesign Regulation limit

AgroBioHeat recommendation:

- Do not adopt an emission limit for dioxins and furans in the revised Ecodesign Regulation

AgroBioHeat recommendations (VI)

Extending Ecodesign Regulation to 1,000 kW

- Market sales of products in the 500 – 1,000 kW heating output range are limited
- Such systems tend to be tailored made depending on the biomass fuel used
- The latest version of EN 303-5 released in 2021 has not been extended for boilers with capacities above 500 kW

AgroBioHeat recommendation:

- Do not extend the revised Ecodesign Regulation beyond the current 500 kW limit
- Instead, explore options to include such installations in the Medium Combustion Plant (MCP) Directive