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CLASSIFICATION	CONFIDENTIAL	DATE	25 JANUARY 2021
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FOR ATTENTION	D. THENGA AG CUMMING P. MAKHOPA L. RAMUHULU	ACTION REQUIRED	FOR INFORMATION AND IMPLEMENTATION
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FROM	S. ANDHEE	REFERENCE	730024
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SUBJECT	TECHNICAL EVALUATION CRITERIA FOR LIMESTONE RFP: KUSILE POWER STATION
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This note confirms that the technical evaluation of the Limestone RFP for Kusile Station will be conducted in 2 phases:

- Phase 1: Evaluation in C-Max - prequalification
- Phase 2: Due diligence and final evaluation of short listed respondents

1. Phase 1

1.1 Mandatory Returnables

- 1.1.1 Limestone Quality Specification offered (Annexure O)
- 1.1.2 Technical Report or Competent Persons Report (CPR) containing the information required as per the Technical Report/CPR guideline as per Annexure P)

1.2 Evaluation

In C-Max the technical evaluation will be based on the following two criteria:

- 1.2.1 Meeting the limestone requirements as per Table 1 below
- 1.2.2 Information in the Competent Persons Report (CPR) or Technical report as per annexure P


Table 1: Kusile Wet Flue Gas Desulphurisation (WFGD) Limestone Specification for Phase 1 Evaluation

Metric	Unit	Expected Quality Specification	Distress Points	Rejection Points
Carbonate (CaCO ₃)	%	≥92.0	<90.0	<89.0
Magnesium Carbonate (MgCO ₃)	%	≤2.5	≥2.7	≥3.0
Silica dioxide (SiO ₂)	%	≤2.5	>2.8	≥3.0
Other Inerts	%	≤3.0	>4.5	≥5.0
Size Distribution 0-5mm	%	<10%	N/A	≥10%

The test methodologies for the parameter / constituents in Table 1 are to be as follows:

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Constituent being analysed	Methodology Type	Reference Standard
Element Composition	X-Ray Fluorescence (XRF) (pressed pellet AND fused bead)	ASTM C1271
Mineralogical Composition	X-Ray Diffraction (XRD)	ASTM C1365 - 06(2011)
Particle Size Distribution	Sieve Analysis (Dry)	ASTM C110 - 16

Scoring will be as per table 2 below

Table 2: Phase 1 Qualitative Scoring Criteria

No.	Evaluation Parameter	Weight (%)	0	1	2	3	4	5	6
	KPA 1: RETURNABLES		0%	41%					
1	1.1 Respondent meets all Eskom's limestone specification requirements	41%	Do not meet all requirements	Meet all requirements					
			2.5%	5.0%					
	1.2 Completeness of Competent Person's Report or Technical report as per the guidelines provided in Annexure P	5%	Incomplete	Submitted Complete					
	KPA 2: INFORMATION CONTAINED IN THE COMPETENT PERSON REPORT/TECHNICAL REPORT		0%	4%					
2	2.1 Local stratigraphic column is contained in the report	4%	Not Contained in report	Contained in report					
	2.2 Information on host lithology / Super Group / Group / subgroup / formation is contained in the report	4%	Not Contained in report	Contained in report					
	2.3 Description of the limestone deposit / economic horizons / mineralogy is contained in the report	4%	Not Contained in report	Contained in report					
	2.4 Information on economic horizon or pay zone cut off / discount factors applied for tons is contained in the report	4%	Not Contained in report	Contained in report					
	2.5 Information on economic horizon / pay zone cut off applied / discount factors for Limestone qualities is contained in the report	4%	Not Contained in report	Contained in report					
			0%	16%					
	2.6 Information on Reserve / Resource Tonnage categories GTIS or TTIS or MTIS is contained in the report	16%	Not Contained in report	GTIS or TTIS or MTIS					
			0%	3%	6%	9%	12%	15%	18%
2.7	Information on quality parameters; Grain size distribution, Bond work index, Composition - Usable CaCO ₃ (excluding portion taken up by dolomite), Total Magnesium (MgCO ₃ + MgO, excluding portion taken up by dolomite), SiO ₂ (Total), SiO ₂ as Quartz, Total Contaminants	18%	No parameter contained in Report	1 parameter contained in Report	2 parameters contained in Report	3 parameters contained in Report	4 parameters contained in Report	5 parameters contained in Report	6 parameters contained in Report
100%									

Threshold required **60%**

Note:

- If ranges are given in the limestone parameter / constituents (quality specification) offered then worse value will be used for scoring.
- Presentations will not be considered as Competent Persons Report (CPR) / Technical Report.
- The information in the CPR / Technical Report returnable will be scored as per Annexure P for completeness. If the respondent scores less than the threshold of 75% the respondent will score 2.5%
- For the reserve / resource tons to score 16%, the Gross Ton In-situ (GTIS) or the Total Tons In-situ (TTIS) or Mineable Tons In-situ (MTIS) must be provided.

2. Phase 2:

During Phase 2, Eskom will perform a due diligence and conduct final scoring of the pre-qualified respondents that have passed Phase 1.

A signed technical assessment shall be completed for each respondent. The following criteria must be completed as a summary for each Supplier/Source that was assessed.

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Table 3 Phase 2 scoring criteria

Supplier	Source	Criteria							Comments/Disclaimers
		1	2	3	4	5	6	7	
		Reserve/ Resource Statement	Geological Model	Mine Plan/ Schedule	Process Flow	Bulk Sample Test Representative Sample	Compliance with specification	Site Visit	Meets all requirements
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									

A signed technical assessment report to be completed by the appointed technical team for each Supplier /Source evaluated.
The following criteria/questions to be completed as summary for each respondent assessed.

	Yes	No	Comments
1. Reserve/Resource Statement			
-Were the reserve and resource statement provided for assessment?			
2. Geological Model			
-Does the geological model confirm the declared reserve/resource statement?			
3. Mine Plan/Schedule			
-Does the declared mine plan/schedule support the required tonnages and qualities?			
4. Process Flow			
-Was the process flow confirmed and does the process support the expected tonnages/qualities?			
5. Bulk Sample/XRF Test			
-Was the representative bulk sample representing the intended final product delivered and analysed by Eskom?			
-Did the relevant XRF test results support the contractual specification?			
6. Site Visit Readiness Assessment			
-Did the site visit assessment confirm what was presented?			
7. Overall Compliance			
-Did the technical assessment meet all the requirements for the phase 2 assessment and would the technical team recommend the source for further engagement?			


All the requirements as specified in table 3 above must be met, otherwise the respondent will be disqualified.

Requirements for Phase 2

1. Annexure S: Reserve and resource statement template (Tonnage and Qualities).
2. The process flow must show the Limestone plies and qualities and tons for each seam, processing qualities and tons and the final Eskom quality and tons (Annexure T is an example of the process flow diagram)
3. Geological Model (should include Borehole Information, Qualities, etc.) as per Annexure U: Guidelines for Geological Information and or validation/verification of the supplier geological model.

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4. Mine Plan and Schedule. Supplier to demonstrate the capacity (equipment) relating to the production rate
5. Site visit to conduct due diligence
6. Methodology followed for obtaining a representative sample.
7. Each potential supplier will also have to provide a 100kg (inclusive of 10% reserve sample) representative sample of the product offered for Eskom to analyse as per Table 4 below.
8. Eskom will conduct chemical analysis of the provided samples as per table 5 to confirm adherence of the respondents to the required limestone specification as per Table 4.
9. For contracting purposes, contracting will done as per the qualities shown in Table 4. The Supplier must however meet the full quality specifications as per Table 6.

PED TSD will assist the appointed Finance team in the benchmark cost validation.

Table 4: Kusile Wet Flue Gas Desulphurisation (WFGD) Limestone Specification for Phase 2 Evaluation


	Parameter/Constituent	Kusile WFGD Specification	Units
1	Grain Size Distribution (delivered limestone)	$\leq 19 \times 0$, with less than 10% < 5mm	mm
2	BWI	$\geq 9 \leq 12$	kWh/t
3	Composition*		
3.1	Usable CaCO_3 (excluding portion taken up by dolomite)	≥ 92	%
3.2	Total Magnesium ($\text{MgCO}_3 + \text{MgO}$, excluding portion taken up by dolomite)	≤ 2.5	%
3.3	SiO_2 (Total)	≤ 2.5	%
3.4	SiO_2 as Quartz	≤ 2	mass%
3.5	Other Inerts	≤ 3	%

The test methodologies for the parameter / constituents in Table 1 are to be as follows:

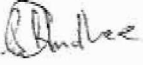
Constituent being analysed	Methodology Type	Reference Standard
Element Composition	X-Ray Fluorescence (XRF) (pressed pellet AND fused bead)	ASTM C1271
Mineralogical Composition	X-Ray Diffraction (XRD)	ASTM C1365 - 06(2011)
Grindability/ Hardness	Bond Work Index (BWI)	ASTM C110 - 16
Particle Size Distribution	Sieve Analysis (Dry)	ASTM C110 - 16

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Submitted by:



 19/03/2021

Sunjay Andhee
 Chief Geologist

TSD Squad Check
Seen and accepted


 19/03/2021

AG Cumming
 Middle Manager-Geology


 23/03/2021


D Thenga
 Senior Manager -: Technical Services

23/03/2021
 

K Ramahali
 Engineering

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Annexures Phase 1:

Annexure O: Limestone Quality Specification Offered


Metric	Unit	Limestone Quality Specification Offered
Carbonate (CaCO₃)	%	
Magnesium Carbonate (MgCO₃)	%	
Silica dioxide (SiO₂)	%	
Other Inerts	%	
Size Distribution 0-5mm	%	

The test methodologies for the parameter / constituents in Annexure O are to be as follows:

Constituent being analysed	Methodology Type	Reference Standard
Element Composition	X-Ray Fluorescence (XRF) (pressed pellet AND fused bead)	ASTM C1271
Mineralogical Composition	X-Ray Diffraction (XRD)	ASTM C1365 - 06(2011)
Particle Size Distribution	Sieve Analysis (Dry)	ASTM C110 - 16

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ANNEXURE P- TECHNICAL REPORT / COMPETENT PERSON'S GUIDELINE

No.	Information contained in Competent Person's Report and or Technical Report	Score %	
		Provided	Not Provided
1	Background	1	0
2	Locality of source	6	0
3	Mining Rights /Permits/ Application for Mining rights (Legal)	6	0
4	Information on Exploration / Drilling	6	0
5	Information on Geological Structure	6	0
6	Lithology/ Stratigraphy/ economic horizons or pay zones present	6	0
7	Information on Limestone Qualities -Raw and or processed/ beneficiated	18	0
8	Limestone Quality contours	4	
9	Limestone Thickness Contours	4	
10	Limestone Quality Cut off parameters (e.g. total magnesium >2%)	6	0
11	Limestone Tonnage Cut off parameters (e.g . seam thickness <0.5m)	6	0
12	Reserve / Resource statement	18	0
13	Limestone Beneficiation / Processing (e.g crushed / screened / washed/ blended	5	0
14	Geotechnical	3	0
15	Risks	3	0
16	Conclusion /Summary/ Recommendations	2	0
Total		100	0

75% and above scores 5% under KPA1 - Returnables

Less than 75% scores 2.5% under KPA1 - Returnables

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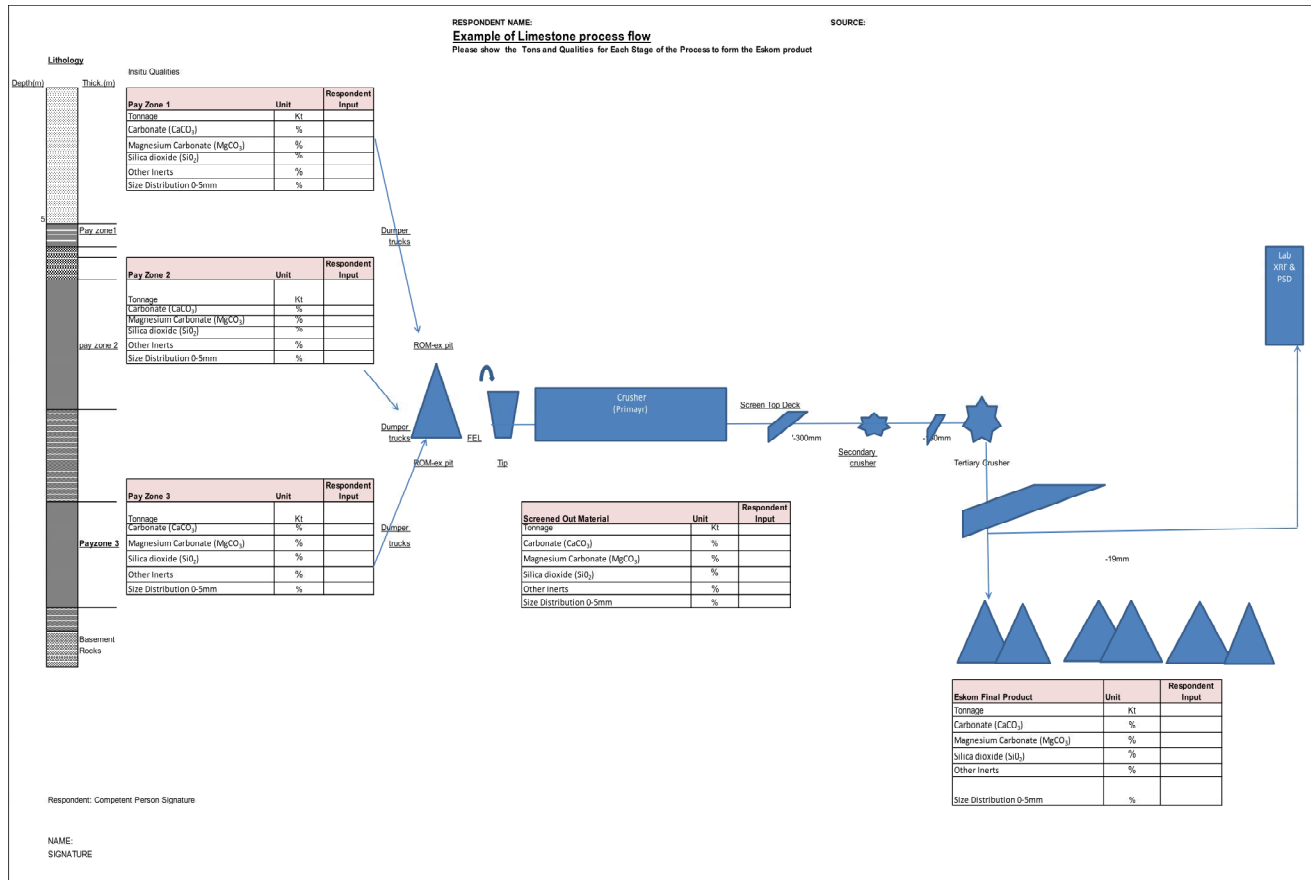
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ANNEXURE T: EXAMPLE OF LIMESTONE PROCESS FLOW



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ANNEXURE U: INFORMATION REQUIRED FOR GEOLOGICAL MODEL (MINEX)

ANNEXURE U – INFORMATION REQUIRED THE GEOLOGICAL MODEL (MINEX)

- 1.1 Collars (Borehole ID, X, Y and Z coordinates, the depth of the BH) and type if there is variation in the borehole data
- 1.2 Pick File (Seams names, From and To for each seam, Borehole ID aligned to each seam)
- 1.3 Sample File (with sample ID align to From and To of each sample taken) From and To Sample Name
- 1.4 Raw qualities for each sample taken (if available) From To Same Name Qualities
- 1.5 Wash qualities for each sample taken (if available)
- 1.6 DTM if available (borehole collars could be used as DTM) (dxf or dwg)
- 1.7 Farm Boundaries, Mineral Rights boundaries, Layout of mining, infrastructure (e.g. roads, buildings, rails, power lines, dams, pans, rivers etc.). All in the same coordinates system as boreholes (dxf, dwg).
- 1.8 Any geological structures such as dykes, faults burnt coal if known or mapped (also in the same coordinates system as others) (dxf or dwg)
- 1.9 Mined out masks or polygons (same coordinates system as others) (dxf or dwg)

ANNEXURE S - RESERVE AND RESOURCE STATEMENT TEMPLATE

Please use the following template (complete table 1 and table 2) for each category (SAMREC) of reserve and resources (ie probable, proven, measured, Indicated and Inferred)

Please complete table 1 below indicating all the information requested.

Reserve/ Resource	Category	Seam/ Block	No. of Boreholes	BH/ 100Ha	Area m2	Thick m	RD g/cm ³	RD g/cm ³	BH/ 100Ha	GTS tons	Geol. Loss %	TTS tons	Area m2	Thick m	RD g/cm ³	MTS tons	Mining Loss %	Mining Extract. %	ROM unct.	Contam. %	Surfac + Moist. %	ROM ct. as del.	Screen Yield %	Wash Yield %	Total Yield %	SALES tons
Reserves	Probable																									
	Seam																									
	Seam																									
	Seam																									
	Proved																									
Resources	Seam																									
	Seam																									
	Seam																									
	Total																									
	Measured																									
	Seam																									
	Seam																									
	Seam																									
	Total																									
	Indicated																									
	Seam																									
	Seam																									
	Seam																									
	Total																									
	Inferred																									
	Seam																									
	Seam																									
	Seam																									
	Total																									
Grand Total																										

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ANNEXURE S: Table 2 – Limestone Qualities

RESERVE AND RESOURCE STATEMENT - QUALITIES (PARAMETERS / CONSTITUENTS)

Supplier:

Source:

Block	Piles	Total Tons Insitu (TTIS) Raw (uncontaminated)																									
		Limestone Qualities - (Parameters / Constituents)																									
		BWI	REACTIVITY	BULK DENSITY BY WEIGHT	BULK DENSITY BY VOLUME	CaCO ₂	MgCO ₃	MgO	Mg(OH) ₂	Al ₂ O ₃	Fe ₂ O ₃	Mn ₂ O ₃	SiO ₂ Total	SiO ₂ (Quartz)	Dolomite	Chlorite	Serpentine	Mica	Garnet	Hematite	Rutile	Ankerite	Clay (Montmorillonite)	Muscovite	Anhydrites	Biotite	Total Inerts
Name	Name	kWh/t	-	kg/m ³	kg/m ³	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	
Total																											

Block	Piles	Mineable Tons Insitu (MTIS) Raw (uncontaminated)																								
		Limestone Qualities - (Parameters / Constituents)																								
		BWI	REACTIVITY	BULK DENSITY BY WEIGHT	BULK DENSITY BY VOLUME	CaCO ₃	MgCO ₃	MgO	Mg(OH) ₂	Al ₂ O ₃	Fe ₂ O ₃	Mn ₂ O ₃	SiO ₂ Total	SiO ₂ (Quartz)	Dolomite	Chlorite	Serpentine	Mica	Garnet	Hematite	Rutile	Ankerite	Clay (Montmorilli)	Muscovite	Anhydrites	Biotite
Name	Name	kWh/t	-	kg/m ³	kg/m ³	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
Total																										

Block	Piles	Run of Mine (ROM) (uncontaminated)																									
		Limestone Qualities - (Parameters / Constituents)																									
		BWI	REACTIVITY	BULK DENSITY BY WEIGHT	BULK DENSITY BY VOLUME	CaCO ₃	MgCO ₃	MgO	Mg(OH) ₂	Al ₂ O ₃	Fe ₂ O ₃	Mn ₂ O ₃	SiO ₂ Total	SiO ₂ (Quartz)	Dolomite	Chlorite	Serpentine	Mica	Garnet	Hematite	Rutile	Ankerite	Clay (Montmorillonite)	Muscovite	Anhydrites	Biotite	Total Inerts
Name	Name	kWh/t	-	kg/m ³	kg/m ³	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
Total																											

Block	Piles	Run of Mine (ROM) (contaminated)																								
		Limestone Qualities - (Parameters / Constituents)																								
		BWI	REACTIVITY	BULK DENSITY BY WEIGHT	BULK DENSITY BY VOLUME	CaCO ₃	MgCO ₃	MgO	Mg(OH) ₂	Al ₂ O ₃	Fe ₂ O ₃	Mn ₂ O ₃	SiO ₂ Total	SiO ₂ (Quartz)	Dolomite	Chlorite	Serpentine	Mica	Garnet	Hematite	Rutile	Ankerite	Clay (Montmorillonite)	Muscovite	Anhydrites	Biotite
Name	Name	kWh/t	-	kg/m ³	kg/m ³	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
Total																										

Piles	Sales																										
	Limestone Qualities - (Parameters / Constituents)																										
	Grain size-Delivered limestone	BWI	REACTIVITY	BULK DENSITY BY WEIGHT	BULK DENSITY BY VOLUME	CaCO ₃	MgCO ₃	MgO	Mg(OH) ₂	Al ₂ O ₃	Fe ₂ O ₃	Mn ₂ O ₃	SiO ₂ Total	SiO ₂ (Quartz)	Dolomite	Chlorite	Serpentine	Mica	Garnet	Hematite	Rutile	Ankerite	Clay (Montmorillonite)	Muscovite	Anhydrites	Biotite	Total Inerts
Name	mm	kWh/t	-	kg/m ³	kg/m ³	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
Total																											

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Table 5: Analysis / Tests to be conducted by Eskom

Constituent being analysed	Methodology Type (include applicable standards)	Measurement	Reference standard	Note
Element Composition	X-Ray Fluorescence (XRF) (pressed pellet AND fused bead)	XRF determines the elemental proportions and the loss on ignition (LOI). Elements are reported as oxides.	ASTM C1271	EPRI standard focuses on Atomic Absorption and alternatively refers to ICP
Mineralogical Composition	QEMSCAN (Eskom internal only)	Determines proportion, habit, shape, size of the minerals in limestone. Good for identifying siliceous limestone and the total and nature of the contaminants.	Alternative method. Laboratory specific standard	Advanced analysis Eskom internal research only
	X-Ray Diffraction (XRD)	Determines the crystalline phases and the calcium carbonate polymorphs.	ASTM C1365 - 06(2011)	Method based on analysing cement (contains limestone)
	Lime Quality Assessment (LQA)	This is an Excel based Eskom RT&D developed tool which uses the elemental composition from XRF to predict mineral proportion. This method is good to predict the mineral proportions without the need to undertake XRD/ QEMSCAN.	Novel Technique developed by Eskom RT&D, standard TBD.	Internally developed by Eskom RT&D
Reactivity	pH-STAT (Based on VGB instruction sheet M701 e/ 2 nd edition 2008) OR Alstom Reactivity Test Method(2007)	Limestone reactivity.	VGB M701E	RT&D report number: RES/RR/11/33718
Grindability/ Hardness	Bond Work Index (BWI)	Determines the hardness of the limestone and the energy required to mill the limestone.	ASTM C110 - 16	ASTM limestone specific
Particle Size Distribution	Sieve Analysis (Dry/ Wet)	Determines the particle size distribution of the limestone feed.	ASTM C110 - 16	ASTM limestone specific

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Table 6: Limestone qualities for contracting

KUSILE WFGD LIMESTONE SPECIFICATION

Parameter/Constituent	Kusile WFGD Specification	Units
Grain Size Distribution (delivered limestone)	≤19 x 0, with less than 10% < 5mm	mm
BWI	9-12	KWh/t
Bulk density by weight	1840	kg/m ³
Bulk density by volume	1360	kg/m ³
Composition		
CaCO ₃	≥92	%
MgCO ₃	≤2.5	%
MgO	<1	%
Mg(OH) ₂		%
Al ₂ O ₃	<1	%
Fe ₂ O ₃	<1	%
Mn ₂ O ₃	<1	%
SiO ₂ (Total)	≤2.5	%
SiO ₂ (Quartz)	<2	%
Dolomite Ca, Mg(CO ₃) ₂	<5	%
Mineralogical Composition		
Chlorite (Fe, Mg, Al, Zn) ₆ (Si, Al) ₄ O ₁₀ (OH) ₈	Trace, undetectable	%
Serpentine(Fe, Mg, Al, Zn) ₆ (Si, Al) ₄ O ₁₀ (OH) ₈	Trace, undetectable	%
Mica IM ₂ -3X ₁ -OT ₄ O ₁₀ A ₂ I=Cs, K, Na, NH ₄ , Rb, Ba, Ca M= Li, Fe ²⁺ , Fe ³⁺ , Mg, Mn ²⁺ , Mn ³⁺ , Zn, Al, Cr, V, Ti T=Be, Al, B, Fe ³⁺ , Si A=Cl, F, OH, O	Trace, undetectable	%
Garnet X ₃ Y ₂ (Z ₄) ₃ X= Mg ²⁺ , Fe ²⁺ , Mn ²⁺ , Ca ²⁺ Y=Al ³⁺ , Fe ³⁺ , Cr ³⁺ , V ³⁺ , Ti ³⁺ , Zr ⁴⁺ , Sn ⁴⁺ Z= Si ⁴⁺ , Al ³⁺ , Fe ³⁺ , Ti ³⁺ , B ⁵⁺ , As ³⁺ , As ⁵⁺	Trace, undetectable	%
Hematite Fe ₂ O ₃	Trace, undetectable	%
Rutile TiO ₂	Trace, undetectable	%
Ankerite CaFe(CO) ₃	Trace, undetectable	%
Clay (montmorillonite) [(Na, Ca)O, 3(Al, Mg) ₂ Si ₄ O ₁₀ (OH) ₂ *4H ₂ O]	Trace, undetectable	%
Muscovite [KAl ₂ (OH, F) ₂ AlSi ₃ O ₁₀]	Trace, undetectable	%
Anhydrite CaSO ₄	Trace, undetectable	%
Biotite K(Mg, Fe ²⁺ , Mn ²⁺) ₃ [(OH, F) ₂ (Al, Fe ³⁺ , Ti ³⁺) ⁺ , Si ₃ O ₁₀]	Trace, undetectable	

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