



SLEAFORD
Renewable Energy Plant

EA 'Trial Protocol Plan' – A (Alternative Biomass Products)

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SUMMARY

This Fuel Trial Protocol Plan (“**TPP**”), as referenced within the sites EPR/DP3030XH variation application, represents the proposed fuel trial and has been designated as EA ‘Trial Protocol Plan’ – A (Alternative Biomass Products).

This TPP covers the testing of additional biomass fuels within the existing auxiliary fuel route and covers all areas as per the proposed TPP.

Alternative biomass fuels which may be trialled under this TPP in chipped, pelleted or its natural form shall include:

- Straw
- Virgin Based Wood
- Olive pellets/pomace
- Miscanthus
- Bamboo
- Spelt husks
- Sunflower Husks
- Oat husks

NB: All fuels shall be deemed to be a separate fuel trial for each product type, although due to the generic nature of the fuels it is proposed that one TPP covers all fuels. Where specific measures are required relating to one or more fuels, such as dust/odour, these will be highlighted for each case..





1 TRIAL DESIGNATION

1.1.1 This TPP represents the fuel trial as outlined within the EPR variation submission and has been classified accordingly as Trial Protocol Plan – A ‘Alternative Biomass Products’.

2 BWSC PLANT MODIFICATION

2.1.1 Both the stage 1 and 2 trials of the alternative biomass products will be progressed through the BWSC Generation Services UK Ltd procedure for managing plant modifications.

2.1.2 A copy of the procedure to be adopted is attached for reference.

 SMI-MA-006-GP Plant Modification Procedure	 SMI-MA-006-GP-AP1 Plant Modification Proc	 SMI-MA-006-GP-AP3 Plant Modification Proc
 SMI-MA-006-GP-AP4 Plant Modification Proc		

2.2 Trial Outline

2.2.1 Any proposed trial will commence once agreed between the Owner (GREP1 Limited) and the Operator (BWSC), subject to installation of the required equipment to support the trial fuel transportation to the boiler and completion of the recommendations for DSEAR compliance.

2.3 Entry Criteria

2.3.1 The alternative fuel trial shall commence once the following criteria have been met:

- (a) The trial protocol is agreed by both the Owner (GREP1 Ltd) and the Operator (BWSC GS UK Ltd).
- (b) All approvals have been received in writing from the following parties:
 - The local planning authority
 - The Environment Agency
 - Ofgem
 - Insurance
- (c) There are no defects or technical issues with the plant which could have a bearing on the delivery of the alternative biomass fuel.
- (d) Successful implementation of DSEAR assessment and/or modifications required as preconditions to combusting alternative sources of biomass

2.4 Exit Criteria

2.4.1 The alternative biomass fuel trial shall be complete once the following criteria have been met:

- (a) Sufficient operational data has been recorded to fully categorise the behaviour of the SREP when running on any alternative source of biomass.

2.4.2 The Owner may choose to terminate the trial at his discretion.






2.5 Suspension Criteria


2.5.1 The trial shall be suspended should it be proven that there is a significant risk to operations or the integrity or safety of the plant as a direct result of the trial. In order to suspend the trial, the relevant party must provide supporting evidence within 48 hours of suspending the trial. The Operator, at his sole discretion, can stop the trial with immediate effect for any health and safety reasons and to avoid any damage of equipment. The Operator shall convene a meeting with the Owner or his representative, as soon as practicable to provide further details for suspending the trial.

2.5.2 Following a suspension of the trial both parties shall review the evidence and mutually agree to the conditions necessary to resume the trial.

3 FUEL TYPE

3.1.1 The following biomass fuels are requested to be considered within this TPP, alongside their expected as received condition chemical analysis. All pelleted fuels are considered as products, so do not have a designated EWC's.

Fuel Type	Elementary Analysis
Agricultural Straw pellets	N/A – to be supplied prior to trial
Virgin / Existing EPR Wood	N/A – to be supplied prior to trial
Olive pellet/pomace	 Olive Pellet.pdf
Miscanthus	 Miscanthus Pellet.pdf
Bamboo	 Bamboo Pellet.pdf
Spelt husks	 Spelt Husk -GREP1 Ltd.pdf
Sunflower Husk	 COA - Sunflower Husk Pellets - ECO2.

Oat husks	 GREP1 Ltd_Biomass_Oat Hu
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3.1.2 All trial fuels chemical analysis are within the ranges of either straw or woodchip, as outlined within the original application (tables 2.4 & 2.5) – an extract is included below.

Parameter	Dimension	Straw		Woodchip		Combined Range
		Nominal Fuel	Range	Nominal Fuel	Range	
LHV (dry)	MJ/kg	14.0	12.3 – 15.9	18.0	18.0 – 20.0	12.3 – 20.0
Moisture	%	16.0	7.1 - 22.6	35.0	30.0 – 50.0	7.1 - 50.0
Ash cont.	% (dry)	6.9	3.2 - 10.6	2.0	-	3.2 - 10.6
Carbon	%	43.8	33.0 - 47.5	Not listed		33.0 - 47.5
Hydrogen	%	6.0	5.4 - 6.5	Not listed		5.4 - 6.5
Sulphur	%	0.45	0.2 - 0.86	-	<0.08	0.2 - 0.86
Oxygen	%	41.55	40.0 - 51.0	Not listed		40.0 - 51.0
Nitrogen	%	0.7	0.36 - 2.25	-	0.1 – 0.4	0.1 – 2.25
Chlorine	%	0.6	0.1 - 1.1	-	<0.05	0.05 - 1.1

3.1.3 The existing emission points for the site will be monitored throughout the trial period and the trial will be stopped should there be any potential exceedance of the emission limits. The trial will not recommence without investigations being carried out and suitable controls applied. These will be shared with the EA Site Inspector, prior to recommencing the trial, to understand the risks and controls enacted

4 FUEL QUANTITY AND PERIODICITY

4.1.1 During the stage 1 trial, it is envisaged that the restriction on the amount of fuel would be capped at a maximum of 300-500 tonnes per day. This would reflect the number of vehicles which could be offloaded within the sites 12-hour day planning permission.

4.1.2 Fuel trials are expected to operate 7-days per week, although it is anticipated there will be short breaks to allow further optimisation or data collection within this period.

4.1.3 The estimated contribution of the product during the trials is expected to be in the range of 20-70%, with the balance being baled and/or chipped product.

4.2 Stage 1

4.2.1 The first stage part of the fuel trial is expected to be up to 3 months duration, to ensure sufficient data can be obtained prior to progressing, if applicable to a stage 2 trial.

4.2.2 The fuels would be introduced at lower concentrations initially, before increasing in stages to the system capacity, or at such point there is a negative impact upon the facility's performance.

4.2.3 Consequently, the absolute theoretical maximum quantity of fuel usage for this first stage trial would be in the region of 10,000 tonnes, although for all practical purposes the actual quantities are expected to be less due to the nature of the trial and availability of fuel stock.

4.2.4 The actual dates of the trial remain subject to change due to the availability of the fuel types on trial. As a minimum any initial fuel trial would be notified to the sites EA inspector at least 2 weeks prior to a new fuel being introduced, to allow for a site visit to be undertaken.

4.3 Stage 2

4.3.1 Any second stage fuel trial would be in the region of 6-12 months duration, with a period of time separating the two stages to allow for any modifications to be undertaken in the sites operating techniques.

4.3.2 The second stage would look to utilise the additional product at the highest possible concentration as determined through stage 1. This periodicity and concentration is deemed prudent to ensure sufficient data can be analysed to ensure the engineering integrity of the plant can be assured.

4.3.3 Due to the increased length and anticipated higher usage during any second stage, the daily theoretical maximum would, remain unchanged at 300-500 tonnes, although the maximum amount to be trailed during this stage would be in the region of 50,000 tonnes.

5 FUEL DELIVERY, OFFLOAD AND STORAGE

5.1.1 All fuels shall be transported to site in covered vehicles, either as walking floor, bulk/tarpaulin tipper or self-discharging pneumatic tanker, to minimise fugitive emissions both to site and during discharge.

5.2 Stage 1

5.2.1 Deliveries will be either stored within the existing woodchip storage barn and processed through the existing operational techniques or fed directly into the process via a new dedicated reception point for this trial (see section 6).

5.2.2 Where product is delivered into the new reception point, it will be transferred from the delivery vehicle onto a holding hopper/conveyor, situated immediately adjacent to the existing auxiliary fuel conveyor to the boiler house. Here it would be immediately introduced into the auxiliary fuel conveyor for onward processing. In this manner the new reception point would provide only 'just in time' storage facilities for the offload and also a minimum amount of transfer distance to the existing conveyor system. It would also bypass the existing storage/oversize and magnetic separator systems but utilise all other downstream components to feed the fuel into the boiler.

5.2.3 Due to the possibility of fugitive emissions during unloading, it is proposed a temporary covered building with a curtain entry would be installed to minimise fugitive emissions during this initial stage 1. For certain products, this covered offloading point would also assist in minimising any fugitive odours.

5.2.4 The entire off-load and feed rate will be continuously monitored throughout all trials as a manual delivery process and all downstream handling facilities would remain the same.

5.2.5 There will be no additional storage of fuel outside of the existing storage facility during this stage 1 trial, with all deliveries to the new reception point been based upon a 'just in time' concept.

5.3 Stage 2

- 5.3.1 During stage 2 trial, the fundamental process will remain the same although to increase the throughput up to the theoretical maximum, a degree of additional on-site storage and automation would be required.
- 5.3.2 Subject to EA approval and planning consents already received, it is proposed to install a 150m³ storage silo to the south of the existing Air-Cooled Condenser.
- 5.3.3 These additional on-site silo would be filled via pneumatic self-offloading tankers, or utilising a permanent covered unloading facility (similar to that used in stage 1)
- 5.3.4 From the storage silo, the product would be transferred via enclosed variable speed screws/conveyors on to the existing main feed conveyor to the boiler (the same feeding pot would be used onto the existing conveyor system for both stage 1 and 2 trials.
- 5.3.5 This system would provide a fully enclosed system and would include additional automation to provide a fully automated process to feed the fuel into the boiler.
- 5.3.6 As per stage 1, all downstream handling facilities would remain the same.

6 CHANGES TO OPERATING TECHNIQUES

- 6.1.1 It is envisaged that there would be some minor changes to the sites operating techniques required, as already indicated in section 5 above.
- 6.1.2 Those for stage 1 reflect the shorter duration of the trial, whereas stage 2 reflects the requirements of a longer duration trial.
- 6.1.3 In addition there will be a minor number of modifications required for DSEAR compliance (additional controls) – these will remain in place for both stage 1 and 2 trials and be captured within the sites plant modification procedure.
- 6.1.4 The net impact on deliveries would be marginal, as any trial product would offset subsequent current fuel deliveries.

6.2 Stage 1:

- 6.2.1 The following items are expected to be installed on site to create a new reception point:
 - (a) A 0.5m² access point - this would be created on the existing auxiliary fuel route main conveyor to the boiler house.
 - (b) An ~1m³ fully enclosed transfer hopper – this hopper would be sited directly above the access point on the existing auxiliary fuel route main conveyor to the boiler house and be equipped with a variable speed rotary valve to control dosing rates. The hopper/conveyor would be fully enclosed to minimise fugitive emissions/odour from exiting during transfer.
 - (c) A combined offloading hopper and transfer conveyor– this would transfer material from the delivery vehicle up to the transfer hopper.
 - (d) A temporary storage covering the offloading area would be erected to prevent fugitive dust/odour emission during the offload.

6.2.2 The existing woodchip feed onto the main conveyor will be also used during the trials to test the ability to blend new products with existing products, although at stage 1, this will be controlled manually via the rotary valve.

6.3 Stage 2

6.3.1 The following items are expected to be installed on site to create additional storage capacity and for the feeding of the product to be fully automated:

- (a) 1 x ~150m³ storage silo – plus associated isolation and filling connections
- (b) Variable speed enclosed screws – transfer the product from the silos to the existing main conveyor to the boiler house
- (c) Stage 1 transfer Hopper – modification of the stage 1 hopper to accept the new screw conveyors from the storage silo
- (d) EC&I changes to allow the feed of the product to be automatically regulated.
- (e) New unloading point with covered storage (please note this will only be required if pneumatic offloads direct to the silos are not feasible)

6.3.2 All the system components would be fully enclosed to mitigate fugitive dust/odour. In addition the stage 1 transfer hopper would retain the ability to undertake further stage 1 trials of additional products.

6.3.3 Should any permanent building be erected, the sites fire-fighting detection and suppressions systems would be suitably extended, as required by both the plant insurer and building control.

7 DUST PREVENTION MEASURES

7.1 DSEAR

7.1.1 The facility’s DSEAR risk assessment has being reviewed by an external consultant (Gexcon) to highlight the additional risks and controls required when utilising the existing and additional products as listed within section 3. Both the original and revised assessment documents are included here.


 161027_2971.S0.X02 .001.R03.DSEAR asse	 Gexcon-21-201312- RA1_rev02.pdf	 IEP100-2001-1C Filtrex (Sleaford REP)
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7.1.2 Sources of ignition remain broadly the same although there is a requirement for an additional control measure to include Explosion vents or suppressors – see enclosed eSuppressors installed locations (in above pdf).

7.2 Fugitive

7.2.1 The potential for fugitive emissions shall be mitigated by the utilisation of covered conveyor systems and dust extraction. However, the unloading area presents the highest risk of increasing fugitive dust emissions. Whilst an enclosed offloading area will minimise this, it is proposed a dust survey be undertaken both internal and external to any enclosure.

7.2.2 The survey would comprise of a personal monitor for personnel working within the vicinity of the unloading area and also background monitoring undertaken at points within the offloading enclosure and external as per the attached document. All samples would be taken at between ground floor and 2m elevation.

 <p>SREP Dust Monitoring with site</p>		
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7.2.3 Prior to the trials being undertaken a control survey would be completed to identify the pre-existing levels. Thereafter for each product one survey would be undertaken, comprising of a minimum of 12hrs of data and incorporating at least 4 offloads. The analysis shall provide evidence that the proposed control measures remain effective.

7.2.4 All monitoring shall be undertaken by an independent 3rd party provider.

8 ODOUR MANAGEMENT PLAN

8.1.1 Most of the fuels are already utilised within the facility although it is recognised that the combustion quantities may increase from historical levels, these are not expected to adversely impact the sites fugitive emissions(odour).

8.1.2 However, following discussions with the EA and experience, there are two products where there is a potential for fugitive emissions. These are:

- (a) Olive pellets
- (b) Olive pomace

8.1.3 Consequently, when these products are trialled for both stage 1 and stage 2, the attached odour management plan shall be enacted, covering both pre and post combustion.

 <p>SREP Odour Plan - Fuel Trials.pdf</p>		
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8.1.4 Prior to any product trial, an odour 'control' shall be taken as a reference to subsequent trials. It is stressed that due to the subjective nature of odour, the same individual shall undertake all monitoring. All monitoring shall be undertaken at ground level, with the exception of those internal measurement locations as identified.

9 FIRE PREVENTION AND CONTROL MEASURES

9.1.1 The existing facilities fire detection and suppression systems have been reviewed and determined as suitable and sufficient to undertake the stage 1 fuel trials. Please see enclosed document under section 7.

- 9.1.2 For stage 1 trial, the additional fire-fighting capacity will be passive systems such as hydrants and extinguishers (identified as Powder/CO₂)

10 NOISE AND LIGHTING CONTROLS

- 10.1.1 The stage 1 & 2 processes have been designed to conform with the original plant specification and therefore no adverse noise during operation is anticipated. However, to confirm this assumption, a noise and lighting survey shall be undertaken during the stage 1 and 2 trials.
- 10.1.2 Such limits shall be as per the existing planning condition at the sites boundary fence, with reference to the original Building control monitoring.

11 EXPECTED COMBUSTION/PLANT INTEGRITY

- 11.1.1 The proposed alternative fuels are biomass fuels like many other one-year crops. Some have a higher proportion of alkali metals, Sulphur and Chlorine, although these are comparable to the facilities design fuel (straw).
- 11.1.2 Consequently, the overall performance of the systems is anticipated to be similar to the existing products combusted.
- 11.1.3 The level of lime abatement is anticipated to remain the same, due to the similar levels of Sulphur and chlorides within the fuels.
- 11.1.4 As the received fuels may have a low moisture content, there is not expected to be any adverse impact on CO emissions.
- 11.1.5 There is the potential for slightly elevated furnace temperatures when burning pelleted fuels, which may impact upon the amount of SNCR abatement chemical required. However, it is expected that any increase in NO_x formation would be limited by combustion air changes in the first instance and also due to the relatively low concentrations of the trial fuel.
- 11.1.6 The boiler stability is expected to remain the same with a supplemental pelleted input. Provided there is sufficient straw to maintain a furnace 'plug', combustion stability should not be affected up to 80% fuel input.
- 11.1.7 The boiler corrosion is expected to be in line with straw. Depending upon the amount of heavy metals, furnace corrosion may be higher and a more thorough tube wall thickness measuring program should be initiated during the next two outage cycles to confirm.
- 11.1.8 The proposed fuels contain Alkali metals in similar amounts as Straw. Consequently, the level of fouling is expected to be the same, although some combustion trimming may be required to prevent adverse deposition on the pendant tubes.
- 11.1.9 There is not expected to be a significant impact on the boiler efficiency, as although there will be a slightly higher heat loss due to the increased amounts of ash, the lower moisture content in the pellets offsets this.

12 EXPECTED IMPACT UPON ASH

- 12.1.1 The amount of ash in the fuel is generally higher than straw, although in line with existing woodchip.
- 12.1.2 It is expected that there will be a corresponding increase in fly ash, although the existing filters have adequate capacity.
- 12.1.3 There may be a marginal impact on bottom ash production.
- 12.1.4 The existing arrangements for bottom and fly ash sampling will remain. During the trial period a daily sample shall be taken and amalgamated into a weekly composite sample for analysis.