



### PPS-jaarrapportage 2018

De PPS-en die van start zijn gegaan onder aansturing van de topsectoren dienen jaarlijks te rapporteren over de inhoudelijke en financiële voortgang. Voor de inhoudelijke voortgang dient dit format gebruikt te worden. Voor PPS-en die in 2018 zijn afgerond is een apart format "PPS-eindrapportage" beschikbaar.

**De jaarrapportages worden integraal gepubliceerd op de websites van de TKI's/ topsector. Zorg er s.v.p. voor dat er geen vertrouwelijke zaken in de rapportage staat.**

De PPS-jaarrapportages dienen voor 1 maart 2019 te worden aangeleverd bij de TKI's via info@tkitu.nl of info@tki-agrifood.nl. Voor Wageningen Research loopt de aanlevering via een centraal punt.

Algemene gegevens	
PPS-nummer	<b>BBE 1710</b>
Titel	<b>BIOCOAL in decentrale toepassingen</b>
Thema	<b>TKI toeslag industrieel onderzoek</b>
Uitvoerende kennisinstelling(en)	<b>ECN part of TNO</b>
Projectleider onderzoek (naam + emailadres)	<b>Pedro Abelha – pedro.abelha@tno.nl</b>
Penvoerder (namens private partijen)	<b>ECN part of TNO</b>
Contactpersoon overheid	<b>Kees de Gooijer</b>
Totale projectomvang (k€)	<b>300</b>
Adres projectwebsite	
Startdatum	<b>1-9-2017</b>
Einddatum	<b>31-12-2019</b>

### Goedkeuring penvoerder/consortium

De jaarrapportage dient te worden besproken met de penvoerder/het consortium. De TKI's nemen graag kennis van eventuele opmerkingen over de jaarrapportage.

De penvoerder heeft namens het consortium de jaarrapportage	<input type="checkbox"/> goedgekeurd <input type="checkbox"/> niet goedgekeurd
Eventuele opmerkingen over de jaarrapportage:	

### Planning en voortgang (indien er wijzigingen zijn t.o.v. het projectplan svp toelichten)

Loopt de PPS volgens planning?	<b>Ja</b>
Zijn er wijzigingen in het consortium/de projectpartners?	<b>Ja.</b> <ul style="list-style-type: none"> <li>- <b>TNO op 1 April 2018 op basis van een Asset Purchase Agreement bepaalde activa en passiva heeft overgenomen van ECN, waaronder de Overeenkomst.</b></li> <li>- <b>De rechten en verplichtingen van Green Fiber onder de Overeenkomst zijn overgenomen door GroeneWaarden</b></li> </ul>
Is er sprake van vertraging en/of uitgestelde opleverdatum?	<b>Nee</b>
Is er sprake van inhoudelijke knelpunten, geef een korte beschrijving	<b>Nee</b>
Is er sprake van afwijkingen van het ingezette budget/de begroting?	<b>Nee</b>

**Korte omschrijving inhoud/doel PPS**

Wat is er aan de hand en wat doet het project daaraan?

Wat gaat het project opleveren en wat is het effect hiervan?

This project aims for the successful testing of "normal" pellets and BIOCOAL pellets in lab-scale combustion installations with extensive analysis of combustion performance and emissions. This will explicitly look at the use of various low-grade woody biomass species. Combustion tests of low-value biomass pellets and low-value torrefied biomass pellets in different small-scale boilers will be carried out for the purpose of determining the possible range for this application. The potential impact for the sector involves the use of cheaper and locally available woody biomass for the production of heat, technically it will become clear how the boiler combustion chamber should be designed and what the impact is on emissions. From a social point of view, emissions can be reduced, the mineral cycle can be closed locally and the use of low-quality biomass for heat generation will be more sustainable.

**Resultaten 2018**

Geef een korte beschrijving van de high-lights van 2018

Geef een korte beschrijving van de projectdeliverables 2018

**Highlights 2018****Yilkins**

Yilkins, after a discussion and agreement with ECN>TNO, selected different low value biomass streams in cooperation with the companies: Meerlanden, Futerra and Sortiva. With Groene Waarden potential material were not selected yet, but this will be done in 2019.

Yilkins produced the pellet materials to be supplied to ECN>TNO and DPS. In general for each testrun for the production of 1 biomass material type, the time spend was:

- extra cleaning step: 1 day
- preparation material: 1 day
- drying: 2,5 days
- torrefaction: 2 days
- pelleting: 1 day
- reporting; 1 day

The number of produced materials and the calculated costs are described below in each partner's highlights (Meerlander, Futerra and Sortiva).

**Meerlanden**

Meerlanden selected together with Yilkins two types of low-grade biomass. Meerlander made an in-kind contribution of 9.800 euro by outsourcing to Yilkins the material preparation tests as described below.

Two types of material were selected 1) 'zeefoverloop' and 2) woodchips as biomass to be upgraded towards white pellets and black pellets.

To clean 'zeefoverloop' a 'wash step' was needed to get the biomass in the right condition to be used to feed the Yilkins drying system. After sieving app. 50% of material was taken out and the woody material left over was very clean resulting in a good pellet quality.

The combustion tests with white pellets are also done by DPS were positive but the ash of the 'zeefoverloop' pellet give some sintering problems with the type of boiler of DPS. This was not seen with the woodchips pellet.

Total days spend by Yilkins: 12 dagen (12 x 8 x 60=) 5.760 euro

- extra cleaning step: 1 day (zeefoverloop)
- preparation material: 2x1 day (zeefoverloop + woodchips)
- dried: 2x2,5 days (zeefoverloop + woodchips)
- torrefaction: 1x2 days (woodchips)
- pelletizing: 1x1 day
- reporting; 2x1 day

Next step were the combustion tests with roughly 100 kg pellets - white and black - by ECN>TNO.

### **Futerra**

Futerra made an in-kind contribution of 31.500 euro by outsourcing to Yilkins the material preparation tests as described below.

Futerra selected together with Yilkins different biomass materials to be tested: pine and eucalyptus wood. The reason for that is that Futerra is building a pellet plant in Portugal and these additional tests are very useful. The step was to make of both material white and black pellets.

Both materials had to be grinded to right particle size to be able to run a good drying test. After drying white pellets were made.

The next step was to torrefy the dried biomass into black pellets.

Pelletizing was done with very good results looking to the characteristics of the pellet compared to the ENplus certification.

For combustion test by ECN the following material was send:

1. Torrefied Pine pellets, roughly 3 different samples (1 with binder, 2 without).
2. Two types of white pellets from pine.

Total days spend by Yilkins: 21 days (21 x 8 x60=) 10.080 euro

- preparation material: 4x1 day (Pine + Eucalyptus)
- dried: 4x2,5 days (Pine + Eucalyptus)
- torrefaction: 3x2 days (Pine + Eucalyptus)
- reporting; 2x1 day

### **Sortiva**

Sortiva made an in-kind contribution of 10.000 euro by outsourcing to Yilkins the material preparation tests as described below.

The selected biomass materials were mainly shreds made from 'green waste' of collected municipalities. The challenges with this kind of low-grade biomasses are the inert materials such as iron, plastics, stones, which had to be sieved out before the materials could be processed in Yilkins upgrading installations.

Grinding of the material was done – or better tried – by CPM but a lot of waste was found in the biomass material and therefore only partly of the input material could be grinded.

Of the correct grinded material Yilkins performed a drying run with all kind of problems resulting in obstructions in the dryer and after opening roughly 0,5 kg of stones and asphalt – stick in – had to be removed out of the dryer. This test resulted in a small sample of dried wood to be torrefied.

After torrefaction, pellets were produced in Ruurlo at Yilkins using the Kahl press without binder. A high energy content pelletized material was obtained, with about 22 GJ/ton.

About 20 kg of pellets were sent to ECN>TNO for burning test, which are planned to be done in 2019.

Total days spend by Yilkins: 10 days (10 x 8 x 60=) 4.800 euro

- preparation material: 1x1 day
- dried: 2x2,5 days (extra day cleaning dismounting + cleaning)
- torrefaction: 1x2 days
- pelletizing: 1x1 day
- reporting; 1x1 day

### **Highlights DPS**

DPS performed burning tests with the Meerlanden material and cooperated in the testing of various biomass materials from customers as mentioned above.

Total spend 15 days (10 x 8 x 60=) 7.200 euro

**ECN>TNO**

**WP2:** ECN>TNO performed combustion tests with white wood pellets class A1 quality (EN 14961-2) in a 32KW<sub>th</sub> pellet boiler, which was defined to be used in this project as a reference installation. These tests served to provide a base line reference to compare the results with the biomass (biocoal included) pellets that were provided by the other project partners. Moreover, internal adaptation in the boiler were undertaken, such as a new burning grate and different air distribution, to accommodate and optimize the combustion of the biocoal pellets produced by the partners. Successful tests were done with ECN>TNO clean wood torrefied pellets (biocoal pellets) to demonstrate the good operation after the modifications.

**Deliverables: optimized boiler operation to test biocoal materials.**

ECN>TNO has done characterization of the biomass and biocoal pellets produced by Yilkins with the materials supplied by Futerra and Meerlanden. The durability and density of the pellets were determined.

Yilkins supplied to ECN>TNO:

- 2 samples of white wood pine pellets with quality A1 and A2 (EN 14961-2) - Futerra
- 3 samples of biocoal pellets (from pine wood) – Futerra
- 1 sample of pruning wood chips pelletized – Meerlander
- 1 sample of pruning wood chips torrefied and pelletized (biocoal) – Meerlander

**Deliverables: characterization data of the fuels – ultimate, proximate, heating value, ash composition. Inputs for WP3.**

**WP3:** ECN>TNO has done the combustion tests of the biomass and biocoal pellets produced by Yilkins with the materials supplied by Futerra and Meerlanden. Gaseous emissions including CO, C<sub>x</sub>H<sub>y</sub>, NO<sub>x</sub>, SO<sub>2</sub>, HCl and particle matter were measured. The combustion efficiency was calculated. The ashes were collect to further analysis

**Deliverables: combustion data result – emissions and efficiency; production of ash for characterization in WP5.**

In 2019 it is planned to perform more characterization of the biocoal material supplied by Sortiva and Groene Waard partners.

**WP5:** The determination of the core properties for biocoal were started, passing by limits of some elements on the fuel composition and a minimum and maximum heating value definition. This matter is still under evaluation. The ash quality and the mineral cycle evaluation will be started in 2019.

<b>Aantal opgeleverde producten in 2018</b> (geef in een bijlage de titels en/of omschrijvingen van de producten of een link naar de producten op de projectwebsite of andere openbare websites)			
Wetenschappelijke artikelen	Rapporten	Artikelen in vakbladen	Inleidingen/workshops
<b>Titels/omschrijvingen van belangrijkste producten in 2018 (max. 5) en hun doelgroepen</b>			
No deliverables of this kind were produced yet, however in 2019 a report will be made to document the differences between the combustion of biocoal biomasses, highlighting its advantages compared to raw biomass. Moreover, a submission of a paper to an international conference (EUBCE 2020) will be produced.			

**Bijlage: Titels/omschrijvingen van alle producten in 2018 of een link naar deze producten op de projectwebsite of andere publieke websites**