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Annexure-1

Scope of Work

**TECHNICAL SPECIFICATION FOR
AGRO RESIDUE BASED BIO-MASS PALLETS
(Non- Torrefied)
FOR CO- FIRING IN COAL BASED THERMAL POWER**



1.0 INTENT OF SPECIFICATION

The intent of this specification is to cover the various relevant aspects and requirements of agro residue based biomass pellets (non- torrefied) to be supplied to a coal based thermal power plant for co- firing in the boilers along with coal.

The utilities are required to review the technical parameters indicated in this specification and make suitable modifications, if required, considering the broad characteristics of biomass pellets likely to be available for supply to their power plant.

2.0 SCOPE OF WORK

The scope of work of the bidder shall include manufacture, supply, loading, transport and delivery of non- torrefied biomass pellets at **2x270 MW** coal based thermal power plant of **GVK Power (Goindwal Sahib) Limited,**
(A wholly owned subsidiary of Guru Amar Das Thermal Power Limited, GATPL).
(A step down wholly owned subsidiary of Punjab State Power Corporation Limited, PSPCL).
Kapurthala Road, Goindwal Sahib.
Dist. Tarn Taran – 143422. Punjab

The bidder shall supply the pellets in loose form filled in the carriage vehicles (closed/ covered containers) and these shall be unloaded in the power plant at the area identified by the owner for this purpose.

The biomass pellets supplied shall primarily be made of agro residue and these shall adhere to the technical requirements indicated in this specification.

Details of Material and supply duration:

Sl. No.	Item : Agro residue-based Biomass Non- Torrefied pellets for	Indicative Quantity [to be supplied in M T per day (TPD) This column must be filled up	Total Quantity (MT) This column must be filled up
1	To be supplied to GVKPGSL, Goindwal Sahib, Punjab		

GVKPGSL requires 300 T/day and for 90 days, total quantity will be 27000 T

- Note: (i) The daily requirement estimated above is indicative only and may change based on the actual plant load factor and requirement of the Power plant.
(ii) The quantity to be supplied can be increased during the contract period subject to mutual consent.

Bidder's quotation should be on the basis of 3500 Kcal/Kg ARB GCV only.

2.1 Table-1: Technical Specification for Agro residue-based Non-Torrefied pellets.

Sl. No	Technical Data	Unit	Specification for Non-Torrefied pellets
1.	Base Material	N. A.	Agro Residue / Crop Residue (wood based pellets will not be acceptable)
2.	Diameter	mm	Not more than 25 mm No other dimension should exceed 35 mm
3.	Bulk Density	Kg/m ³	Not less than 600
4.	Fines%(Length<3mm) (ARB*)	Wt %	Fines≤5%
5.	Moisture (ARB)*	Wt %	Not more than 14%
6.	Gross Calorific Value (ARB)**	KCal/Kg	2800-4000
7.	Hard Groove Grindability Index (HGI)		Not less than 50

* ARB — As Received Basis

** GCV ranges are indicative.

3. Mode of transportation:

a) The default mode of transportation is covered truck with the waterproof arrangement, however, the supplier may also offer transport by rail mode with the prior consent of the respective power plant management.

b) Unloading shall be in the scope of Power Plant provided material is loosely filled in the Tipper Truck/Trolley vehicle having hydraulic tipping arrangement for unloading of Pellets. The Carriage vehicles should be fully covered and waterproofed during transportation to prevent the material from rain, sunlight and dust aspects.

c) The supplier may supply the material i.e. Biomass pellets packed in bags. In that case, the supplier shall unload the material at his own cost and extra charges, if any, shall be borne by the supplier.

Before unloading, samples shall be tested for moisture content. However, the HGI report shall be “submitted by the Supplier with each carriage vehicle/consignment at the time of supply.

Demurrage, if any, on the carriage vehicle for reasons attributable to the Supplier will be borne by the Supplier

4 QUANTITY DETERMINATION BY STORE

- a. Weighing of vehicles shall be carried out on weighbridges (for tare and gross) at Power Plant. The Supplier may witness the weight of vehicles once in 15 days, Power Plant Fuel sourcing (FS) representative will accompany the Supplier representative when any such visit is carried out. Supplier shall intimate Power Plant FS representative via e-mail at least two days in advance about the date of such visit.

Net weight = Gross weight less the Tare weight, both as measured at Power Plant weighbridge

Power Plant may provide a copy of calibration certificates of weighbridge if requested by the Supplier. Power Plant shall undertake the calibration of Weigh Bridge in line with the schedule/practice as recommended by Legal Metrology.

- a. Any other contingency may be mutually discussed and settled.
- b. Net adjusted quantity received at the Plant i.e. quantity worked out by Power Plant after carrying out adjustment due to quality variations for the Base Parameters, if any, shall be applicable for payment.

5. QUALITY DETERMINATION

- 5.1 Power Plant will carry out the sampling and analysis of Non-torrefied pellets at Power Plant as per the provisions of either BIS or ASTM at the option of Power plant. Power Plant will carry out the sampling and testing process as per the relevant BIS (IS 436 Part-1) standards for vehicle top sampling.
- 5.2 The authorized representatives of Power Plant and pellet supplier shall jointly witness the process of sample collection and preparation of the laboratory samples. The representatives shall put their signature on the sample tags in evidence of the process of sampling. Both consumer and pellet supplier shall sign on the samples register maintained by the Power Plant at the unloading end.
- 5.3 For purpose of rejection test before unloading, samples shall be tested for moisture content by Power Plant. If test result of any sample collected from a truck/consignment meets Technical parameter criterion for moisture content as given in (Table 1) then truck will be allowed for unloading, otherwise, truck (Consignment) will be rejected if test result meets the rejection criterion as given in (Table 3) and it shall be the supplier's responsibility to carry it back on his own cost.
- 5.4 For testing of GCV and other Technical parameters, single sample shall be prepared for all the consignments received in a day from a particular Supplier. For avoidance of doubt, in case supply is from multiple Suppliers in a day, Supplier-wise sample shall be prepared for all the consignment received in a day.
- 5.5 The final laboratory sample shall be divided into 3 (three) parts. Part-1 of the sample is for analysis of GCV and other technical parameters by Power Plant lab at site. Part-2 sample is to be handed over to the pellet supplier for its own analysis. Part- 3 of the sample, called Referee sample, shall be sealed jointly and shall be kept with Power Plant under proper lock and key arrangement.

- 5.6 The Power Plant's representative will have the right to witness sampling and testing of pellets for the Base Parameters at the loading end.
- 5.7 The supplier's representative will have the option to witness the sample collection, preparation, testing of the main sample, and final packing of the reserve sample. Any dispute related to sampling, preparation, and analysis activity has to be raised strictly within 48 hours of the respective activity. Further, any dispute related to testing results may be raised strictly within 7 days of the declaration of the results by the Power Plant. The disputes concerning sampling and testing may be entertained only if backed up by logical and justifiable reasons/documentary support like test reports of Part-2 sample from NABL accredited lab along with printout copy of Bomb calorimeter readings. Frivolous/repeated disputes may invite penal action by Power Plant.
- 5.8 As this process of sampling and preparation is a continuous round the clock process to deal with the multiple consignment workloads, so Power Plant would carry out the process as per the time deemed suitable for the process. Hence, it is the responsibility of the supplier's representative to be available at all time witness the same.
- 5.9 Power Plant may request Supplier to withdraw representative who is not diligent and/or is not cooperative. Frivolous/unreasonable objections to the sampling and testing process at Power Plant will not be entertained. It may be noted that witnessing testing (if any) carried out outside the Power Plant lab will not be feasible and should be avoided.
- 5.10 Power Plant may also consider (at its option) sharing part of the sample (third sample) with the Supplier. The third sample is for reference of the Supplier only and results of analysis of the third sample will not be considered for determining the payments.
- 5.11 Referee samples will be preserved in the Power Plant laboratory under locked almirah in sealed condition in a moisture-free area for 30 days (from the date of declaration of such results) in the safe custody of the Power Plant.
- 5.12 Generally, Quality reports will be generated within 7 working days of receipt of the material and the same will be communicated to the Supplier, subject to receipt of loading end quality report.
- 5.13 In case dispute is raised within the stipulated time period, the Reference sample shall be analyzed in a NABL accredited laboratory as notified by Power Plant from time to time, expense of which shall be borne by pellet supplier. Expense borne on supplier part shall be adjusted against payment to the supplier. NABL accredited laboratory report of referee sample shall be final and binding on both the parties.
- 5.14 It may be noted that referee samples shall only be used in case of conflict of quality and price adjustment, whereas, in case of rejection of consignment due to Total moisture (TM) content, Power Plant reported TM content result will be final and binding.
- 5.15. To prevent misuse of the facility by disputing the majority of results of the lot, Power Plant will abort this reserve testing process in case if the reserve sample results (first two)

are within the repeatability limits (as per BIS 1350) from original results. In this case, original

Sl. No.	Technical Data	Testing Method/Standard
1.	Dimension (Diameter & Length)	ISO 17829 or Equivalent method may be referred
2.	Fines (%)	ISO 18846 or Equivalent Method may be referred
3	GCV(ARB)	IS 1350 or equivalent method may be referred
4.	Moisture content (ARB)	Method based upon IS 1350 or equivalent method may be referred (Hand-Held Moisture Meter may also be used)
5.	HGI	ISO 5074 or equivalent method may be referred

results will be considered for payment purposes.

5.16 Any pellet that is received at Power Plant will not be returned/ permitted to be collected by the Supplier unless agreed to in writing by Power Plant Standards/Methods as per the table below will be referenced/used for quality determination:

5.17 For Determination of Total Moisture (TM) content:

- a. Samples shall be collected from each truck/dumper for TM determination.
- b. TM will be determined by Power Plant lab validated method based on IS 1350,

(10g of 2.90mm passing sample will be heated for 2 hours at 108 +/- 2 Deg C. Total Moisture will be computed as per the formula below:

$$TM\% = (W1-W2) \times 100 / W1$$

Where: W1= Initial Weight of Sample (10 grams) W2= Final Weight of Sample.

Note: Before unloading, samples shall be tested for moisture at Station end. If this value is in the rejection level range, the consignment shall be rejected and it shall be the suppliers' responsibility to carry it back at his own cost.

6. COMPUTATION METHODOLOGY FOR VARIOUS RECOVERIES/ QUANTITY ADJUSTMENTS

The supplier shall guarantee technical parameters of agro residue-based pellets as given in table-1 under clause 1.2. The characteristics contained in Technical Specification (table-1 under clause 1.2.) shall be adhered to and maintained and non-adherence shall result in 'Quantity and Price Adjustment' as per clause 7.2 or even rejection as per clause 7.4 of this volume.

6.1 Acceptance range with/without pro-rata price / quantity adjustment:

6.2 The agro residue-based pellets supplied shall conform to technical specifications as given in Table-1 under clause 1.2. But, in case consignment of agro residue-based pellets does not meet the guaranteed parameters for GCV, moisture content, and fines %, but are within the acceptable limit as given in table 2, the consignment shall be accepted but with a pro-rata price/ quantity adjustment as applicable.

Table 2: Parameters on Acceptable Limits

SI. No	Technical Data	Units	Acceptance range Without Price /Quantity adjustment	Acceptance range with pro-Rata Price/Quantity adjustment
1	Gross Calorific Value (ARB*) — Non-Torrefied	Kcal/Kg	As per clause 6.12	
2	Total Moisture (ARB")	Wt %	Not more than 14%	
3	Fineness% (ARB)	Wt %	Fineness <= 5%	Fineness > 5%

*ARB: As the received basis.

6.3 Price Adjustment for Gross Calorific Value (GCV)

6.4 If a consignment of agro residue-based pellets does not meet the guaranteed parameters for Gross Calorific Value (ARB) but is within the acceptable limit, the consignment shall be accepted but with pro-rata upward or downward price adjustment as calculated using the following formula:

6.5 N/A

6.6 Non-Torrefied pellet:

6.7 Stipulation of limits for Quoted GCV: Based on the Base material and Mixing material as per technical specification, Bidder is required to quote GCV value of biomass in Kcal/Kg within the range as mentioned below:

6.8 In case of Non-Torrefied Pellet Minimum Limit- 2800 Kcal/Kg Maximum Limit- 4000 kcal/Kg

- 6.9 Supplier shall supply the agro residue based Non-torrefied biomass pellets of GCV not less than 2800 kcal/kg. Price shall be adjusted for GCV variation of supplied material as below:

For GCV (ARB) \geq 2800 Kcal/Kg [For GCV more than or equal to 2800 Kcal/Kg]

- 6.10 Pro-rata price adjustment shall be done for GCV variation within acceptable GCV range of supplied material as per following formula: -

Adjusted FOR price = [Quoted FOR price“ x Actual GCV (ARB)]/ Quoted GCV(ARB)

*FOR Price- FOR Destination Price

- 6.11 In case upward GCV variation is more than the Maximum Limit for Non-Torrefied pellet then Price adjustment on account of GCV shall be limited to Maximum Limit for Non-Torrefied pellet only.

- 6.12 The downward GCV variation from Minimum limit, pro-rata price adjustment shall be done for GCV variation of supplied material as per following formula:

For GCV 2800 Kcal/Kg > GCV \Rightarrow 2400 Kcal/Kg [For GCV less than 2800 Kcal/Kg AND more than or equal to 2400 Kcal/Kg]

Adjusted FOR price = $0.75 \times [\text{Quoted FOR price} \cdot \text{Actual GCV (ARB)}] / \text{Quoted GCV (ARB)}$

For GCV 2400 Kcal/Kg > GCV \Rightarrow 2000 Kcal/Kg [For GCV less than 2400 Kcal/Kg AND more than or equal to 2000 Kcal/Kg]

Adjusted FOR price = $0.5 \times [\text{Quoted FOR price} \cdot \text{Actual GCV (ARB)}] / \text{Quoted GCV (ARB)}$

For GCV < 2000 Kcal/Kg [For GCV less than 2000 Kcal/Kg]

- 6.13 In case of GCV (ARB) is less than 2000 kcal/kg, no payment shall be made for already delivered and consumed material of GCV less than 2000 Kcal/kg.

Note: In case, supplier is found to frequently supply the material of GCV less than 2800 Kcal/Kg or found to take deviations in other technical parameters, warning letter shall be issued to supplier.

6.14 Recovery on Account of Excess Fines in Consignment

Dimension of agro residue-based pellets has been given in the technical specification which shall be adhered to. Dust, crushed agro residue-based pellets in consignment as received at Power Plant shall be treated as fines and there shall be recovery on account of excess fines (ARB) if it exceeds 5%. The recovery on account of excess fines will be worked out as per the following formula.

Recovery= Adjusted price of biomass pellets x W x (Weight% of fines beyond 5 %.)

W= weight of consignment as received

This amount shall be recovered from the payment of that consignment.

6.15 Rejection level

The consignment of agro residue based pellets arrived at the Power Plant shall initially be tested for following before unloading and shall be rejected if total moisture (as given in table 3) exceeds the rejection level given as follows:

Table-3 Rejection Level

Sr. No	Technical Data	Unit	Rejection Level
1	Total Moisture (ARB)	Wt %	More than 14%

7. Sampling and Analysis:

a) Sampling analysis at loading end (Supplier Side)

- (i) Each consignment should be accompanied by general details (such as name of company/firm/agency, address, date of dispatch, batch number, vehicle type and number, weight of consignment, bulk density etc.) and technical details which shall contain the values of all parameters specified in technical specification table-1 in the format given in annexure-II given at the end of this document
- (ii) The charges incurred on account of sampling analysis at loading end shall be borne by the supplier.

b) Sampling and analysis at receiving end (GVKPGSL site)

- (i) 30 Kgor appropriate amount of sample shall be collected from each carriage vehicle/ consignment on random basis either prior to unloading or during unloading or as per methodology mutually agreed between supplier(s) and GVKPGSL. Broad guidelines are as per Annex-A.
- (ii) The authorized representative(s) of GVKPGSL and supplier will jointly witness the process of sample collection and preparation of the laboratory samples. All representatives shall put their signature on the sample tags as evidence of the process of sampling. Testing process may also be witnessed by representative of supplier.

- (iii) Before unloading, samples shall be tested for moisture. If the value comes out to be more/less than rejection level as given in Table-2, the consignment shall be rejected and it shall be the supplier's responsibility to carry it back on his own cost.
- (iv) GVKPGSL shall arrange for analysis of fines part of Non-torrefied paddy residue based pellets at Plant site, if it exceeds more than 5⁰/», proportionate recovery shall be done for excess fines as above.

- (v) The collected sample shall be distributed in three parts-

Part-1:	For test and analysis in GVKPGSL lab
Part-2:	Shall be handed over to supplier/ supplier's representative
Part-3:	Shall be the referee sample which will be sealed and the representatives from both side shall put their signature on the sample tag. The sealed referee sample shall be kept in a safe box/ almirah with joint seal of both the parties, at GVKPGSL site.

- (vi) Part-1 sample shall be tested for GCV, moisture, fines, etc. regularly which shall be used for quantity / price adjustment, payment purpose and also to ascertain rejection parameters. Analysis report by supplier shall be treated as indicative only.

In case, supplier is supplying more than one carriage vehicle/ consignment in a day, a composite Part-1, Part-2 and Part-3 sample for whole day may be prepared by mixing appropriate amount of samples collected from carriage vehicle/ consignment which shall be used for quantity / price adjustment and payment purpose. Whereas, in that case, rejection parameters shall be ascertained by testing samples only from individual carriage vehicle/ consignment.

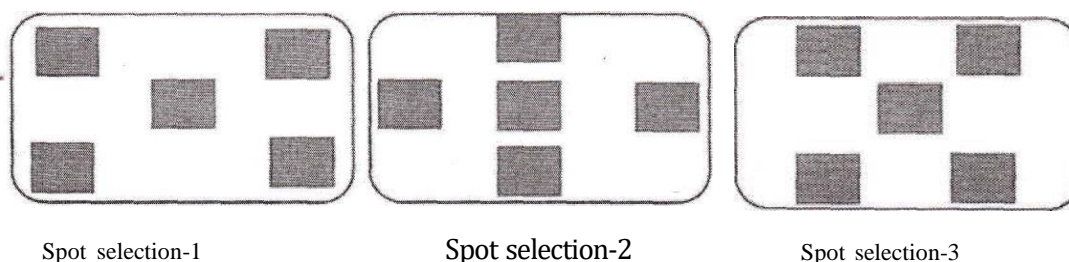
- (vii) Test report by GVKPGSL shall be sent to supplier after sample testing though e-mail. In case, supplier is not satisfied with the test results of GVKPGSL which is being used for price and quantity adjustment, the sealed referee sample (Part 3) kept at GVKPGSL site office in safe box/ almirah, shall be tested preferably in a NABL accredited laboratory as notified by GVKPGSL time to time, expense of which shall be borne by supplier and shall be adjusted against payment of consignment. Referee laboratory report of referee sample shall be final and binding on both the parties.
- (viii) It is to be noted that, referee sample shall only be used in case of conflict in quantity and price adjustment, whereas, in case of rejection of consignment due to moisture (ARB), GVKPGSL test results shall be treated sufficient for rejection.
No further third party test of referee sample shall be permissible.
- (ix) In case supplier fails to provide its representative for witnessing the sampling and testing process, GVKPGSL lab report shall be final. No third party test shall be carried out in such case.
- (x) Further, in case, GVKPGSL fails to perform sampling of consignment due to any reason attributed to GVKPGSL, the test report of supplier sent with consignment shall be treated final for payment.
- (xi) No claim regarding quantity/ price adjustment shall be entertained after 15 days of GVKPGSL lab test report sent to supplier through e-mail by GVKPGSL.

8.0 Sampling methodology:

The Pellet sample should be representative sample, means it should have pellets of all sizes (small, medium, large) etc. The collected sample should represent the truck/ consignment. For the purpose of rejection test before clearance for unloading, each truck/consignment shall be tested for moisture and GCV by GVKPGSL. For testing of GCV and other Technical parameters, single composite sample shall be prepared for all the consignments received in a day from a particular vendor. For avoidance of doubt, in case supply is from multiple vendors in a day, vendor-wise sample shall be prepared for all the consignment received in a day.

The sample quantity of approximately 30 Kg is to be collected from each truck/consignment from 4-5 randomly selected spots on the truck top after removing biomass pellet layer of random depth from the top. Approximately 5-6 kg of sample is to be collected from each spot.

Five spots are selected for sampling of biomass pallet as shown in figure below. Any one spot selection option will be decided by GVKPGSL sampling staff after viewing the biomass loading pattern. Spot selection is not in vendor's scope.



i) For testing of moisture for rejection test for unloading clearance

After collection of samples from the truck as stated above, thoroughly mix the pellet samples and collect approximately 1 Kg of representative sample for carrying out rejection test.

ii) For testing of GCV and other technical parameters

Do the coning and quartering of the rest of the sample, till the sample quantity is reduced to 4-5 Kg as explained below:

Example-Suppose one collects 30 Kg sample from One truck and total no of trucks received in a day from a particular vendor is 'N' then the total pellet sample collected will be around '30N' Kg. 'N' can be 1,2,3 ...or so on.

Prepare a cone (heap) of '30N' Kg and divide the cone from top to bottom and remove the half portion (left or right). Further, prepare the cone for remaining '15N' Kg of pellet and divide the heap and remove the pellet of side opposite to the side of previous removal. Now, the balance available qty of pellet is '7.5N' Kg and continue this process till the pellet sample is reduced to '4-5' Kg. The final laboratory sample shall be distributed for determination of GCV and other technical parameters

8.1 Sampling shall be carried out only between 09:30 hours to 13:30 hours (weekday except Sunday).

Sample collection / preparation / analysis for moisture (ARB) parameters require minimum 4-5 hrs. Report of moisture (ARB) content for vehicles / consignment sampled at GVKPGSL site upto 11:00 hours (weekdays except Sunday) will be issued on same day and rest shall be issued on subsequent working day.

8.2 Before unloading, samples shall be tested for moisture.

8.3 Demurrage if any on the carriage vehicle due to any reason occurred shall not be on GVKPGSL account

ANNEXURE- A**Brief description of sampling / testing procedures to be followed at GVKPGSL Goindwal Sahib:**

Sr. No.	Parameter	Base Standard	Methodology
1	Sample collection	IS 436 Part-1 Sec-1	30 kg of sample to be collected from each carriage Vehicle/consignment on random basis either prior to unloading or during unloading. 50% sample to be used for % fines estimation and remaining sample shall be used for preparation of Total Moisture and GCV sample. Sample to be collected after removal of 25-30 cm top layer. If consignment has more than 1 carriage vehicle then at least 20% vehicles selected at random to be sampled for collection of this representative sample.
2	Sample Preparation	IS 436 Part-1 Sec-1	<p>After proper mixing gross sample to be divided into 2 equal parts.</p> <p>One part to be used for % fines determination.</p> <p>Second part to be passed through 12.5 mm crusher. Whole crushed sample to be passed through 3 mm crusher and divided into 2 equal parts of 2.5 kg each. One 2.5kg part to be reduced to 500 g after coning & quartering and packed as total moisture sample. Second 2.5 kg part to be mixed properly and halved to 1.25 kg. This part to be kept for overnight conditioning. Next day conditioned part to be pulverised and after mixing to be divided into 3 equal parts as Part-1 (lab part), Part-2 (supplier part) & Part-3 (referee part).</p>
3	Fines	ISO 18846	<p>Sample shall be passed through 3 mm mesh size sieve having circular holes (dimensions 45 cm x 30 cm) with base receiving pan is to be used.</p> <p>Sample qty = 1 Kg (approx.) to be obtained after coning / quartering. Tilt the screen 10 times side to side.</p> <p>Record % fines = $\text{Weight of fines passing sieve} \times 100 / \text{Total sample weight}$</p>
4	GCV	IS 1350 Part-2 2017	Approx. 1 g of 212 micron passing sample to be tested using Parr 6200 bomb calorimeter.
5	Total Moisture	IS 1350 Part-1 1984	<p>Lab validated method: 10 g of 2.90 mm passing sample to be heated for 2 hrs at 108\pm2°C.</p> <p>Record % TM = $(\text{Loss in weight}) \times 100 / (\text{Initial weight of sample})$</p>

