Abellon

Without Prejudice

14.03.2024

To,

The Ld. Secretary,
Central Electricity Regulatory Commission,
3rd Floor, Chanderlok Building,
36 Janpath, New Delhi – 110001

Subject: **Comments / Suggestions on behalf of Abellon Clean Energy Limited on the Draft Central Electricity Regulatory Commission (Terms and Conditions for determination of Tariff from Renewable Energy Sources) Regulations, 2024**

Dear Sir,

This is with reference to the public notice dated 17.02.2024 bearing No. RA-14026(11)/1/2023-CERC ("**Public Notice**") vide which this Hon'ble Commission notified the Draft Central Electricity Regulatory Commission (Terms and Conditions for determination of Tariff from Renewable Energy Sources) Regulations, 2024 ("**Draft RE Tariff Regulations 2024**") and accordingly invited the comments / suggestions / objections from the stakeholders and interested persons latest by 14.03.2024.

In furtherance of the same, Abellon Clean Energy Limited ("**ACEL**"), being holding entity of several Waste-to-Energy project developers in the state of Gujarat, seeks to submit comments / suggestions / objections to the Draft RE Tariff Regulations 2024.

ACEL seeks to submit its comments / suggestions / objections in two parts:

(i) Comments with respect to applicable tariff for Refused Derived Fuel ("**RDF**") based WTE projects have been enclosed as **Annexure – A**.

(ii) Comments with respect to applicable tariff for Biomass power projects have been enclosed as **Annexure – B**.

ABELLON CLEANENERGY LIMITED GUJARAT

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Accordingly, ACEL humbly seeks your kind indulgence in taking the attached comments on record for the purpose of the public hearing on the Draft RE Tariff Regulations 2024 scheduled on 19.03.2024.

Yours Sincerely,

Abellon CleanEnergy Limited

(Authorized Signatory)

ABELLON CLEANENERGY LIMITED GUJARAT

ANNEXURE -A

At the outset, we are thankful to this Hon'ble Commission for publishing the Draft CERC (Terms and Conditions for Tariff determination from Renewable Energy Sources) Regulations, 2024 ("**Draft Regulations**") which includes tariff component for the Waste to Energy ("**WTE**") projects and inviting stakeholder comments. The present comments and representation are limited to tariff measures being provided in Draft Regulations for WTE projects.

The determination of a cost-reflective tariff for WTE projects is vital for the operation and viability of such projects and, particularly WTE projects which directly result in the reduction in harmful impact of waste and improvement in the quality of public life. We have analyzed the provisions of the Draft Regulations and have provided certain comments and suggestions for consideration of this Hon'ble Commission in order to assist this Hon'ble Commission in determining the applicable tariff for WTE projects. Further, we reserve our right to file any additional or supplementary submissions and also make any additional oral submissions during the course of public hearing. The clause wise comments and suggestions are as follows for your kind consideration:

Sr. No.	Reference	Existing Description	Comments / Suggestions
1.	Regulation 62	**62. Capital Cost**	- Regulation 12 under Chapter 2 of the Draft Regulations specify that the "*norms for capital cost, as specified in relevant chapters of these regulations,* ***shall be inclusive of land cost, pre-***

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<td>"<u>Capital Cost</u>"

Page 28 of Draft Regulations</td>
<td>Normative Capital Costs for first year of the Control Period shall be as under:

<table>
<tr><th>Technology</th><th>Capital Cost (Rs. Lakhs/ MW)</th></tr>
<tr><td>MSW</td><td>1800</td></tr>
<tr><td>RDF</td><td>2100</td></tr>
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<td><u>development expenses, all capital work including plant & machinery, civil work, erection, commissioning, financing cost, interest during construction and evacuation infrastructure up to an inter-connection point.</u>"

- ACEL submits that in the process of determination of applicable capital cost for MSW and RDF-based WTE projects, this Hon'ble Commission ought to be cognizant of the fact that owing to the poor segregation of MSW at source, the WTE generators are forced to incur additional expenditure in pre-processing the MSW to ensure that the inert content is adequately segregated before incineration.

- WTE generators are further obligated to manage the subsequent issues created by the incineration of poor quality MSW vis-à-vis incurring a higher cost for maintaining an adequate Flue Gas Cleaning System (FGCS) to ensure adequate treatment of</td>
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			harmful effluents discharged from the incineration of such poor quality MSW. - ACEL submits that this Hon'ble Commission ought to consider evaluating real-time empirical data from operational and functioning WTE projects instead of basing its determination on any assumptions. - ACEL further seeks to highlight that the construction and commissioning of its Jamnagar WTE project of group entity of ACEL entailed capital cost of INR 19.33 Crores / MW. However, such costs were incurred in the period between 2019-2021 and there has been a considerable hike in effect of inflationary forces upon various costs. Further, the capital cost requirement fluctuates considerably due to the geographical factors. ACEL's other pipeline projects cost have also gone up and approximately is around INR 22.33 Crores/MW for which cost commitments

			were made during 2020-2022. Accounting for the aforesaid and other prevalent factors, ACEL submits that the capital cost ought to be determined in the range of INR 23 Crores/MW to INR 28 Crores / MW for the next control period. - Considering the aforesaid issues and taking into account the prevailing market rates, the **capital cost of MSW-based WTE projects using RDF ought to be provided as INR 23 Crores/MW to INR 28 Crores / MW** for the next control period which is **inclusive of pre-processing infrastructure.** - ACEL is submitting the aforesaid figures on the basis of the operational data procured from its 7.5 MW WTE plant in Jamnagar, where the total capital cost is around INR 145 Crores, thereby translating to INR 19.33 Crores / MW. It is worth highlighting that the entire economics behind the Jamnagar plant has been corroborated by appropriate authorities such as Indian

			Renewable Energy Development Agency ("**IREDA**") and Power Finance Corporation ("**PFC**"). However, it is pertinent to note that construction of the aforesaid project had begun back in 2019, and the costs incurred were in line with the market rates at the time. - Notably, the Ministry of Housing and Urban Affairs ("**MoHUA**") '*Guidelines on Usage of RDF in Various Industries, October-2018*' also states that cost of setting up **Pre-processing facility** is around Rs 12 Crores Per100 ton which translates to Project cost of Rs 120 Crores for 14.9 MW waste to energy Plant.

Table 18. Tentative Capital Cost for setting up to 100 TPD plant

S.No.	Items	Cost (Rs. Lakhs)
1	Air Shifter (1 nos.)	25
2*	Shredder Metso (14tph @ 50mm X1 nos.)	390
3*	Screen, Ecostar make for segregation & recycling 1 no. @12 tph	145
4*	Baling Machine (1 X 15tph)	102
5	Magnetic band (1 no.)	3
6	Conveyors (50 mtrs length approx)	13
7	Weigh Bridge-60T	11
8	Electricals	
a	600 KVA transformer	10
b	1 nos. of 365 KVA DG	22
c	Panel & cables	10
d	VCB	4
e	Earthings	5
f	Lighting of shed & boundary wall	15
9	Civil (Covers Boundary wall, office block, rain water harvesting, bore well, soaking pit, road, toilet etc.)	172
10	Covered Shed (2000 sqm)	200
11	Office furniture & computer	2.5
12	Lab equipment	10
13	Fire fighting	30
14	Reject collection Bins- 6 nos.	3
15	Electrical Connection charges (govt. department)	10
16	Vehicle (JCB 1 nos. & Tractor 1 no.)	35
	Total	1217.5
	Contingency @3%	36.5
	Grand Total	1254.0
	Rounded Off	12.55 Cr

(Cost Source: M/s IL&FS Environmental Infrastructure & Services Ltd.)

			A table containing a detailed breakdown of the component-wise Capital Cost incurred by the developer has been annexed hereto and marked as **Annexure – A1** A descriptive analysis of the individual components for Capital Cost in case of RDF based WTE Projects has been annexed hereto and marked as **Annexure – A2**. In view of the above, ACEL humbly requests that this Hon'ble Commission considers the capital cost application to MSW-based WTE projects using RDF in the range of INR 23 Crores / MW to INR 28 Crores / MW for the purpose of determination of tariff
2.	Regulation 66	This Hon'ble Commission has disallowed fuel costs for determination of tariff of	- This Hon'ble Commission has not allowed fuel cost to the WTE projects and also not considered co-firing of supplementary fuel by such projects in order to maintain the necessary statutory

	"**Fuel Cost**" *Page 29 of the Draft Regulations*	MSW and RDF based power projects. Further, this Hon'ble Commission has not included blending and co-firing of the supplementary	threshold of furnace temperature for optimum incineration of waste and production of electricity. - Further, in relation to the usage of the supplementary fuel, following is noteworthy: A. It may also be noted that low calorific value of MSW/RDF poses issue in start-up / shutdown activity requirement where the boiler required to maintain a temperature of minimum 850 °C which is possible with help of co-firing of Biomass. If MSW/RDF is incinerated at below temperature of 850°C, the harmful gases such as Dioxin and Furans will be released, which is threat for the environment. Further, moisture content in MSW/RDF is increased during the monsoon season which further has an impact on maintaining the desired Boiler temperature of minimum 850°C, thereby necessitating that allow Biomass as an auxiliary fuel to the extent of 15%.

			B. It is further noteworthy that the MNRE Guidelines provide for usage of industrial waste as supplementary fuel: - **MNRE guidelines dated November 2022 for implementation of Waste to Energy Programme "Programme on Energy from Urban, Industrial and Agricultural Wastes/Residues"** *1.2.* ***Objective****: The objective of the programme is to support the setting up of Waste to Energy projects for generation of Biogas/ BioCNG/ Power/ producer or syngas from urban, industrial and agricultural wastes/residues.* - **MNRE REVISED GUIDELINES OF WASTE-TO-ENERGY PROGRAMME – 28.02.2020**

			3.1 Type of Waste – Municipal Solid Waste *viii). In MSW to Power projects, mixing of any waste of renewable nature or biomass may be mixed to the extent of 25% of the total waste used or as per SERC/CERC regulations.* C. The Gujarat Pollution Control Board("**GPCB**") has issued Standard Operating procedures ("**SOP**") for utilisation of Non-recyclable Solid Wastes ("**NRSW**") (including Plastic Waste), ETP Sludge, Deinking Sludge from Waste Paper based Paper Mills and Refused Derived Fuel ("**RDF**") in Industrial Boiler / Waste to Energy Plant in the month of November 2023. The relevant para of the GPCB SOP are reproduced below: ***"5.1 Design and Operational Aspects of Boiler:***

			a) *A well designed waste to energy/ steam boiler having capacity not less than 10 TPH is to be provided for the purpose. It should be suitably designed for feeding and combustion of different type of wastes mentioned in this SOP.* b) *Combustion system of boiler must be designed to maintain combustion temperature above 850 degree centigrade with a flue gas residence time at least 2 seconds during combustion to avoid formation of dioxin & Furans.* c) *The auxiliary fuel is to be used to reach required temperature of 850 degree centigrade before starting waste feeding.* d) *Automatic startup of auxiliary fuel system is to be provided for maintaining the temperature at 850 degree centigrade, in case temperature starts going down. However, characteristics of the waste feed should be*

			preferably such that it will not require auxiliary fuel more than 20% of total fuel requirement. e) *Startup/ shutdown procedure following above requirement is to be derived and strictly followed to maintain combustion temperature above 850 degree centigrade with gas residence time of 2 seconds all the times."* it is therefore inferred that in order to use MSW/RDF into the combustion chamber of Boiler, the minimum temperature of boiler should be 850 °C or above. If MSW/RDF are inserted in the Boiler before temperature of 850 °C, the harmful gases such as Dioxin and Furans will be released, which is threat for the environment. Similarly, during the Shut-down Activity the waste(MSW/RDF) left in the Boiler are required to be burn completely, which is only possible with the help of auxiliary fuel. Thus, WTE plants are required to use auxiliary fuel to maintain a temperature of 850°C during start-up,

			operations and shut-down activity of the MSW/RDF based WTE Plants. D. It is also important to note that the European Commission published a report on "Best available Techniques (BAT) reference document for Waste Incineration" prepared by European Integrated Pollution Prevention and Control Bureau (EIPPCB) in year 2019. This BAT reference document for Waste Incineration forms part of a series presenting the results of an exchange of information between EU Member States, the industries concerned, non-governmental organizations promoting environmental protection and the Commission, to draw up, review and, where necessary, update BAT reference documents. The said report suggests that during the start-up activity of the plant, the best practice is to insert waste in the combustion temperature after a temperature of 850 °C is achieved. It is

			not advisable to insert waste before the temperature of 850 °C. During shutdown, it is necessary to keep the furnace temperature at the desired level until there is no more unburnt waste in the furnace. The use of Auxiliary fuel which is of non-waste (coal or coke) type has been described which will help in enhancing the temperature of combustion chamber to required level during start-up, Shut down and plant operation. The relevant para of the European Commission BAT report is reproduced below: ***"2.3.1.7 Auxiliary burners*** *At start-up, auxiliary burners are used to heat up the furnace to a specified temperature before any waste is added. During operation, the burners are switched on automatically if the temperature falls below the specified value. During shutdown, the burners are used*

			until there is no more unburnt waste in the furnace to keep the furnace temperature at the desired level ***1.3.2 Rotary kilns*** *…Operating temperatures of rotary kilns range from around 500 °C (as a gasifier) to 1450 °C (as a high-temperature ash melting kiln).* ***Higher temperatures are sometimes encountered, but usually in non-waste incineration applications. When used for conventional oxidative combustion, the kiln temperature is generally above 850 °C****. Kiln temperatures in the range of 900–1 200 °C are typical when incinerating hazardous wastes….*

			2.4.3.1 Energy inputs to waste incinerators *In addition to the energy in the waste, there are other inputs to the incinerator that need to be recognised when considering the energy efficiency of the plant as a whole.* *Electricity inputs* *Electricity is needed to run the process. The source can be external or circulated.* *Steam/heat/hot water inputs* *Steam (or hot water or other heat carrier) can be used in the process. The source can be external or circulated.* *Non-waste fuels* ***Non-waste fuels are used to:*** i. *Preheat the combustion air;*

			ii. ***Increase the temperature in the combustion chamber to the required level during start-up before the plant is fed with waste;*** iii. ***Ensure that the required combustion chamber temperatures are maintained during plant operation;*** iv. ***Maintain the temperature in the combustion chamber at the required level during shutdown, while there is still unburned waste in the plant;*** v. *Heat up the flue-gas for treatment in specific devices, such as selective catalytic reduction SCR or bag filters; Heat up the flue-gas (e.g. after wet scrubbers) in order to avoid bag filter and stack corrosion, and to suppress plume visibility."* Although Europe has allowed fossil fuel (coal or coke) as auxiliary fuel, however, in the interest of environment and robust

			compliance to objectives we are suggesting Biomass to be used as supplementary fuel, which is renewable in nature. - ACEL vide its letter dated 05.03.2024 has made a representation to the Central Electricity Authority ("**CEA**") highlighting the need to allow usage of supplementary fuel for MSW projects in order to maintain the requisite furnace temperature as specified above and accordingly sought its indulgence in placing a recommendation to this Hon'ble Commission expanding upon the same. - Recently, the CEA while appreciating the suggestion of the ACEL vide its email dated 13.03.2024 notified ACEL that appropriate suggestions have been furnished to this Hon'ble Commission upon perusal of ACEL's representation. A copy of the email communication between ACEL and CEA has been annexed hereto and marked as **Annexure – A3**.

			- It may be noted that CEA is recognized under the Electricity Act as apex body for the technical issue. The recommendation made by the CEA in terms of Section 73 (n) of the Electricity Act has statutory weightage and ought to be acted upon by the Hon'ble Commission. Section 73 (n) of the Electricity Act provides: "73. Functions and duties of Authority.—The Authority shall perform such functions and duties as the Central Government **may prescribe or direct**, and in particular to— "…. *(n)* ***advise the Appropriate Government and the Appropriate Commission on all technical matters relating to generation, transmission and distribution of electricity***

			- It is understood that the CEA vide its letter dated 06.03.2024 to this Hon'ble Commission highlighted the various extraneous factors that are associated with the incineration of MSW for generation of electricity and the hardships being faced by the developers in the absence of sufficient provisions allowing usage of auxiliary fuel. Reference was placed on the provisions of the "*Standard Operating Procedure for Utilization of Non-recyclable Solid Wastes (NRSW) (including Plastic Waste), Effluent Treatment Plant (ETP) Sludge, Deinking Sludge from Waste Paper based Paper Mills and Refused Derived Fuel (RDF) in Industrial Boiler / Waste to Energy Plant*" issued by the Gujarat Pollution Control Board (GPCB) and the European Commission's report on "*Best available Techniques (BAT) reference document for Waste Incineration*" to further highlight the general trend of acceptance in usage of auxiliary fuel in MSW based WTE projects, the same being reproduced and relied upon hereinabove. Accordingly, the CEA suggested that it is justifiable

			that a suitable provision for usage of auxiliary fuel and corresponding parameters be considered for the tariff determination process in the Draft Regulations and suggested that usage of supplementary fuel to the extent of 5% be allowed. A copy of the letter dated 06.03.2024 of the CEA has been annexed hereto and marked as **Annexure – A4**. - Considering the above, particularly binding technical advisory being provided by the CEA which is statutory in nature in terms of Section 73 (n) of the Electricity Act and the applicable legal regime which permits usage of supplementary fuel usage, ACEL suggests that this Hon'ble Commission should allow the supplementary fuel cost for co-firing of **supplementary fuel Biomass in the range of 10%-15%**. This Hon'ble Commission may also note that the Hon'ble Gujarat Electricity Regulatory Commission ("**GERC**") in its

			Biomass Tariff Order 2022 has considered the cost of biomass being used as supplementary fuel to be INR 5,044 / MT in 2023. Accordingly, ACEL requests that a similar consideration may be undertaken by this Hon'ble Commission by allowing the pass through of INR 5,044 / MT as supplementary fuel to the extent of 15% in the applicable tariff, along with an escalation factor of 5.72% to adjust for inflation. It is further suggested that the component of supplementary fuel in the overall fuel cost ought not to be treated on a levelized basis. Instead, it ought to be revisited and reviewed every 3 years in order to ensure that the applicable costs are reflective of the true market rates, thereby suitably protecting the developers from any undue financial hardships.
3.	Regulation 65	The Hon'ble Commission has proposed the O&M Cost as **6.5% of the capital cost**	- Regulation 19 of the Draft Regulations specifies that the O&M expenses for the entire tariff period shall be determined on the normative O&M expenses specified therein for the first year of

	"Operation and Maintenance Expenses" *Page 29 of Draft Regulations*	for MSW-based projects and **8.5% of the capital cost** for RDF-based projects with an **escalation rate of 5.89%**.	the control period and the escalation shall be based on such normative expenses for the first year. - As evident from the Explanatory Memorandum furnished along with the Draft Regulations, this Hon'ble Commission has arrived at the proposed O&M expenses by a simple comparative analysis of the findings of other State Commissions and without addressing any of the individual and pertinent issues that are unique to WTE developers. - ACEL submits that similar to the determination of capital cost of the projects, the O&M expenses ought to be determined by analyzing the actual operational data and experiences offered by WTE developers in order to provide a cost-reflective tariff. Accordingly, it is submitted that the O&M expenses for WTE projects ought to be determined by taking into account the following costs:

			(i) O&M of power plant (ii) O&M of pre-processing plant (iii) O&M of ash & inert material disposal (iv) O&M of FGCS A detailed breakdown of the O&M expenses in each category has been annexed hereto and marked as **Annexure – A5**. - It is submitted that WTE developers have to compensate for the lack of reliable technology and scientific methods for disposal and segregation of waste at source. They also have to account for certain variables that affect the smooth functioning and efficient operation of the plants, thereby affecting the actual O&M expenditure incurred by such developers.

			- It is also noteworthy that costs associated to O&M expenditure for a WTE plant are not fixed and fluctuate over time. The slow pace of scientific development coupled with the sever impact on supply chain due to various extraneous circumstances such as the COVID-19 pandemic, Russia-Ukraine and Israel-Palestine wars have further put inflationary pressure on the overall economics of the project and the same needs to be adequately accommodated in the tariff determination for cost-reflective recovery of expenses. - In addition to the aforesaid issues highlighted, it is also relevant to point out at the O&M expenses are also exacerbated by the costs incurred towards use of consumables such as lime and activated carbon for treatment of flue gas, specialized equipment like extractor crane, corrosive nature of fuel and need for refurbishment and replacement, requirement of skilled labour and various other factors that are considerably higher than other

			generators. Such factors ought to be adequately provided for at the time of determination of applicable O&M expense. - It is also worth highlighting that there is a significant uncertainty in the O&M costs applicable to WTE projects due to various factors such as heterogenous quality of waste and unstable market conditions. Furthermore, this Hon'ble Commission is obligated to determine a tariff which allows the generator to recover the actual costs incurred in a reasonable manner, by virtue of Section 61 of the Electricity Act, 2003. The suitability of the proposed O&M percentage threshold is contingent upon the approval of the revised capital expenditure per MW, as proposed in our recommendation above, which is essential for enabling the adoption of a cost-reflective tariff. - Considering the above, ACEL humbly prays for a hybrid tariff model wherein the O&M component is treated independently

			and periodically re-determined without according a levelized treatment to the same. -
4.	Regulation 64 "**Auxiliary Consumption**" *Page 28 of the Draft Regulations*	This Hon'ble Commission has proposed the auxiliary consumption as **15%**.	- ACEL submits that the basic design of a WTE project can be segregated into two major components: (a) the Generating Plant and (ii) the Pre-Processing Plant. It must be noted that from an operational perspective, the WTE plant requires increased volume of air for adequate combustion of heterogenous waste having high moisture content and low calorific value. Therefore, it requires appropriate side-wall cooling, flue gas recirculation and cylinder cooling, all of which entails a much higher load on such individual fans. As such, it significantly increases the quantum of auxiliary consumption of such power plants. - In addition to the above, WTE plants also require additional systems such as FGCS (lime activation and injection of activated carbon), bag filters and boiler cleaning systems which further add

to the burden of auxiliary consumption. A detailed breakdown of the component-wise auxiliary consumption is reproduced hereinbelow:

Sr. No.	Components	Connected Load (kWh)	Running kW / Day
1.	Boiler	826	13,076
2.	Turbine	107	620
3.	Pre-Processing Plant	615	4,884
4.	Mist Cooling Tower & Water Treatment	673	7,103
5.	Fuel Handling System	187	474
6.	Other Equipment	446	2718
	Aux. Power Consumption	**2854**	**28,875**

				Gross generation / day	- 1,53,000
				% of Aux. Power in Power Plant	- **18.87%**

- Thus, as per the actual data provided hereinabove, our auxiliary power consumption is 18.87% which may be considered by this Hon'ble Commission as basis for our proposal. However, we are requesting a minimum of 16% if 18.87% is not considered by this Hon'ble Commission.

- It is further worth pointing out that the Hon'ble MERC vide Order dated 22.03.2021 in Case No. 162 of 2019 has determined the auxiliary consumption as 18.67%.

			- As such, we submit that the auxiliary consumption for RDF-based WTE projects may be considered as **at least 16% and if not 18.67%** as considered by the Hon'ble MERC.
5.	Regulation 14 "**Loan Tenure and Interest on Loan**" *Page 14 of the Draft Regulations*	This Hon'ble Commission has proposed the interest rate on loan to be normative interest rate of 200 basis points above the average MCLR prevalent during the last available 6 months.	- ACEL submits that consideration of 200 basis points above average MCLR is incorrect and not an accurate reflection of the true nature of market practices. Further, as per the documents available with ACEL from construction / commissioning of its WTE projects, the fundings that were received operate with an interest rate @ 11.95%. - It may also be noted that IREDA has granted financial assistance @ 11.95% to the existing pipeline WTE Projects. - The current market regime and applicable rates indicate that interest rate ought to be @ 11.95%

			- Hence, we suggest that the applicable interest on term loan may be determined as **11.95%**
6.	Regulation 15 "**Depreciation**" *Page 14 of the Draft Regulations*	This Hon'ble Commission has proposed the depreciation rate at 4.67% p.a. for the first 15 years and remaining depreciation to be evenly spread during the remaining useful life of the project.	- As evident from the Explanatory Memorandum, this Hon'ble Commission has adopted the 'Differential Depreciation Approach' involving the utilization of the straight-line method to compute depreciation over the loan tenure and beyond and while considering the project's salvage value to be 10% of the project cost. - Keeping in line with the provisions under CERC RE Tariff Regulations 2020, we have considered the salvage value of the project to be 10% and allotted 90% of the Capital Cost of the Project eligible for depreciation. - It is appropriate to consider the findings of the other Ld. SERCs regarding applicable depreciation rate:

State	Tariff Order Particulars	Depreciation (%)
Rajasthan	Order in Petition Nos. 1195 and 1221 of 2017 *Dated: 18.05.2018*	5.83% - First 12 years 2.51% - Remaining 8 years
Himachal Pradesh	*Order Dated: 07.05.2016*	5.83% - First 12 years 2.51% - Remaining 8 years
Telangana	Order in OP No. 14 of 2020 *Dated: 18.04.2020*	5.83% - First 12 years 2.50% - Remaining 8 years
Gujarat	2016 Tariff Order Dated: 10.11.2016	7% - First 10 years 2% - Remaining 10 years

Bihar	Case No. 22 of 2015 Order dated 24.09.2015	7% - For 10 Years 1.33% For (15 yrs)
Bihar	Suo-motu Proceedings No.19/2016 dated 01.08.2016	7% - First 10 years 2% - Remaining 8 years

- In light of the above, ACEL submits that repayment of the loan undertaken by a project developer would be better facilitated if this Hon'ble Commission considered the depreciation rate of 7% for the first 10 years of the project life. Thereafter, this Hon'ble Commission ought to adopt the Straight-Line Method of depreciation and accordingly determine it @ 2% for the remaining useful life of the Project.

- Therefore, ACEL submits that the depreciation ought to be **7% for the first 10 years and 2% for the remaining useful life of the project.**

7.	Regulation 16 "**Return on Equity**" *Page 15 of the Draft Regulations*	This Hon'ble Commission has proposed the Return on Equity ("**RoE**") is **<u>14%</u>**. Further, it has provided for grossing up of ROE by latest available MAT rate for first 20 years and by latest available Corporate Tax rate for the remaining period.	- This Hon'ble Commission has considered the historical trends of various benchmark rates, including bank rate, SBI PLR, deposit rates and government securities rate for the purpose of determining the risk-free rate and market risk premium. However, it has erred in not considering the exigent circumstances that are prevalent with WTE projects which necessitates a differential view and treatment of the ROE component for such projects. - Due to the nascent stage of development of technology associated with WTE projects, the developers are constrained to import a major bulk of the plant and machinery from abroad and integrate them into the indigenous balance of plant equipment. It is not out of place to mention that operating a plant in a relatively new environment and with foreign technology is associated with an element of risk which ought to be adequately provided for.

			- It is further submitted that due to the nascent stage of technology development in India and associated risk of operating equipment / technology integrated from foreign imports, there is an element of high risk and low returns which dissuades the nationalized banks from financing such projects. Further, it is difficult for the developers to obtain financing from private equity / venture capital funds / DFIs since they are unable to match their expectation of 25-30% returns on their investment. As such, it is imperative that this Hon'ble Commission determine an applicable ROE which is competitive and would result in better returns so as to make it a lucrative opportunity for investors / financiers to fund such projects with the prospect of better returns. This would ensure better investment oppurtunities for WTE projects which would ultimately satisfy one of the basic tenets of the Electricity Act, 2003, i.e., the promotion of generation and co-generation of renewable energy.

			- It is also noted that the ROE for WTE projects have been calculated on the basis of MAT @ 17.47%. However, ACEL submits that such an assumption is erroneous and is not reflective of the market practice and regulatory regimes. It is a matter of fact that as per the applicable tax on equity in the current scenario is considered to be 27.82%. It is submitted that considering an assumption which is lower than the prevailing market trends would *inter alia* hamper the investors by not accurately accommodating for their actual tax liability. - ACEL also wishes to highlight that for the purpose of calculation of ROE, this Hon'ble Commission has erred in considering the MAT for the first 20 years, which is the entire useful life of WTE projects. It is submitted that Hon'ble Commission ought to have allowed consideration of MAT for the first 10 years and

Corporate Tax Rate of 27.82% for the period thereafter until expiry of the useful life of the project.

- The following comparative analysis may be relevant:

State	Tariff Order Particulars	Return on Equity (%)
Rajasthan	Order in Petition Nos. 1195 and 1221 of 2017 *Dated: 18.05.2018*	First 10 years: 20% Remaining 10 years: 24% Normative ROE: **22%**
Himachal Pradesh	*Order dated: 07.05.2016*	First 10 years: 20% Remaining 10 years: 24% Normative ROE: **22%**

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<tr><td>Jharkhand</td><td>Order dated 21.06.2017 in Case No 12 of 2016</td><td>First 10 years: 20%
Remaining 10 years: 24%</td></tr>
<tr><td rowspan="2">Bihar</td><td>Order dated 01.08.2016 in Suo-motu Proceedings No.19/2016</td><td>First 10year - 20%
from 11th - 24%</td></tr>
<tr><td>Order dated 24.09.2015 in Case No. 22/2015</td><td>First 10year - 20%
from 11th - 24%</td></tr>
<tr><td>Tamil Nadu</td><td>Order dated 28.03.2019</td><td>17.60%</td></tr>
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- As such, we suggest that the applicable tax rate on ROE ought to be considered as <u>27.82%</u> and the resultant ROE post tax ought to be determined as <u>18%</u>.
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<td>8</td>
<td>Regulation 10</td>
<td>This Hon’ble Commission provides for determination</td>
<td>- Considering the aforesaid suggestions / proposals, ACEL humbly submits that this Hon’ble Commission may consider not</td>
</tr>
</table>

	"**Tariff Design**" *Page 12 of the Draft Regulations*	of a generic tariff on a Levelized Basis, considering the year of commissioning of the project, for the entire tariff period of the project.	fixing a Levelized Tariff for WTE projects. Instead, it is suggested that a **Hybrid Tariff Model** be adopted where the fixed costs associated with the WTE projects are considered on a levelized basis, whereas the O&M and Fuel Cost components are accorded a differential treatment by fixing a quantum for the first 3 years of the project life along with escalation and a provision to revisit such costs in the following control period. Such a hybrid tariff model and differential treatment of O&M and Fuel Cost would ensure that the WTE developers are suitably protected against various market forces and uncertainties owing to the associated technology being at a nascent stage, poor quality of available waste, fluctuation in price and associated costs of material and alteration in applicable tax rates, among others.

TABREZ MALAWAT | SYED. HAMZA |
SOURAJIT SARKAR | RUPALI JAIN
ADVOCATES
THE GUILD, ADVOCATES & ASSOCIATE COUNSEL
C-586, LOWER GROUND FLOOR
EMAIL: tabrez.malawat@theguild.co.in
Phone: 9643243451

Date
Place

Annexure - A1

RDF - CAPEX

Particulars	Total Cost Rs in Lacs	Remarks
Civil with Campus infra	1,043	Factory gates, visitor infra, weighbridge, internal roads, compound wall, drainage, landscaping etc.
Fuel Storage and feeding system	1,876	bunker, for storage for 5 days, grabbers, fuel feeding system incl. pusher, vibro feeder, Auxiliary fuel feeding system with silo, interior (Operator Cabin with CCTV, Lighting, HVAC) including civil, electrical
Boiler (Incinerator)	5,649	Boiler house (Indoor Type), Combustion Grate, Pressure Parts, Structure steels, Steam Cycle, Electrical, Bottom Ash discharge system, Insulations, Boiler instrumentations, Fans, Pumps, Motors, Fire Safety Infra, excess spare & other supporting structures including stair case, platform, safety railings etc.
Flue Gas Cleaning System (FGCS)	2,816	This includes Removal of all types of solid suspended particulates, neutralising acid coponents if any, capturing carsenogenic elements like dioxin & furans , adsorbing heavy metal oxide etc. Systems includes Eletrostatic Presepetator, Dosing system for acid control , Dosing system for harmful gases, bag filters, multiple fly ash conveying system with storage silos, chimney. Entire section is of indoor type supported with noise control, lighting, safety etc.
Steam Turbine (Condensing Type)	2,173	Turbine building consisting of steam turbine, alternator, control systems,
Campus Water System including Mist infrastructure (Inside Project)	672	This includes all primary & secondary treatment for cooling water , steam generation, campus general water distribution, waste water utilization, fire water reservoir, mist arrangement for colling need of condensing turbine. This includes piping network, water treatment plants, water storages, pumps, motors, misting arrangements, required earthwork, civil work, electrical work, area light, consumbales storage, water test laboratory etc.
Fire fighting system	110	Fire safety network across power block with necessary sprinklers, fire hydrants, pumps, motors, earthwork, civil work etc.
Balance of Plant Equipments (BOP)	213	Air Compressor, Air Conditioners, Electric Operated Overhead Crane,Lab Equipments, Weigh Bridge, Distribution network etc.
Electrical Equipment	227	Cables, Panels, DG Set , Electrical Lift
Instruments & Automation	461	**Plant automation (Data Control system)**. This includes about 1500 I/O for measuring real time multiple parameters of overall power block. This I/Os are grouped and linked with cental control station. Control station has multiple visual screens for plant operators. **CEMS (Continuous Emission Montoring System)**: as per statuory need , real time emission parameters to be measured and to be connected to the internet to enable montoring by state pollution control board. Consumable required for flue gas cleaning system are linked with CEMS. Supported with uninterupted power supply (UPS) equipements.
Designing & Engineering Consultant Charges (2.5% of Project Costs)	300	Campus master planning, preparation of arechitectural layout, preparation of all requisite P&I diagrams, integration of vendor drawings, structural design, electrical design, utilties design, process engineering, construction drawings, periodical site visit , design & quality review process, preparation of statutory drawings etc.

RDF - CAPEX

Particulars	Total Cost Rs in Lacs	Remarks
EPC (Engineering Procurement & Construction) (4% of Project Costs)	722	Drawings management, Preparation of BOQs (Bill of Quantities), Preparation of tender documents, selction of vendors & contractors, understanding of overall processes, deputation of project professional at site for day to day construction management, erection, testing , validating etc. Preparation of project MIS(Managememt INformation system), preparation of CPM, PERT charts, conducting regular site meetings, vendor meetings, carrying out FAT, Site Acceptance Test, Observation of EHS (Environment Health & Safety) protocols, Inventory management, Handing over process etc.
Proj. Mgmt.	98	Project insurance policies , Project Mgmt. (Loading unloading, Local freight, Contingency)
Furniture & IT Infra	110	Required office infrastructure and IT Infrastructure at all strategic operating points of Campus.
Total Hard Cost A	**16,468**	

RDF - CAPEX

Particulars	Total Cost Rs in Lacs	Remarks
STP Infra	600	Setting up primary treatment plant to remove unwanted stuff like odour, colour, suspended particulates, hardness etc. Pumping infrastructure for transfer of water from STP plant. Laying underground long distance(Avg. 10 KM) HDPE pipeline till WTE Campus.This includes crossing over roads, railways, gas line, electrical lines etc. Liasoning with respective authorities or taking necessary permissions for laying STP line from STP plant to Waste to Energy plant.
Power Evacuation	1,674	Power Evacuation includes : Transmission Line , Switch Yard, Transoformer, HT Cable turbine to Substation, Electrical & Civil work
IDC	2,948	
Pre-operative & Preliminary Cost	224	**Considered for 18 Months (Construction Period for Main Plant)** Civil & Furniture (Borewell, Fencing, Water sump for water storage, office container + prefab toilet, security rest room, gazebo, canteen, dining area, wash area, signages) **Electrical & IT** (Power temporary connection, flood light, lighting pole, distribution panel, contractor, UPS-5 KW, DG Set rental, DG set fuel, Monthly bill of 100 KW connection) **Miscelleneus** (Guest house, Weekly Site visit charges, security charges, domestic vendor visit expense, international trips, site vehicle, medical kit, walkie - talkie, safety equipments, electrical tools, kitchen equipment, cook salary , RO plant, flag pole, fire extinguisher, stationary, firewood for initial start-up, lawn mover cutter, petty cash)
Project Pre Development Expense	100	This includes understanding of MSW generated by respective cities, conducting waste characterisation with respect to physics, chemistry, biology to prepare design basis for the project. This also includes visiting reference sites, meeting with experienced professionals, retaining need based experts.
Total Other Cost B	**5,546**	
Total Cost C = A+B	**22,014**	
DSRA	1,102	
Margin Money for WC	300	
Bank Guarantee - GUVNL | SMC	225	
Total Soft Cost D	**1,627**	
Total Cost E = C+D	**23,641**	
1. Civil Work	708	
2. Electrical Work	496	
3. Plant & Machinery	7,703	
MBF	*67*	
Splitter	*618*	
Ballestic Separator + Conveyor	*982*	
Star Screen + Conveyor	*773*	
Shredder + Conveyor	*1,950*	
NIR + Conveyor	*1,427*	
Baller + Conveyor	*233*	
Other	*1,652*	
4. Furniture & IT Infra	12	
5. Proj. Mgmt.	708	
Total Pre Processing Project Cost F	**9,627**	
Total Project Cost G =E+F	**33,268**	
Per MW	**2,233**	

A. RDF-BASED WTE PROJECTS:

Annexure-A2

I. *Hard Costs*

1. Civil Costs

The following have been considered as the basic civil works requirements for the smooth and efficient running and operation of a WtE Plant:

a. Civil with Campus Infrastructure
b. Fuel Storage and Feeding System
c. Boiler (Incinerator)
d. Flue Gas Cleaning System (FGCS)
e. Steam Turbine
f. Campus Water System
g. Fire Fighting System
h. Balance of Work
i. Electrical Equipment
j. Instrument and Automation
k. EPC Project Cost
l. STP Infra
m. Power Evacuation

i. The civil works would also entail those works carried out towards establishing the Project campus infrastructure such as the Factory gates, infrastructure for accommodating visitors, weighbridge, internal roads, compound wall, drainage and landscaping of the plot to make it suitable for construction of the WtE plant.

ii. The civil cost would further include the expense to be incurred by the developer towards building and maintenance of a Fuel Storage and feeding system for the storing the RDF for a period of up to 5 days and ancillary machinery and equipment for feeding the stored RDF into the boiler in a periodic and controlled manner. The same include cost incurred on interior (such as operator cabin with CCTV, Lighting, HVAC) and other civil and mechanical work pertaining to Fuel Storage and feeding system.

2. <u>Plant & Machinery</u>

i. The capital costs under Plant & Machinery include those pertaining to the processing plant.

ii. The processing plant includes cost of boiler, turbine, fuel storage and feeding system, ACC and all the other auxiliary systems of the power plant, like the auxiliary cooling water system inclusive of the auxiliary cooling tower and pumps, compressed air system, AC, firefighting system, instrumentation system and others. The cost additionally includes that of the steam piping (all medium pressure, high pressure and low-pressure piping), cooling water piping and all other piping within the battery limits of the power plant.

iii. On account of seasonal variability, the quantum as well as the quality of MSW varies, which in turn affects the quality of RDF prepared from the same. Inferior quality of incoming MSW would either require substitution with supplementary fuel, or flexibility to digest full quantity of RDF and also accommodate supplementary fuel to generate the rate power output.

iv. The Boiler infrastructure is a major portion of a WtE plant which entails the usage of various associated equipment for the purpose of generation of electricity through incineration of RDF. Additionally, the steam produced from the incineration process is channeled through the Steam Turbine building which includes the turbine, alternator and cooling control systems built into it.

v. A WtE Plant also contains a Campus Water System inclusive of a Mist Infrastructure within the Project. Such infrastructure includes the piping system and supply of water for various requirements within the Project campus such as steam generation, waste water utilization, consumption by personnel, fire water reservoir and mist arrangement, among others. Further, the safety system within the Project includes the Fire-fighting system that is laid out across the campus and especially in key areas with sprinklers and fire hydrants in order to tackle any untoward breakout of fire. Additionally, the we have also considered the cost to be borne towards the maintenance of Balance of Plant including heavy machinery such as Air conditioners, Overhead Cranes, Lab Equipment.

vi. The Plant & Machinery cost is also inclusive of the monitoring and automation system to be installed. It includes numerous I/O for measuring real-time multiple parameters of the overall power block, which are linked to a central control station for overview and monitoring of the entire plant.

vii. Flue gas emissions are a major component that WtE generators have to deal with, especially with respect to the quantum of harmful carcinogenic and solid suspended particles that are mixed within it. As such, an efficient Flue Gas Cleaning System is of paramount importance which includes equipment such as the Electrostatic Pre-separator, Dosing system for acid control and harmful gases, bag filters, multiple fly-ash conveying system with storage silos and chimneys.

viii. It is to be noted that expenses towards Engineering, Procurement and Construction (EPC) are a major portion of the total cost towards Plant & Machinery. We have considered the range of expenses to be incurred by the generator from the sourcing and selection of an EPC vendor for the particular project all the way to management of drawings, preparation of Bill of Quantities (BOQ) and tender documents, preparation and management of Management Information System (MIS) and Environment Health & Safety (EHS) along with other associated management and compliances to be observed.

ix. Furthermore, the Project site and plant development also necessitates an expense towards consultancy charges for acquiring an effective Designing and Engineering roadmap for the Project. This activity includes preparation of the campus master plant, statutory drawings and design plan for the structural, electrical and utilities aspect along with period review procedures in the form of site visits and equipment supervision. Additionally, WtE generators also have to incur the cost towards Project Management.

x. We have considered an expense towards acquiring and maintaining proper furniture and IT infrastructure within the campus for the smooth operation and functioning of the plant would be incurred by the developers.

xi. Project developers would also need to install Electrical Equipment such as cables, panels, electrical lifts within the Project.

II. *Other Costs:*

3. Power Evacuation & Transmission Cost:

i. We have considered the cost to be incurred by the WtE generators for evacuating the power generated through a transmission infrastructure to the nearest available sub-station of the Distribution Licensee from the Project Site. As such, the transmission infrastructure includes Transmission Lines, Switch Yard, Transformer and HT Cable turbine to Sub-Station, along with the cost to be incurred from the associated Civil and Electrical Work.

ii. The actual cost of setting up the transmission / evacuation infrastructure would be different with each different Project and shall be dependent upon various factors such as location of the Project and the potential obstacles between it and the nearest sub-station, compliance with various safety issues, varying Right of Way acquisition issues and requirement for laying the infrastructure underground.

Considering the above, we humbly request that this Hon'ble Commission may, while determining the cost of evacuation, consider determining a standard cost applicable to all WtE Projects on the basis of a generic assumption but also provide for the actual cost of evacuation to be passed through under the tariff component. Upon commissioning of the Project, the standard cost allocated would be adjusted to meet the actual cost incurred by the Project.

4. <u>Sewage Treatment Plant (STP) Infrastructure:</u>

i. The STP infrastructure in every WtE plant is an important factor for controlling the quantum of hazardous and dangerous elements being ejected from the operation of the Plant through the waste-water generated. As such, the primary sewage treatment facility is essential for removing unwanted elements such as foul odour, colour and suspended particulates.

ii. The treatment plant infrastructure includes a piping system for discharging the treated wastewater in a designated area from the project campus. As per the general realm, the WtE generator would require the laying of long-distance underground pipes which would face similar issue to that of the evacuation infrastructure in the form of geographical obstacles, ROW issues and acquiring relevant authorizations and permits for successfully laying down the piping system. As mentioned above, such a scenario would be different in each particular case due to the inherent variability of the determining factors and therefore, this Hon'ble Commission may adopt a similar mechanism as may be adopted for the evacuation cost for allotting the cost of the STP infrastructure by providing a standard cost during the construction period and then passing through the actual cost, which would subsequently adjusted as against the standard cost allocated.

5. <u>Pre-Operative and Preliminary Expense</u>

i. The Pre-operative and Preliminary Cost entail the expenses incurred by a WtE generator in the period leading up to the commencement of operation of the Plant. The Petitioner has considered expenses in such period which would relate to

fencing, borewell, water storage infrastructure, office spaces and basic provisions such as rest-rooms, canteens and dining area, among others.

ii. The expenses are also incurred towards the Electrical and IT infrastructure during such period which includes power connection, back-up power provisions, proper lighting set-ups, distribution panel, costs towards Diesel Generators and consumables. Further, we have also considered miscellaneous expenses such as domestic vendor, international trips, safety kits, charges in lieu of guest house, weekly site visits and security along with other necessary equipment and consumables such as walkie-talkies, firewood for initial start-ups and petty cash.

6. Project Pre-Development Expenses

i. Pre-Development Expense of a Project are related to the various costs incurred by the WtE generator in feasibility studies, technical and commercial studies, design and engineering of the project. Further, such expenses also includes cost incurred behind conducting due-diligence regarding the quality of MSW in respective cities, conducting waste characterization activity and engagement and consultation of experienced professionals and experts.

7. Interest During Construction (IDC)

i. Total IDC cost in inclusive of the construction period and financing cost. IDC cost has been calculated as per financial principles. The IDC has been calculated based on the interest on IDC at 11.95 %

III. *Other Costs:*

8. DSRA, Margin Money for WC and Bank Guarantee

i. In addition to the aforementioned expenses, WtE Generators also have to incur the necessary expenses towards maintenance of the Debt Service Reserve

Account ("**DSRA**"), requisite Margin Money towards the Working Capital of the Project and Bank Guarantee in terms of the directions / requirements of the Distribution Licensee and the State Municipal Corporation.

IV. *PRE-PROCESSING PLANT* (in case of RDF-based WTE Projects):

In addition to the expenses incurred as explained in the preceding paragraphs, the RDF-based WTE project developer also has to accommodate for Capital Costs that are incurred in lieu of the Pre-Processing Plant that is responsible for processing the MSW received from the relevant municipal corporation and converting the same into RDF. The following may be considered as a brief description of the individual components that comprise the Pre-Processing Plant:

1. **Radial Grabber**:

   This equipment is the first step in pre-processing of incoming MSW that forms a part of the Pre-Processing Plant. The project developer has to incur the appropriate cost of installing such specialized equipment which is responsible for moving the incoming waste from the storage pit onto the conveyer belt. Accordingly, it initiates the process of conversion of MSW into RDF.

2. **Moving Bed Feeder (MBF):**

   Pursuant to the Radial Grabber moving the incoming MSW from the unloading bay, the MBF ensures the steady dispensation of MSW on the conveyer belt. This equipment operates both as a storage as well as a dispensing system wherein it accumulates the MSW that is transferred by the Radial Grabber and dispatches the same at a pre-determined pace of 30 Tons / hour in order to ensure that the conveyer belt has an even spread of boiler fuel, which in turn maximizes the efficiency of processing of waste. Accordingly, the project developer has to incur the expenses towards establishing and operating such equipment.

3. **Splitter**:

This constitutes an upstream conveyer belt that moves the material fed by the previous components and dispenses it onward in order for it to be separated onto various drive spiral shaft fixed at certain angles. The movement of the conveyer dispatches the material in a longitudinal direction, which is then forced to move sideways on account of movement of the spiral shafts. The Splitter also consists of mesh screens installed at various intervals which are responsible for segregating particles contained in the waste based on size. The smaller particles fall through the shafts, the longer yet thinner particles get segregated at the end and the thicker cubes are discharged sideways.

4. **Trommel**:

The Trommel is a step in the process of segregation of waste material fed into the Pre-Processing Plant. Its operational purpose serves to tumble and churn the waste in order to screen the particles in the waste based on its size and further helps in substantially removing the moisture content in order to improve the calorific value of the waste. It consists of a perforated screen with gaps of 25mm which ensures that particles of a smaller size, such as dust, dirt and organic matter are rejected and the larger particles are dispensed onward to the Shredder for further reduction in size.

5. **Shredder:**

This equipment serves a critical purpose that ensures smooth pre-processing and efficient combustion of fuel. The Shredder consists of various components that are responsible for shredding and breaking down large-sized waste into smaller sizes of < 80 mm that is vital for rendering it combustible and usable on the grate. Therefore, the project developer has to ensure the installation of Shredders at the Pre-Processing Plant.

6. **Star-Screen:**

The project developers have to install star-screens which are an important part for pre-processing of MSW. It operates as a self-cleaning screen that ensures finer segregation of waste. Pre-Processing Plants have to be equipped with Star-Screens which are

capable of delivering processed RDF by segregating inert waste of less than 20mm in size from the bulk of waste not larger than 80mm.

7. **Control Room (Pre-Processing Plant):**

Every Pre-Processing Plant has to be equipped with a Control Room for operating and supervising the individual equipment and procedures. Project developers have to ensure that such control rooms consist a PLC-based armchair for controlling the Radial Grabber. It also requires a PLC-based SCADA, consisting of one operating-cum-engineering station and a graphical overview of the individual equipment as enumerated above. Further, developers have to incur expenses for engaging skilled labour / professionals that are conversant with operating such highly technical and capital-intensive equipment in an efficient manner.

Rajeev Malhi - Abellon

From: ce rndcea <ce-rndcea@gov.in>
Sent: 13 March 2024 17:55
To: Regulatory - Abellon
Cc: Ashok Kumar Rajput; memberpsce@nic.in; Shriraj Shah - Abellon
Subject: [EXTERNAL]Re: Recommendation to Hon'ble CERC for inclusion of Auxiliary fuel to extent of 4-5% in MSW to Energy Plants during Start-up and Shut-down activity and the monsoon period.
Attachments: 06-03-2024_RELATED TO MSW MII (1).pdf

महोदय/ महोदया
With regards to subject cite matter, it is to state that your representation has been examined and appropriate suggestions have been sent to the concern authorities for their consideration. The copy the communication is attached here for your information please.

सादर/ Regards
Surata Ram, CE

मुख्य अभियंता के कार्यालय से / O/o Chief Engineer
ई टी एंड आई प्रभाग / ET&I Division
केंद्रीय विद्युत प्राधिकरण / Central Electricity Authority
विद्युत मंत्रालय / Ministry of Power
011-26732257

From: regulatory@abellon.com
To: "Ashok Kumar Rajput" <akrajput@nic.in>, memberpsce@nic.in
Cc: "ce rndcea" <ce-rndcea@gov.in>, shriraj@abellon.com
Sent: Wednesday, March 13, 2024 2:47:41 PM
Subject: Recommendation to Hon'ble CERC for inclusion of Auxiliary fuel to extent of 4-5% in MSW to Energy Plants during Start-up and Shut-down activity and the monsoon period.

Dear Shri Ashok Rajput ji,

This is with regards to a letter dated 05.03.2024 submitted to your office from Abellon CleanEnergy Limited, whereby we have made representation to your office for the need of allowing Auxiliary fuel in Municipal Solid Waste based Waste to Energy Power plant to maintain the temperature of 850 degree Celsius during start-up, shutdown and as temperature stabilizer during monsoon period. Further, we request you to recommend your observations to Hon'ble Central Electricity Regulatory Commission(CERC).

In this regard, we also wish to file our submissions in the Hon'ble CERC (Terms and Conditions for Tariff determination from Renewable Energy Sources) Regulations, 2024. As the last date of submission is 14.03.2024, we humbly request you to kindly share with us the observations/submissions you have made, if any.

Thanks & Regards,

Rajeev Malhi | Sr. GM – Regulatory Affairs
Abellon
Tel: +91-79-66776100 | M: +919879596162

Annexure - A4

भारत सरकार/ Government of India
विद्युत मंत्रालय/ Ministry of Power
केन्द्रीय विद्युत प्राधिकरण/ Central Electricity Authority
ई टी एंड आई प्रभाग/ ET&I Division

सं. के.वि.प्रा./पी.सी.ई.-II/ई.टी. एवं आई./MII/2024/35-41 दिनांक: 06-03-2024

The Secretary,
Central Electricity Regulatory Commission,
Chanderlok Building, 36, Janpath, New Delhi- 110001.

Subject: Suggestions related to MSW/RDF Plants for inclusion in the draft Regulations of CERC on Tariff Determination for Electricity from Renewable Energy Sources.

Sir,

This is with reference to Draft Notification No.: RA-14026(11)/1/2023-CER dated 17.02.2024 of Central Electricity Regulatory Commission (Terms and Conditions for Tariff determination from Renewable Energy Sources) Regulations, 2024. For these regulations, CERC have sought comments /suggestion from the stakeholders/public by 14th March 2024.

2. In relation to these draft regulations, CEA has received representation(s) from the developer(s) of power plants based on Municipal Solid Waste (MSW) and Refused Derived Fuel (RDF) raising their concerns about the omission of requirement of auxiliary fuel in the said draft regulations and its impact in the tariff to be determined by CERC for electricity generated from such plants.

3. On perusal of the representation and the provisions laid down in the *"Standard Operating Procedure (SOP) for Utilization of Non- recyclable Solid Wastes (NRSW) (including Plastic Waste), Effluent Treatment Plant (ETP) Sludge, Deinking Sludge from Waste Paper based Paper Mills and Refused Derived Fuel (RDF) in Industrial Boiler / Waste to Energy Plant"* issued by Gujarat Pollution Control Board (GPCB) in the month of November 2023 (copy of relevant excerpt i.e. para 5.1 of the SOP enclosed at **Annexure-I**), it transpires that a provision for auxiliary fuel to maintain sustained appropriate temperature of above 850 degree Celsius in the combustion of the MSW/RDF during startup, operation and shutdown is a technical requirement for the preclusion of the formation of environmentally detrimental gases of Dioxin and Furans, for safe and scientifically proper combustion of waste, for optimal efficiency,

and for ensuring efficiency, the health and longevity of the plant among other things merits its inclusion under Chapter 10 of the said draft Regulations of CERC and allied tables (form 2.1) for parameters for determination of the tariff for electricity generated from the power plants based on MSW/RDF.

4. The requirement of inclusion of provisions for auxiliary fuel is further buttressed by the provisions viz paras *2.3.1.7 Auxiliary burners, 1.3.2 regarding rotary kilns, 2.4.3.1 Energy inputs to waste incinerators (copy enclosed at* ***Annexure-II****) as laid down in the European* Commission's Report on "*Best available Techniques (BAT) reference document for Waste Incineration*" prepared by European Integrated Pollution Prevention and Control Bureau (EIPPCB) in the year 2019.

5. As it becomes mandatory for the developers to use auxiliary fuel for the reasons mentioned above, the omission of both the provisions of auxiliary fuel and the variable component in tariff due to technically and environmentally necessary auxiliary fuel requirement in the methodology and parameters proposed in the draft Regulations will economically adversely affect the developers.

Thus, keeping in view the environmental aspects, the efficiency, health and longevity of the MSW/RDF based power plants, in our considered opinion it will be justifiable that the provision of the auxiliary fuel and corresponding parameters (viz. fuel component in tariff) for tariff determination be included in the draft Regulations to address the germane concerns of the developers of the MSW/RDF power plants.

Further, it is suggested that the proportion of the auxiliary fuel may be kept limited to the extent of 5% and it may be mandated that only renewable based fuel say biomass be used as an auxiliary fuel.

Encl: As above,

Yours faithfully,

6.3.2024

(सुरता राम /Surata Ram)

मुख्य अभियन्ता/ Chief Engineer (ET&I)

Copy to:

1. Secretary, Ministry of New and Renewable Energy, New Delhi
2. Chief (Regulatory Affairs), CERC, New Delhi
3. Principal Economic Adviser, NITI Aayog, New Delhi
4. Adviser (Energy), NITI Aayog, New Delhi
5. Director (PHE-SBM-2), Ministry of Housing and Urban Affairs, New Delhi
6. Senior Adviser-Renewable Energy, CERC.

Annexure-I

The relevant para of the Gujarat Pollution Control Board's ***Standard Operating Procedure (SOP) for Utilization of Non- recyclable Solid Wastes (NRSW) (including Plastic Waste), ETP Sludge, Deinking Sludge from Waste Paper based Paper Mills and Refused Derived Fuel (RDF) in Industrial Boiler / Waste to Energy Plant*** in the month of November 2023, is reproduced below:

"5.1 Design and Operational Aspects of Boiler:

a) *A well designed waste to energy/ steam boiler having capacity not less than 10 TPH is to be provided for the purpose. It should be suitably designed for feeding and combustion of different type of wastes mentioned in this SOP.*
b) *Combustion system of boiler must be designed to maintain combustion temperature above 850 degree centigrade with a flue gas residence time at least 2 seconds during combustion to avoid formation of dioxin & Furans.*
c) *The auxiliary fuel is to be used to reach required temperature of 850 degree centigrade before starting waste feeding.*
d) *Automatic startup of auxiliary fuel system is to be provided for maintaining the temperature at 850 degree centigrade, in case temperature starts going down. However, characteristics of the waste feed should be preferably such that it will not require auxiliary fuel more than 20% of total fuel requirement.*
e) *Startup/ shutdown procedure following above requirement is to be derived and strictly followed to maintain combustion temperature above 850 degree centigrade with gas residence time of 2 seconds all the times.*
f) *Fuel firing system of Waste to Energy shall consist of Silo / Fuel Feed Hopper, Ram Feeder, Combustion Grate with hydraulic drive.*
g) *The combustion chamber to be scientifically designed and sized for the complete combustion of carryovers and controlling the super heater inlet gas temperature and also to ensure providing proper residence time for the complete combustion of non-recyclable solid waste.*
h) *Air system should have a facility to supply primary (combustion) and secondary air to the boiler.*
i) *The combustion chamber should be provided with an adequate special refractory to counter the erosion and corrosion as well as to ensure that heat is contained within the combustor. Refractory with higher percentage of silicon carbide is preferred.*
j) *Flue gas shall pass through super heaters, evaporators, economizer, flue gas cleaning systems, ID fans before final exhaust into the atmosphere through chimney of adequate height.*
k) *The combustor must be designed in line with the best available technologies to ensure stable and continuous operation and complete burnout of the waste and flue gases."*

Annexure-II

Relevant paras from the European Commission report on "*Best available Techniques (BAT) reference document for Waste Incineration*" prepared by European Integrated Pollution Prevention and Control Bureau (EIPPCB) year 2019:

"2.3.1.7 Auxiliary burners

At start-up, auxiliary burners are used to heat up the furnace to a specified temperature before any waste is added. During operation, the burners are switched on automatically if the temperature falls below the specified value. During shutdown, the burners are used until there is no more unburnt waste in the furnace to keep the furnace temperature at the desired level

1.3.2 Rotary kilns

Rotary kilns are very robust and almost any waste, regardless of type and composition, can be incinerated. Rotary kilns are, in particular, very widely applied for the incineration of hazardous wastes and most hazardous clinical waste is incinerated in high-temperature rotary kiln incinerators. [64, TWG 2003]
Operating temperatures of rotary kilns range from around 500 °C (as a gasifier) to 1450 °C (as a high-temperature ash melting kiln). ***Higher temperatures are sometimes encountered, but usually in non-waste incineration applications. When used for conventional oxidative combustion, the kiln temperature is generally above 850 °C****. Kiln temperatures in the range of 900–1 200 °C are typical when incinerating hazardous wastes.*

Generally, and depending on the waste input, the higher the operating temperature, the greater the risk of fouling and thermal stress damage to the refractory kiln lining. Some kilns have a cooling jacket (using air or water) that helps to extend refractory life, and therefore the time between maintenance shutdowns.

2.4.3.1 Energy inputs to waste incinerators

In addition to the energy in the waste, there are other inputs to the incinerator that need to be recognised when considering the energy efficiency of the plant as a whole.
Electricity inputs

Electricity is needed to run the process. The source can be external or circulated.
Steam/heat/hot water inputs

Steam (or hot water or other heat carrier) can be used in the process. The source can be external or circulated.
Non-waste fuels
Non-waste fuels are used to:

i. *Preheat the combustion air;*
ii. ***Increase the temperature in the combustion chamber to the required level during start-up before the plant is fed with waste;***
iii. ***Ensure that the required combustion chamber temperatures are maintained during plant operation;***
iv. ***Maintain the temperature in the combustion chamber at the required level during shutdown, while there is still unburned waste in the plant;***
v. *Heat up the flue-gas for treatment in specific devices, such as selective catalytic reduction SCR or bag filters;*
vi. *Heat up the flue-gas (e.g. after wet scrubbers) in order to avoid bag filter and stack corrosion, and to suppress plume visibility."*

.....

Annexure - A5

O&M Expenses

Particulars	Sub Head	Yearly Rs in Lacs
Emission Control	Lime Dosing Cost	355
	Activated Carbon Cost	34
	Replacement of Bag Filters	70
Emission Control Total		**458**
Ash & Inert Management	Labour Expenses	30
	Hazardous Ash from Bag Filters	48
	Fly Ash From ESP, Boiler House	3
	Bottom Ash from Boiler	54
	Bank Zone, APH Economizer	5
	Inert waste disposal	121
	Freight Expenses	83
Ash & Inert Management Total		**344**
Spares	Boiler Spares	96
	Turbine Spares	6
	Electrical Spares	36
	Water System Spares	24
	Crane and fuel feeding system spares	36
	Balance of Plant Spares	12
Spares Total		**210**
Consumables	Boiler Consumables	24
	Turbine Consumables	8
	Electrical Consumables	5
	Water System Consumables	101
	Crane and fuel feeding system Consumables	8
	Balance of Plant Consumables	11
Consumables Total		**157**
Plant automation | Instrumentation and Calibration	Software including Licensing Fees	3
	Annual Calibration of Instruments	3
	Replacement of Field Instruments and Hardware	4
Plant automation | Instrumentation and Calibration Total		**10**
Water Management	Reject Recycling Cost	2
	Ash Quenching & Gardening Cost	1
Water Management Total		**3**
Compliance	Testing Expenses	6
	Consultant and statutory Compliance	1
	Boiler Inspection	1
	Leachate Treatment	3
	Odour Control Management	6
	Weight Bridge Safety valves, Pressure Vehicle, Crane Lift	2
	Fire	2
	EHS	4
	SLDC Expenses	2
	Lab Equipment Maintenance	3
Compliance Total		**31**

O&M Expenses

Particulars	Sub Head	Yearly Rs in Lacs
Maintenance	AMC for Critical Equipment	2
	AMC for balance systems	1
	Yearly Maintenance	1
	Building & Campus Infra Maintenance	6
	STP Maintenance	1
Maintenance Total		**11**
Start-up | Stand-by Power	DISCOM- Electricity Expenses	48
	Diesel Expenses	48
	Generator Hire Expenses	1
Start-up | Stand-by Power Total		**97**
Community Engagement, Grievances, Awareness / Odour Mgmt	Community Engagement	6
	Grievances	6
	Community Awareness	6
Community Engagement, Grievances, Awareness / Odour Mgmt Total		**18**
Other Plant Overheads	Labour Expenses	119
	Plant Employee Salary	252
	Loading & Unloading Expenses	27
	Equipment Hire Expenses	3
	Administration including Security	60
	Plant Insurance	65
	Miscelleneus Expenses	23
Other Plant Overheads Total		**548**
Corporate Overheads	Legal Expenses	6
	Compliance Expenses	6
	Finance Expenses	12
	Regulatory Expenses	6
	HRM Expenses	6
Corporate Overheads Total		**36**
Total		**1,923**

Particulars	Sub Head	Yearly Rs in Lacs
Pre- Process	Labour Expenses	96
	Plant Employee Salary	76
	Loading & Unloading Expenses	163
	Diesel Expenses	141
	Spares Fuel Processing	370
	Consumables Fuel Processing	20
	Waste Manegment Disposal Cost	94
Total		**959**

Grand Total	**2,882**

ANNEXURE -B

At the outset, we are thankful to this Hon'ble Commission for publishing the Draft CERC (Terms and Conditions for Tariff determination from Renewable Energy Sources) Regulations, 2024 ("**Draft Regulations**") which includes tariff component for the biomass power projects based on Rankine cycle technology ("**Biomass Projects**") and inviting stakeholder comments. The present comments and representation are limited to tariff measures being provided in Draft Regulations for Biomass Projects.

The determination of a cost-reflective tariff for Biomass Projects is vital for the operation and viability of such projects. We have analyzed the provisions of the Draft Regulations and have provided certain comments and suggestions for consideration of this Hon'ble Commission in order to assist this Hon'ble Commission in determining the applicable tariff for Biomass Projects. Further, we reserve our right to file any additional or supplementary submissions and also make any additional oral submissions during the course of public hearing. The clause wise comments and suggestions are as follows for your kind consideration:

Sr. No.	Reference	Existing Description	Comments / Suggestions
1.	Regulation 2 (c) "**Definitions and**	'Biomass' means wastes produced during agricultural and forestry operations (for	- The definition of the Biomass needs to be modified as the organic fraction of MSW shall constitute as "Biomass" and ought to

	Interpretations" *Page 2 of the Draft Regulations*	example, straws and stalks) or produced as a by-product of processing operations of agricultural produce (e.g., husks, shells, deoiled cakes); wood produced in dedicated energy plantations or recovered from wild bushes or weeds; and the wood waste produced in some industrial operations;	be included in the definition of the Biomass. - It is noteworthy to mention that the "*Indian Standard for Design, Construction, Installation and Operation of Biogas (Bio methane) Plant*" published in February 2023 by the Bureau of Indian Standards ("**BIS**") states that "Biomass" includes the organic fraction of MSW as well. **Clause 3.8 of Indian Standard for Design, Construction, Installation and Operation of Biogas (Bio methane) Plant published in February, 2023 by the Bureau of Indian Standards (BIS)-**

			3.8 Biomass *— Material of biological origin excluding material embedded in geological formations and/or transformed to fossilized material. Biomass is organic material that is plant based or animal based, including, but not limited to dedicated energy crops; agricultural crops and trees; food, feed and fibre crop residues; aquatic plants, algae, forestry and wood residues; organic agricultural, animal and processing by-products; agricultural, municipal and industrial organic waste and residues, whether or not in landfills; and sludge, waste water, and other non-fossil organic matter.* A copy of the "*Indian Standard for Design, Construction, Installation and Operation of Biogas (Bio methane) Plant*" published in

			February 2023 by the BIS has been annexed hereto and marked as **Annexure – B1**. - A similar definition has been provided in the Ministry of New and Renewable Energy ("**MNRE**") vide its Guidelines for Implementation of Waste to Energy Programme issued vide its letter dated 02.11.2022 as well: **Definition of Biomass as provided on Pg. 18 of MNRE's Guidelines for implementation of Waste to Energy Programme (November, 2022) –** *"6. Biomass resources are the biodegradable and non-edible fraction of products, wastes and residues from agriculture, forestry and*

			related industries as well as the ***<u>biodegradable fraction of industrial and municipal wastes</u>****.”* A copy of the MNRE guidelines for Implementation of Waste to Energy Programme dated 02.11.2022 has been annexed hereto and marked as **<u>Annexure – B2</u>**. - Biomass and MSW have also been recognised as raw materials for production of “Advanced Biofuels” in the National Policy on Biofuels, 2018: **Clause 5.2 of National Policy on Biofuels, 2018-** *“5.2 Potential domestic raw materials for*

<table>
<tr>
<td></td>
<td></td>
<td></td>
<td>production of biofuels in the Country are: (...) For Advanced Biofuels: <u>Biomass, MSW</u>, Industrial waste, Plastic waste etc.”

A copy of the National Policy on Biofuels, 2018 has been annexed hereto and marked as <u>Annexure – B3</u>.</td>
</tr>
<tr>
<td>2.</td>
<td>Regulation 31

“<u>Capital Cost</u>”

Page 21 of Draft Regulations</td>
<td><u>31. Capital Cost</u>
(1) The normative capital cost for the first year of the Control Period, i.e. financial
year 2024-25 shall be as under:

<table>
<tr><th>Biomass power projects based on Rankine</th><th>Capital Cost (Rs. lakhs/ MW)</th></tr>
</table>
</td>
<td>- Being an emerging industry, the technology development and market cultivation for biomass-based power generation requires large amount of capital investment. Currently, the industry suffers from lack of adequate investment due to the low tariffs and historical failure of biomass power plants in the country which has raised concerns regarding the financial viability of the plants and impacted their</td>
</tr>
</table>

		cycle technology			bankability. - Biomass is seasonal in nature. It depends on the agriculture scenario and the kind of crops that are grown in the respective states where the plants are located. Thus, there is a high amount of biomass available during harvest season and limited availability during the off-season. Furthermore, during the monsoon season, the quality of the biomass stored on fields has high moisture content which affects the quality of biomass to be used as a feedstock in the boilers for power generation. - Biomass may be available only during the harvest season but the fact that there is also a surplus availability of biomass during such season which is not fully utilized in
		Project [other than rice straw and juliflora (plantation) based project] with water-cooled condenser	638		
		Project [other than rice straw and Juliflora (plantation) based project] with air-cooled condenser	685		

		For rice straw and juliflora (plantation) based project with water cooled condenser	697	the power plants due to limited capacities and requirement. This surplus biomass can instead be procured by the power plants at low prices and stored suitably for use during the off-season which shall prevent the shutdown of the plants during such seasons on account of shortages in fuel supply and lead to better stability with regards to the fuel prices. However, in order to implement the same, appropriate infrastructure needs to be developed at the various plants to enable storage of the biomass for usage throughout the year. Thus, the cost of building such storage capacities at the various Biomass Plants also needs to be factored in the Capital Cost while determination of the tariff. - In light of the same, it is proposed that
		For rice straw and juliflora (plantation) based project with air cooled condenser	744	

			additional capital costs amounting to approx. INR 90 lakhs to INR 1 Cr need to be considered in addition to the costs proposed by this Hon'ble Commission in the Draft Regulations.
3.	Regulation 35 "**Operation and Maintenance Expenses**" *Page 22 of the Draft Regulations*	Normative O&M Expenses for the first year of the Control Period, i.e. financial year 2024-25, shall be Rs.55.03 lakhs per MW and shall be escalated at the rate specified in Regulation 19 of these Regulations for the Tariff Period.	- Nearly all the elements involved in biomass power generation mechanism suffer from the high cost, including raw materials, logistics service, equipment as calculated per unit of power generating capacity, maintenance of the grid-connecting device, and the overall operation of the plant. Due to a lack of professional logistics operators, the biomass power plant has to purchase raw materials either at a designated place or

			directly from scattered farmers. There is simply no scale benefit in the acquisition of raw materials, therefore increasing purchasing cost. Furthermore, compared with conventional power plants, the generating capacity of biomass power plant is smaller, yet additional facilities are required, especially special storage fuel collecting and storage facilities. Moreover, power plants are responsible for power transformation and transmission onto the grid. Further, the transport of the fuel to the plant is also a challenge in itself since Biomass based projects are usually small in size & located in remote/rural areas and their requirement regarding transportability is more about the availability of roads rather than the size of roads/ rail network.

			Motor-able roads are essential for movement of equipment during construction phase and for transport of labour & fuel during the operational phase. The aforementioned factors contribute to high operation cost for the biomass project. - Most forms of biomass are very voluminous i.e. it has relatively low energy density per unit of mass compared to fossil fuels. This makes handling, storage and transportation more costly per unit of energy carried.

			- In light of the aforesaid, it is proposed that the normative O&M Expense for the first year of the Control Period is considered as INR 65 lakhs per MW.

Through

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Date
Place

भारतीय मानक
Indian Standard
IS 9478 : 2023

बायोगैस (बायोमिथेन) प्लांट का डिजाइन, निर्माण, संस्थापन और प्रचालन — रीति संहिता

(तीसरा पुनरीक्षण)

Design, Construction, Installation and Operation of Biogas (Biomethane) Plant — Code of Practice

(Third Revision)

ICS 75.160.40

भारतीय मानक ब्यूरो
BUREAU OF INDIAN STANDARDS
मानक भवन, 9 बहादुर शाह ज़फर मार्ग, नई दिल्ली - 110002
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February 2023 Price Group 11

Renewable Energy Sources Sectional Committee, MED 04

FOREWORD

This Indian Standard (*Third Revision*) was adopted by the Bureau of Indian Standards, after the draft finalized by the Renewable Energy Sources Sectional Committee had been approved by the Mechanical Engineering Division Council.

This standard was first formulated in 1980 with the title 'Family sized bio-gas plant - Code of practice' and was subsequently revised in 1986 and 1989. The standard covered the family sized biogas plants, upto 10 m^3 per day capacity. This standard has revised with a view to including larger capacity biogas plants, namely small sized (up m^3 to 25 m^3 per day), medium sized (25 m^3 per day to 2 500 m^3 per day) and large sized (more than 2 500 m^3 per day) biogas plants.

Biogas plants have been gaining lot of importance due to scarcity of conventional form of energy and from sustainability considerations. This standard provides the guidance to stakeholders to select and design the capacities of biogas plant for their requirements of biogas.

Biogas plant mainly consists of a digester, gas storage unit, inlet and outlet assembly, mixing chamber and gas distribution pipelines.

This revision has been taken up to keep pace with the latest technological developments and practices followed in biogas plant industries. This revision incorporates the following major changes:

a) Biogas plants with capacity more than 10 m^3 per day are also included;
b) More designs of biogas plant;
c) Feedstocks other than *gobar* are also included;
d) Plant performance parameters;
e) More material of construction;
f) Recommended applications of final product and by-product; and
g) Recommended OLR for different type of feedstocks.

The digestate manure from the biogas plant, also known as the fermented/digested solid and liquid manure (organic fertilizer), are substances made up of one or more unprocessed materials of a biological nature (plant/animal) and may include unprocessed mineral materials that have been altered through microbiological decomposition process. Digested solid and liquid manure (organic fertilizer) can be upgraded/fortified for its use in different crops. Some of the upgraded/fortified digested slurry/manure includes, phosphate rich organic manure, and potassium rich organic manure. The digestate manure from the biogas plant may be used as an organic fertilizer for agriculture purposes as per Annex H. In the formulation of Table 10 of this standard, assistance has been drawn from *Fertilizer Control Order*, 1985.

While revising this standard considerable assistance has been derived from Ministry of New and Renewable Energy draft 'Standards for design, development, operations and maintenance of biogas plants (small, medium, and large scale) in India'.

The composition of the Committee responsible for the formulation of this standard is listed in Annex J.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 2022 'Rules for rounding off numerical values (*second revision*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

DESIGN, CONSTRUCTION, INSTALLATION AND OPERATION OF BIOGAS (BIOMETHANE) PLANT — CODE OF PRACTICE

(Third Revision)

1 SCOPE

This standard specifies the requirements for design, construction, installation and operation of small, medium and large sized biogas (biomethane) plants. It includes the classification of biogas plants on the basis of daily biogas production, included and excluded feedstocks for plant, plant performance parameters, different designs and materials for digesters and gas holders, and their construction.

2 REFERENCES

The standards listed in Annex A contain provisions which through their reference in this text constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated in Annex A.

3 TERMINOLOGY

For the purpose of this standard, the definitions given below shall apply.

3.1 Anaerobic Digestion — A biological conversion of biodegradable materials by microorganisms in the absence of oxygen creating two main products: biogas and digestate. An example of anaerobic digestion is the biological conversion of the biodegradable parts from predominantly biomass sources. For the purpose there are three types of mixing: biogas mixing, impeller mixing and slurry mixing:

a) *Biogas Mixing* — This is novel and simple digester turbulence mechanism to break foam, froth and some materials inside the digester without any mechanical moving part inside the digester;

b) *Impeller Mixing* — This is expensive digester mixing, mechanical device need not be used for digester mixing until the high organic loading rate digester is designed for production; and

c) *Slurry Mixing* — This is the method of recirculation of digesting material from top to the bottom and from bottom to the top.

3.2 Bio-CNG/Compressed Bio Gas (CBG) — A compressed biomethane having similar capabilities as that of compressed natural gas (CNG).

3.3 Biogas — The gas produced by anaerobic digestion of organic matter, comprising methane (CH_4) as the main component (50 percent to 70 percent) and carbon dioxide (CO_2) (30 percent to 40 percent) with varying quantities of H_2S, moisture and some other gases in trace quantities.

3.4 Biogas Meter — The instrument used for measuring quantity of biogas generated by biogas plants of different capacities.

3.5 Biogas Installation — The installation including its pipelines, pipes and accessories for anaerobic digestion of biomass and waste, upgrading of biogas, liquefaction of biogas, storage of biogas (in raw, gas or liquid form), storage of CO_2, storage of auxiliaries, storage of biomass and digestate.

3.6 Biogas Pipeline — A system of pipework for transportation of biogas or biomethane with all associated equipment and stations up to the point of delivery and outside the biogas installation. This pipework is mainly below ground, but also includes above ground parts.

3.7 Biogas Storage — Buffer, gas holder, tank, vessel, bag or similar component used to store biogas. The biogas storage can be an integral part of the digester.

3.8 Biomass — Material of biological origin excluding material embedded in geological formations and/or transformed to fossilized material. Biomass is organic material that is plant based or animal based, including, but not limited to dedicated energy crops; agricultural crops and trees; food, feed and fibre crop residues; aquatic plants, algae, forestry and wood residues; organic agricultural, animal and processing by-products; agricultural, municipal and industrial organic waste and residues, whether or not in landfills; and sludge, waste water, and other non-fossil organic matter.

3.9 Biomass Pipeline/Digestate Pipeline — System of pipework for transportation of liquid biomass or digestate with all associated equipment, up to the point of delivery.

3.10 Biomass Pre-treatment — Treatment of biomass with chemical, physical, thermal and biological methods in order to increase methane production when the biomass is digested or gasified.

3.11 Biomethane — Methane rich gas with the properties similar to natural gas derived from biogas produced by anaerobic digestion or gasification by upgrading. Sometimes, the term 'upgraded biogas' is also used instead of the term 'biomethane'.

3.12 Capacity — Capacity of the biogas plant is the total amount of feedstock or biogas that can be contained or produced respectively.

NOTE — This standard defines the capacity based on daily biogas production.

3.13 Compressed Biomethane (CBM) — Biomethane used as a fuel for vehicles or for other purposes, typically compressed up to 20 MPa in the gaseous state.

3.14 Cooking Biogas — The kitchen sized micro-level biogas plant produced raw biogas which is directly used for cooking purposes in domestic stoves with and/or without purification.

3.15 Digestate/Effluent/Compost — Remaining effluent from the anaerobic digestion process including solid fraction and liquid fraction. It is the digested slurry coming from outlet. This is a rich source of plant nutrients and used as a manure (organic fertilizer). It is also used as inoculum/starter for hastening the process of composting of other organic material.

3.16 Digester — A tank, also known as fermentation tank embedded partly or fully in the ground or completely above ground, it may be of cylindrical or other suitable shape and size, and made of suitable construction materials it is used to hold the slurry within it for digestion for a recommended retention period.

3.17 Dry Matter — Remaining part of biomass or digestate after drying the moisture content.

3.18 Gasholder — It is a storage tank for biogas. The gas holder may be an integral part of the digester design or placed separately.

3.19 Hydraulic Retention Time (HRT) — A measure of the average duration of time for which feedstock remains in the digester. It is estimated by dividing the volume of the reactor by daily or hourly volumetric feed rate). It is expressed in time (days or hours).

3.20 Inlet — The component of the biogas plant used for feeding the mixture of biomass and water to the digesters.

3.21 Inlet Feed Slurry — A mixture of biomass feedstock and water/digested slurry in the right proportion which is fed to the digesters.

3.22 Mixing Tank/Feed Preparation Tank — This is a tank in which the input feed is mixed with water or liquid digestate recirculated, prior to feeding into the digester through the inlet.

3.23 Municipal Solid Waste (MSW) — The organic and inorganic solid wastes together arise out of municipalities with/without segregation.

3.24 Organic Dry Matter (Volatile Matter Upon Loss on Ignition) — Part of biomass or feed slurry or digester content or digestate derived from total dry matter containing carbon and originating from living materials [sample = moisture + dry matter, dry matter = volatile matter (organic) + fixed matter (inorganic/ash)]. Instead of organic dry matter (organic portion of dry matter), the term 'total volatile solids' is also used.

3.25 Organic Loading Rate of Digester (OLR) — Amount of volatile organic dry matter entering the anaerobic digester over time, measured in kilograms per cubic metre of digester volume per day (kg/m^3 per day). The organic load gives an indication of the capacity of the digester whether it's a low rate, standard rate or high rate digester. It provides information on nutrient supply levels of the microorganisms involved, overload or undersupply of the system as well as resulting technical and process control measures to be taken. The organic load describes the efficiency of the anaerobic digester.

3.26 OrganicFraction of Municipal Solid Waste (OFMSW) — The organic portion out of the total municipal solid waste, which consists of biodegradable (VS) and non-biodegradable organic solid waste.

3.27 Digester Outlet or Drain — The outlet or drain for taking out the digested portion of the slurry.

3.28 Raw Biogas — Biogas directly derived from the digester which is not conditioned, cleaned, dried or purified.

3.29 Substrate — Part of the biomass which is biodegradable and converted by microorganisms and/or enzymes as catalyst into biogas and fermented manure (organic fertilizer).

3.30 Total Solids (TS) — Solids that include both the suspended solids and the dissolved solids which are obtained by separating the solid and liquid phase by drying. It is generally denoted in percentage of feedstock.

3.31 Transportation of Biogas — Activity intended to transport biogas from one place to another through pipelines and/or cylinders/cascades in order to supply biogas to distribution systems or for utilization by industrial and domestic consumers.

3.32 Two Stage Biodigester — Two digesters are used in series, where the first digester is used for acidification and second for methanogenesis.

3.33 Volatile Solid (VS) — Volatile solid is the amount of volatile matter lost after the ignition of pre-dried biomass sample at 550 °C for 4 h. It is expressed in percent of TS.

4 CLASSIFICATION OF BIOGAS PLANTS

Biogas plants are classified in Table 1 on the basis of the total biogas production per day from the plant.

Table 1 Classification of Biogas Plants
(*Clause* 4)

Sl No.	Classification	Biogas Production (in m^3/ day)
(1)	(2)	(3)
i)	Small scale	1 - 25
ii)	Medium scale	25 - 2 500
iii)	Large scale	>2 500

NOTE — Small scale biogas plants for largely urban and semi-urban areas for digesting domestic organic kitchen and garden waste can be less than 1 m^3/day biogas production also.

5 FEEDSTOCKS

5.1 Feedstock is broadly identified as:

a) Organic waste from animals;
b) Biodegradable solid and liquid organic waste from industries including sugar mills and food processing industries crop residues and suitable stubbles;
c) Organic/biodegradable fraction of municipal solid waste; and
d) Domestic sewage.

5.2 Specifications of feedstock to be used in the biogas plant are categorized as:

a) Included feedstock; and
b) Excluded feedstock.

5.3 Included Feedstocks

Annex B shows the type of feedstocks considered for biogas plants along with organic loading rate, hydraulic retention time, volatile solid removal and biogas yield according to plant size.

5.4 Excluded Feedstocks

The following feedstocks shall not be included in the biogas plants:

a) Fossil fuels and products and by-products made from them;
b) Woody biomass;
c) Paper;
d) Cardboard;
e) Pasteboard;
f) Harbour sludge and other water body sludges and sediments;
g) Plastics;
h) Metals; and
j) Biomedical/pathogenic waste.

5.5 Characteristics of Input Feed-Stocks

Characteristics of input feedstock shall comply with parameters as prescribed in the Table 2. For sampling and analysis of biomass refer Annex C.

Table 2 Input Feedstock Parameters/Specifications
(*Clause* 5.5)

Sl No.	Parameters	Requirement
(1)	(2)	(3)
i)	C : N ratio	15 to 30 : 1
ii)	Total solids (percent) for wet digestion	5 to 15
iii)	Total solids (percent) for dry digestion	> 15
iv)	Volatile solids (percent)	> 60
v)	Particle size	As applicable according to technology used for pre-digestion/digestion.

NOTES

1 C is organic carbon.
2 For < 15 C : N ratio, two-stage bio-digester is recommended.

6 PLANT PERFORMANCE PARAMETERS

Biogas plant performance shall be defined with the parameters such as feedstock characteristics, temperature, organic loading rate, *p*H, biogas yield, and hydraulic retention time (HRT). Annex B shows the minimum acceptable limit for organic loading rate, hydraulic retention time, volatile solid removal and biogas yield according to plant size. Anaerobic digestion process in the biogas plant shall comply with the requirements as given in the Table 3.

Table 3 Digester Performance Parameters
(*Clause* 6)

Sl No.	Parameter	Range
(1)	(2)	(3)
i)	Temperature in °C	Mesophilic process: 20 to 40 Thermophilic process: 45 to 60
ii)	*p*H	6.8 to 7.5
iii)	FOS/TAC ratio [VFA (volatile fatty acids)/Alkalinity]	0.3 to 0.4 Recommended for biogas plants of capacity 500 m^3 per day or above (*see* Annex D)

7 DESIGN AND CONSTRUCTION

7.1 Different Designs of Biogas Plants

The different plant designs for anaerobic digestion for different plant sizes shall be considered as shown in Table 4. An illustration about the different designs of biogas plants is given at Annex E.

Table 4 Different Designs of Biogas Plant
(*Clause* 7.1)

	Plant design for different plant sizes		
Sl No.	**Small-scale**	**Medium-scale**	**Large-scale**
(1)	(2)	(3)	(4)
i)	Continuous stirred tank reactor (CSTR) type digesters (horizontal/vertical design)	Up-flow anaerobic sludge blanket (UASB)	Up-flow anaerobic sludge blanket (UASB)
ii)	Floating-drum plant with a cylindrical digester (KVIC model)	Continuous Stirred Tank Reactor (CSTR)	Continuous Stirred Tank Reactor (CSTR)
iii)	Floating-drum plant with a hemisphere digester (*Pragati* model)	External circulation sludge bed (ECSB)	External circulation sludge bed (ECSB)
iv)	Floating-drum plant made of angular steel and plastic foil (*Ganesh* model)	Plug flow reactor	Plug flow reactor
v)	Floating-drum plant made of pre-fabricated reinforced concrete compound units	Biogas induced mixing arrangement (BIMA) digester	Biogas induced mixing arrangement (BIMA) digester
vi)	Floating-drum plant made of fibre-glass reinforced polyester	High rate solid digesters	High rate solid digesters
vii)	—	Fixed film reactor	Fixed film reactor
viii)	Fixed-dome plant with a brick reinforced, moulded dome (*Janta* model) (6 m^3 to 25 m^3 per day)	Fixed-dome plant with a brick reinforced, moulded dome (modified PAU *Janta* model) (upto 500 m^3/day)	—
ix)	Fixed-dome plant with a hemisphere digester (*Deenbandhu* model) (up to 6 m^3 per day)	Floating films reactors	Floating films reactors
x)	Bag type digesters	—	—

In general biogas plant mainly consists of a digester, gas storage unit, inlet and outlet assembly, mixing chamber and gas distribution pipelines.

7.2 Materials for Construction

This section covers the requirements of construction materials used for construction of biogas digester, biogas holder, pipes and fittings. For construction of any structure refer Annex F also.

7.2.1 *Digester*

The digester for small-scale plants may be made from bricks, membranes (neoprene rubber, flexible PVC, flexible HDPE)/high density polyethylene (HDPE)/ferro-cement/mild steel/stainless steel/fibre reinforced plastic (FRP), flexi bag type biogas plants made up of linear low density polyethylene (LLDPE)/high quality poly-propylene sheet/PVC lined polyester double UV coated fabric, etc, having water and gas leak proof design and fabrication, with ultraviolet protection and desired strength for minimum life of 10 years. The digester for medium and large scale plants may be made from bricks masonry/reinforced cement concrete/mild steel/stainless steel. For reference, the relevant Indian Standards for construction of digester using different materials are given in Table 5.

Table 5 Material for Construction of Digester
(*Clause* 7.2.1)

Sl No.	Material	Relevant Indian Standard
(1)	(2)	(3)
i)	Masonry	IS 1905
ii)	Reinforced cement concrete (RCC)	IS 456
iii)	Steel	IS 800
iv)	High density polyethylene (HDPE)	IS 2508
v)	Linear low density polyethylene (LLDPE)	IS 2508/IS 12701
vi)	Ferro-cement	—
vii)	Glass fibre reinforced plastic (FRP)	IS 12866
viii)	Poly-propylene sheet	—
ix)	PVC lined polyster double UV coated fabric	—
x)	Polyethylene with polypropylene/EPDM (Ethylene propylene dine monomer) as outer layer (bag type digester)	—

7.2.2 *Gas Holder*

Gas holder/dome for small, medium and large scale plants may be made from brick masonry and gas leak proof with suitable material. Appropriate corrosion allowance (thickness/coating) to be provided for gas holders made up of steel. Gas holders shall also be provided with suitable protective enclosure. Methane permeability should be upto 200 cm^3/m^2/day at 10 N/mm^2 absolute pressure as per ISO 15105 (Part 1). For reference the relevant standards for construction of gas holder using different materials are given in Table 6.

Table 6 Material for Construction of Gas Holder
(*Clause* 7.2.2)

Sl No.	Material	Relevant Indian Standard
(1)	(2)	(3)
i)	Glass fibre reinforced polyester resin with steel frame	IS 12986 (Part 1)
ii)	Brick masonry (upto 80 m^3 per day)	IS 1905
iii)	PVC lined polyester double UV coated fabric should be *Min* 750 g/m^2 or higher according to storage capacity	—
iv)	Steel	IS 800
v)	Linear low density polyethylene (LLDPE)	IS 12701

Calculation of gas holder volume:

Total expected gas production from each Digester = X m^3/day

Per hour biogas production from each digester = $X/24$ m^3/hr.

Recommended duration of storage for Biogas = 3 hours (Y)

Required volume of gas holder for each digester = $(X/24) \times Y$ m^3

Supplied volume of gas holder = 1.10 × required volume

NOTE — Recommended duration of storage for raw biogas could be as per design and local utilization requirements for medium and large scale biogas plants.

7.2.2.1 *Membrane based gas holder*

The membrane based biogas holder shall not chemically react to media such as slurry and biogas, temperature and aging. Membrane material shall be defined in terms of tensile strength, gas diffusivity, temperature resistance (membrane to remain intact in the stipulated range mentioned) surface resistance, fire resistance, and UV resistance. The membrane shall comply with the requirements as given in Table 7.

Table 7 Requirements for Membrane Based Biogas Holder
(*Clauses* 7.2.2.1 *and* 7.2.2.2)

Sl No.	Particulars	Specifications
(1)	(2)	(3)
i)	Tensile strength	3 000 N/5 cm, *Min* as per ISO 1421
ii)	Gas diffusivity	200 cm^3/m^2/ day at, *Max* 10 N/mm^2(1 bar) absolute pressure
iii)	Temperature resistance	- 30 °C to + 70 °C
iv)	Surface resistance	Less than 3×10^9 Ohm,
v)	Bleeder resistance	Less than 3×10^8 Ohm, *Max*
vi)	UV resistance	UV content of total solar radiation 5.4 kWh/m^2/day, *Min* for designed/projected life
vii)	Flame resistance	100 mm per min (at biogas flash point temperature)
viii)	Maximum operating pressure (Set point for pressure release valve)	50 mm water column (WC)

7.2.2.2 In case of double membrane based biogas holder, the requirements given in Table 7 and the following shall be complied with:

a) The biogas produced by anaerobic digestion inside the digester is collected from digester mounted single/double membrane biogas holder installed on each digester;

b) The membrane is microbiologically resistant as per the geo-synthetic method for determining microbiological resistance by soil burial test as per the appropriate standard;

c) Digester mounted double membrane biogas holder shall be made of PVC coated polyester fabric; and

d) The external and internal membrane shall be protected against ultra violet light, treated with fungicide and flame retardant materials according to appropriate standard.

NOTE — The minimum material strength shall be further dependent on the project specific requirements dictating the required material strength as appropriate for the results of the static design calculations for the inflated structure.

7.2.3 *Pipes and Fittings*

7.2.3.1 For low pressure (up to 1bar) conveyance of biogas, HDPE, CPVC, MDPE, uPVC, Stainless Steel pipes and fittings may used of required thickness. The mild steel pipes and fittings being used to carry raw biogas shall be as per IS 15663 (Part 1). After the purification of the biogas as per IS 16087, it may be transported using pipes and fittings being used for natural gas as per IS 15663 (Part 1). All piping material shall have appropriate corrosion allowance and UV tolerance for designed life of minimum 15 years.

NOTE — A purification unit may be installed, depending upon the requirement.

7.2.4 *Automatic/Manual Biogas Flare Unit*

The flaring unit can be installed for safety requirements and/or for emergency/maintenance shutdown situation.

7.3 Feedstock Storage

7.3.1 *Solid Feedstocks*

For short term storage of feedstocks (up to 7 days) appropriate facilties for leachate collection and covered storage without causing odour problem will be designed and setup at the site of biogas plant, for the long term storage of feedstocks the facility shall follow *Central Pollution Control Board* (CPCB) and *State Pollution Control Board* (SPCB) waste storage guidelines.

7.3.2 *Liquid Feedstocks*

The feedstock/slurry may be stored in appropriate leak proof tanks before adding it to the digester, as applicable.

8 ELECTROMECHANICAL WORK

All electro mechanical works like valves, gates, pipes and fittings, instrumentations, lightings, wiring, etc. shall be as per the relevant Indian Standard.

9 SPECIFICATION OF OUTPUT

9.1 Biogas (Biomethane)

The biogas (biomethane) for use in automotive application, piped network and cylinder applications shall comply with and tested in accordance with IS 16087.

ANNEX A
(*Clause* 2)

LIST OF STANDARDS REFERRED

IS/ISO No.	*Title*
IS 456 : 2000	Plain and reinforced concrete — Code of practice (*fourth revision*)
IS 800 : 2007	General construction in steel — Code of practice (*third revision*)
IS 875 (Part 1) : 1987	Code of practice for design loads (other than earthquake) for buildings and structures: Part 1 Dead loads — Unit weights of building materials and stored materials (*second revision*)
IS 1079 : 2017	Hot rolled carbon steel sheet, plate and strip — Specification (*seventh revision*)
IS 1161 : 2014	Steel tubes for structural purposes — Specification (*fifth revision*)
ISO 1421: 2016	Rubber- or plastics-coated fabrics — Determination of tensile strength and elongation at break
IS 1905 : 1987	Code of practice for structural use of unreinforced masonry (*third revision*)
IS 2062 : 2011	Hot rolled medium and high tensile structural steel — Specification (*seventh revision*)
IS 2379 : 1990	Pipelines — Identification — Colour code (*first revision*)
IS 2508 : 2016	Polyethylene films and sheets — Specification (*third revision*)
IS 3370	Concrete structures for retaining aqueous liquids — Code of practice:
(Part 1) : 2021	General requirements (*second revision*)
(Part 2) : 2021	Plain and reinforced concrete structures (*second revision*)
IS 4923 : 2017	Hollow steel sections for structural use — Specification (*third revision*)
IS 4984 : 2016	Polyethylene pipes for water supply — Specification (*fifth revision*)
IS 5312	Swing check type reflux (non-return) valves for water works purposes — Specification:
(Part 1) : 2004	Single door pattern (*second revision*)
(Part 2) : 2013	Multi — door pattern (*first revision*)
IS 5572 : 2009	Classification of hazardous areas (other than mines) having flammable gases and vapours for electrical installation (*third revision*)
IS 6092	Methods of sampling and test for fertilizers:
(Part 1) : 1985	Sampling (*first revision*)
(Part 2)	Determination of nitrogen,
(Sec 1) : 2004	Introduction (*second revision*)
(Sec 2) : 2004	Test methods not covered under dual number standards (*second revision*)
(Sec 3) : 2004/ISO 4176	Nitrate nitrogen content — Nitron gravimetric method
(Sec 4) : 2004/ISO 5314	Ammoniacal nitrogen content — Titrimetric method after distillation
(Sec 5) : 2004/ISO 5315	Total nitrogen content — Titrimetric method after distillation
(Part 3)	Determination of phosphorus,
(Sec 1) : 2004	Introduction (*second revision*)

(Sec 2) : 2004	Test methods not covered under dual number standards (*second revision*)
(Sec 3) : 2004/ISO 5316	Extraction of water — soluble phosphates
(Sec 4) : 2004/ISO 6598	Quinoline phosphomolybdate gravimetric method
(Sec 5) : 2004/ISO 7497	Extraction of phosphates soluble in mineral acids
(Part 4) : 1985	Determination of potassium (*first revision*)
(Part 5) : 1985	Determination of secondary elements and micronutrients (*first revision*)
(Part 6) : 1985	Determination of moisture and impurities (*first revision*)
IS 6940 : 1982	Methods of test for pesticides and their formulations (*first revision*)
IS 7016	Methods of test for rubber or plastics coated fabrics:
(Part 1)	Determination of roll characteristics,
(Sec 1) : 2022/ISO 2286-1 : 2016	Methods for determination of length, width and net mass (*third revision*)
(Sec 2) : 2019/ISO 2286-2 : 2016	Methods for determination of total mass per unit area, mass per unit area of coating and mass per unit area of substrate (*second revision*)
(Sec 3) : 2019/ISO 2286-3 : 2016	Method for determination of thickness (*second revision*)
(Part 2) : 2022/ISO 1421 : 2016	Determination of tensile strength and elongation at break (*third revision*)
(Part 3)	Determination of tear resistance,
(Sec 1) : 2022/ISO 4674-1 : 2016	Constant rate of tear methods (*third revision*)
(Sec 2) : 2017/ISO 4674-2 : 1998	Ballistic pendulum method (*second revision*)
(Part 4) : 2003/ISO 7854	Rubber - or plastics - coated fabrics — Determination of resistance to damage by flexing (*second revision*)
(Part 5) : 2019/ISO 2411 : 2017	Rubber - or plastics - coated fabrics — Determination of coating adhesion (*third revision*)
(Part 6)	Determination of bursting strength,
(Sec 1) : 2016/ISO 3303-1 : 2012	Steel — Ball method (*second revision*)
(Sec 2) : 2018/ISO 3303-2 : 2012	Hydraulic method (*second revision*)
(Part 7) : 2009/ISO 1420	Rubber - or plastics - coated fabrics — Determination of resistance to penetration by water (*second revision*)
(Part 8) : 1975	Accelerated ageing
(Part 9) : 2003/ISO 5978	Rubber - or plastics - coated fabrics — Determination of blocking resistance (*second revision*)
(Part 10) : 1997/ISO 4675	Rubber - or plastics - coated fabrics — Low Temperature bend test (*first revision*)
(Part 11) : 1987	Determination of flexibility — Flat loop method
(Part 12) : 1987	Determination of tack — Tear resistance

(Part 13) : 2003/ISO 5473	Rubber - or plastics - coated fabrics — Determination of crush resistance (*first revision*)
(Part 14) : 2003/ISO 4646	Rubber - or plastics - coated fabrics — Low temperature impact test (*first revision*)
(Part 15) : 2019/ISO 5470-1 : 2016	Determination of abrasion resistance using taber abrader
IS 8329 : 2000	Centrifugally cast (spun) ductile iron pressure pipes for water, gas and sewage — Specification (*third revision*)
IS 8749 : 2002	Biogas stove — Specification (*second revision*)
IS 8935 : 1985	Specification for electric solenoid operated actuators (*first revision*)
IS 9334 : 1986	Specification for electric motor operated actuators (*first revision*)
IS 9523 : 2000	Ductile iron fittings for pressure pipes for water, gas and sewage — Specification (*first revision*)
IS 9890 : 1981	Specification for general purpose ball valves
IS/ISO 10434 : 2020	Steel gate valves flanged and butt — welded ends for petroleum petrochemicals and allied industries
IS 12701: 1996	Rotational moulded polyethylene water storage tanks - specification (*first revision*)
IS 12866 : 2021	Plastic translucent sheets made from thermo-setting polyester resin glass fibre reinforced — Specification
IS 12986 (Part 1) : 1990	Biogas plants — Glass fibre reinforced polyester resin gas holders — Specification: Part 1 With steel frame
IS 13095 : 2020	Butterfly valves for general purposes (*first revision*)
IS13349 : 1992	Cast iron single faced thimble mounted sluice gates
IS 14333 : 2022	Polyethylene pipes for sewerage and industrial chemicals and effluent — Specification (*first revision*)
IS 15045	Pneumatic fluid power — Five — port directional control valves
(Part 1) : 2021/ISO 5599-1 : 2001	Mounting interface surfaces without electrical connector (*first revision*)
(Part 2) : 2021/ISO 5599-2 : 2001	Mounting interface surfaces with optional electrical connector (*first revision*)
(Part 3) : 2001	Code system for communication of valve functions
ISO 5599-3 : 1990	
ISO 15105 (Part 1) : 2007	Plastics — Film and sheeting — Determination of gas-transmission rate — Part 1: Differential-pressure methods
IS 15663 (Part 1) : 2006	Design and installation of natural gas pipelines — Code of Practice: Part 1 Laying of pipelines
IS 15778 : 2007	Chlorinated polyvinyl chloride (CPVC) pipes for potable hot and cold water distribution supplies — Specification
IS 16087 : 2016	Biogas (biomethane) — Specification (*first revision*)
IS/ISO 17292 : 2015	Metal ball valves for petroleum petrochemical and allied industries (*first revision*)
IS 17875 : 2022	Stainless steel seamless pipes and tubes for general service
IS 17876 : 2022	Stainless steel welded pipes and tubes for general service
IS/ISO 22109 : 2020	Industrial valves — Gearbox for valves

ANNEX B
(*Clauses* 5.3 *and* 6)

Table 8 Type of Feedstocks Considered for Biogas Plants Along with Organic Loading Rate (OLR), Hydraulic Retention Time (HRT), Volatile Solid (VS) Removal and Biogas Yield According to Plant Size

Sl No.		Small Scale Biogas Plant					Medium Scale Biogas Plant					Large Scale Biogas Plant				
	Types of Waste	**OLR** (kg VS/m^3 digester liquid volume/ day) min	**HRT** (day) min	**VS removed** (percent) min	**Specific biogas produced** (m^3/ kg VS removed) min	**Biogas produ-ced** (m^3/t solid waste) min	**OLR** (kg VS/m^3 digester liquid volume/ day) min	**HRT** (day) min	**VS removed** (percent) min	**Specific biogas produced** (m^3/ kg VS removed) min	***Min*. biogas produced** (m^3/t VS) min	**OLR** (kg VS/m^3 digester liquid volume /day) min	**HRT** (day) min	**VS removed** (percent) min	**Specific biogas produced** (m^3/ kg VS removed) min	**Biogas produced** (m^3/t VS) min
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
i)	Poultry waste + seed	1.75	40	44	0.6	50	2	35	44	0.7	60	2	35	44	0.7	70
ii)	Municipa l solid waste + seed	2.2	30	75	0.5	70	2.7	30	75	0.5	75	3	30	75	0.5	80
iii)	Food waste + seed	2	30	70	0.55	90	2.5	30	70	0.55	90	3	30	70	0.55	95
iv)	Vegetabl e waste + seed	2.2	30	75	0.6	80	2.7	30	75	0.65	85	3.3	30	75	0.65	95
v)	Slaughter house	2	20	55	0.7	70	3	30	60	0.7	70	3	25	60	0.8	65

Table 8 (*Concluded*)

	waste + Seed															
vi)	Agricultural waste + rice straw + seed	1.4	35	53	0.33	60	1.7	35	53	0.33	70	2	30	53	0.33	70
vii)	Kitchen waste + seed	2.2	30	75	0.5	70	2.7	30	75	0.5	80	3.3	30	75	0.5	70
viii)	Cattle dung [DAP, milch, grazed(on grass /straw dominant diet)]	2	40	28	0.23	30	2	40	28	0.23	35	2.29	35	28	0.23	35
ix)	Sewage sludge (no pretreatment)	-	-	-	-	-	0.8	25	60	0.23	35	0.8	25	60	0.23	35

NOTES

1 Seed/inoculum shall be active biodigester slurry, STP sludge, fresh cow dung or recirculated slurry or water (microbial inoculum).
2 OLR varies from high rate to low rate to standard rate anaerobic digester; high rate 4 to 8, standard rate 2 to 4, low rate 1 to 2, HRT also varies as less than 15 days high rate, 15 day to 25 day standard rate more than 25 days low rate digester.
3 The units and parameter above are recommended for optimum performance, however improved performance is desirable.
4 For reference, it may be assumed that for a family of 4 persons, 1 m^3 per day of biogas is required for cooking purpose.

ANNEX C
(*Clause* 5.5)

SAMPLING AND ANALYSIS

C-1 FEEDSTOCK

For feedstock following parameters may be analysed as per the relevant Indian Standard:

a) Total solids;
b) Volatile solids;
c) Compositional analysis;
d) C:N ratio; and
e) Bio-chemical methane potential (BMP).

C-2 PRODUCT/PROCESS

During the operation of biogas plant following parameters may be analysed:

a) *p*H value;
b) FOS-TAC ratio;
c) Biogas yield; and
d) Biogas analysis.

C-3 ANALYSIS OF DIGESTED SLURRY

Digested slurry may be analyzed for all parameters using standard test methods as prescribed in Table 9.

Table 9 Testing Parameters for Analysis of Digested Slurry
(*Clause* C-3)

Sl No.	Parameters	Method of Test
(1)	(2)	(3)
i)	Sampling	IS 6092 (Part 1)
ii)	Moisture, percent	IS 6092 (Part 6)
iii)	Colour	—
iv)	Odour	—
v)	Particle size	—
vi)	Bulk density, g/cm^3	IS 6940
vii)	Total organic carbon, percent	—
viii)	Total nitrogen (as N), percent	IS 6092 (Part 2/Sec 1 to 5)
ix)	Total phosphate (as P_2O_5), percent	IS 6092 (Part 3/Sec 1 to 5)
x)	Total potassium (as K_2O), percent	IS 6092 (Part 4)
xi)	Micronutrients	IS 6092 (Part 5)

ANNEX D
(*Clause* 6)

ASSESSMENT OF FOS/TAC RATIOS

Sl No.	FOS/TAC Ratios	Assessment
(1)	(2)	(3)
i)	> 0.6	Highly excessive biomass input, stop adding biomass.
ii)	0.5 – 0.6	Excessive biomass input, add less biomass.
iii)	0.4 – 0.5	Plant is heavily loaded, monitor the plant more closely.
iv)	0.3 – 0.4	Biogas production at a maximum, keep biomass input constant.
v)	0.2 – 0.3	Biomass input is too low, slowly increase the biomass input.
vi)	< 0.2	Biomass input is far too low, rapidly increase the biomass input.

ANNEX E
(*Clause* 7.1)

DIFFERENT TYPES OF DIGESTERS USED IN BIOGAS PLANTS

E-1 CONTINUOUS STIRRED TANK REACTOR (CSTR) TYPE DIGESTERS (HORIZONTAL/VERTICAL DESIGN)

CSTR digester consists of continuous stirred tank reactor where continuous mixing of effluent and biomass takes place with the help of central and lateral agitators. The essential feature is that the wash out of the active anaerobic bacterial biomass from the reactor is controlled by a sludge separator recycle system. The basic idea underlying the anaerobic contact process is to:

a) provide contact between the active biomass and feed;

b) utilize the digester volume effectively;

c) prevent stratification and temperature gradient; and

d) minimize the formation of scum layer and the deposition of sludge solids.

E-1.1 CSTR Digester Process

a) Raw effluent is collected in a buffer tank which maintains the temperature around 38 °C to 42 °C . Some quantity of treated spent wash (digester outlet) is also mixed in buffer tank to raise the *p*H;

b) From buffer tank raw spent wash feed is at the top in a centre shaft of the digester;

c) There will be one central agitator and two to five numbers of lateral agitators available to make uniform distribution of biomass and substrate for uniform degradation;

d) The effluent travels to the bottom and contacts with active anaerobic culture in the reactor by the rotation of central agitator and lateral agitators;

e) The re-circulated sludge also mixed with raw effluent in a central shaft of the digester;

f) The treated spent wash collected through overflow pipe and passed through degassing tower for removal of dissolved gases to achieve better settling of sludge in further process;

g) Biogas is collected at the top of the digester and will be stored in gasholder. Biogas from the biogas holder will be compressed and sent to boiler for burning; and

h) Biogas is also used for gas engine to generate the power; here H_2S shall be removed from the biogas before using in the gas engine.

E-2 UP-FLOW ANAEROBIC SLUDGE BED (UASB)

UASB reactor is based on the so-called three-phase separator, which enables the reactor to separate gas, water and sludge mixtures under high turbulence conditions. This allows for compact and cheaper designs. The reactor has multiple gas hoods for the separation of biogas. As a result, the extremely large gas/water interfaces greatly reduce turbulence, making relatively high loading rates of 10 kg/m to 15 kg/m^3 per day possible. Separation in the UASB reactor requires only 1.0 m of height, which prevents flotation effects and, consequently, floating layers. Generally, during the treatment of UASB reactor, the substrate passes through an expanded sludge bed containing a high concentration of biomass first. After that, the remaining part of substrate passes through a less dense biomass named the sludge blanket. The influent is pumped to the UASB reactor from bottom of it by peristaltic pump. The influent moves upwards and gets in contact with the biomass in sludge bed, then continues to move upwards and the rest substrates act with the biomass again in the sludge blanket which has a less concentration of biomass compared with the sludge bed below. The volume of sludge blanket must be sufficient to conduct the further treatment to wastewater by-passed from the lower layer of sludge bed by channeling. At the same time, it will help to ensure a stable effluent quality. A three phases [gas-liquid-solid (GLS)] separator located above the sludge blanket to separate the solid particles from the mixture (gas, liquid, and solid) after treatment and hence allowing liquid and gas to leave the UASB reactor. After the treated wastewater is collected by the effluent collection system via number of launders distributed over entire area discharging, it passes to main launder provided at periphery of the reactor and the biogases generated will be collected as the valuable fuel or for deposal.

E-3 FLOATING DRUM PLANT WITH A CYLINDRICAL DIGESTER (KVIC MODEL)

This type of plant has an underground well-shaped digester having inlet and outlet connections through pipes located at its bottom on either side of a partition wall. An inverted drum (gas holder) made of mild steel is placed in the digester which rests on the wedge shaped support and the guide frame at the level of the partition wall and moves up and down

along a guide pipe with the accumulation and use of gas. The weight of the drum applies pressure on the gas to make it flow through the pipelines to the points of use. The gasholder alone is the costliest component which accounts for about 40 percent of the total installation cost of biogas plant. It also needs to be painted regularly for protecting it against corrosion. These plants can be of any size to cater the needs of the users.

E-4 FLOATING DRUM PLANT WITH A HEMISPHERE DIGESTER (*PRAGATI* MODEL)

In *Pragati* Design Biogas Plant is floating drum plant with the depth of pit is less than KVIC biogas plant and is cheaper. It can be constructed in hilly area and high water table areas.

The digester of *Pragati* design plant start from the foundation in dome shape thereby reducing the constructional area, for same digester volume, thus reducing the cost of construction of the plant. The wall thickness of digester is kept 75 mm only. Dome shape construction takes place up to a collar base, where a central guide frame is provided. The digester wall above guide frame is constructed in cylindrical shape.

E-5 FLOATING DRUM PLANT MADE UP OF ANGULAR STEEL AND PLASTIC FOIL (*GANESH* MODEL)

It is basically a KVIC plant constructed with bamboo and polythene sheet. The digester is made of an angle iron frame, bamboo and polythene sheet. The KVIC gas holder and guide frame are used in this design also. The cost of this plant is 70 percent of KVIC plant.

E-6 FLOATING DRUM PLANT MADE OF FIBRE GLASS REINFORCED POLYESTER

This type of digester, which is widely used on a household scale, uses fiberglass so it is more efficient in handling and changing the biogas plant site. This digester consists of one part that functions as a digester and gas storage, each mixed in one chamber without insulation. Digester from fiberglass material is very efficient because it is very impermeable, lightweight and strong. If there is a leak, it is easily repaired or reshaped as before, and the more efficient is that the digester can be moved at any time if the farmer does not use it anymore. The main advantage of fiberglass digester is its ease of implementation and handling, low investment cost and being more environmentally friendly.

E-7 PLUG FLOW REACTOR

Plug flow reactors, also known as tubular reactors, consist of a hollow pipe or tube through which reactants flow. The plug flow reactor can be in the form of a tube wrapped around an acrylic mould that is encased in a tank. Water at a controlled temperature is circulated through the tank to maintain a constant reactant temperature. Plug flow reactors, consist of a cylindrical pipe with openings on each end for reactants and products to flow through. Plug flow reactors are usually operated at steady-state. Reactants are continually consumed as they flow down the length of the reactor. Plug flow reactors may be configured as one long tube or a number of shorter tubes. They range in diameter from a few centimeters to several meters. The choice of diameter is based on construction cost, pumping cost, the desired residency time, and heat transfer needs. Typically, long small diameter tubes are used with high reaction rates, and larger diameter tubes are used with slow reaction rates.

E-8 EXTERNAL CIRCULATION SLUDGE BED (ECSB)

Ii is high-rate anaerobic digestion system uses granular biomass to treat wastewater. This technology is ideal for urban areas and facilities with limited space availability. Wastewater with high concentrations of soluble organics can be easily treated in the compact ECSB system, making this technology an ideal choice for breweries, beverage plants, biofuel processors, or the pulp and paper industry. It can be constructed from various materials such as steel, concrete, or fibre/glass-reinforced plastic (FRP/GRP). This technology continuously meets discharge requirements and eliminates wastewater surcharges, converts organic waste to recoverable green energy (heat and power). Its pressurized system design eliminates odour emissions and sealed headspace, eliminating the potential for tank corrosion.

E-9 BIOGAS INDUCED MIXING ARRANGEMENT (BIMA) DIGESTER

The Biogas induced mixing arrangement (BIMA) system is the original among the self-mixing hydraulic digester systems. It doesn't require any mechanical equipment such as agitator, circulation pumps or gas injection for mixing the digester. The 2-chamber system uses the produced biogas to create a level difference in the chambers and in this way builds up a mixing pressure of up to 5 N/mm^2. The turbulent mixing occurs against the biogas production in intervals of 4 time to 10 time a day.

The system is extremely low-maintenance and has lower operational costs than conventional systems. Ideal applications of this system are high solid sludge and waste, such as in the sewage sludge treatment, treatment of organic solid wastewater, manure, organic household and industrial waste, etc.

E-10 FIXED-DOME PLANT WITH A BRICK MASONRY, MOULDED DOME (*JANTA* MODEL, 6 m^3/day TO 25 m^3/day)

The main feature of the fixed-dome biogas plant or *Janta* model biogas plant is that the digester and the gas holder are integrated parts of brick masonry structure. The digester is made of a shallow well having a dome-shaped roof on it. The inlet and outlet tanks are connected with the digester through large chutes which are called displacement chambers. The gas pipe is fitted on the crown of the masonry dome and there is an opening on the outlet wall of the outlet displacement chamber for the discharge of spent digested slurry. The size of this plant is limited to 25 m^3 per day.

E-11 FIXED-DOME PLANT WITH A HEMISPHERE DIGESTER (*DEENBANDHU* MODEL, UPTO 6 m^3/day)

This plant is designed on the principle that the surface area of biogas plants is reduced (minimized) to reduce their installation cost without sacrificing the efficiency of the plant. The design consists of segments of two spheres of different diameters, joined at their bases. The structure thus formed, acts as the digester, as fermentation chamber, as well as the gas storage chamber. The higher compressive strength of the brick masonry and concrete makes it preferable to go in for a structure which could always be kept under compression. A spherical structure loaded from the convex side will be under compression and therefore, the internal load will not have any residual effect on the structure. The digester is connected with the inlet pipe and the outlet tank. The upper part above the normal slurry level of the outlet tank is designed to accommodate the slurry to be displaced out of the digester with the generation and accumulation of biogas and is called outlet displacement chamber. The size of these plants is recommended up to 6 m^3/day.

E-12 FIXED-DOME PLANT WITH A BRICK MASONRY, MOULDED DOME (MODIFIED PAU *JANTA* MODEL, UPTO 500 m^3/day)

Fixed-dome plant with a brick reinforced, moulded dome or modified PAU *Janta* model biogas plant is a large capacity biogas plant developed to cater to the needs of dairy farmers. This essentially, is a 'Janta' design but of a higher capacity. The gas-holder is hemispherical in shape and is structurally safe and crack-resistant. The construction of this type of plant is easy and is not very different from the method for the *Deenbandhu* Biogas Plant. This plant can be constructed with around 50 percent to 60 percent cost as compared to the cost of other conventional floating drum type (KVIC) biogas plant. The biogas plant is an all brick masonry structure. Reinforced cement concrete is not used for construction of either the digester or the dome of the plant. The design is suitable for all regions of the country. The plant may be designed for any rated capacity from 20 m^3/day to 500 m^3/day for the hydraulic retention period of 40 days or more depending upon total solid concentration (TSC) of the influent slurry. Normally cattle dung mixed with equal quantity of water is used as feed for the plant having TSC of 9 percent to 10 percent. The plant may also work satisfactorily for higher TSC of upto 12 percent. This means water consumption may be cut by upto 50 percent depending upon the season and physical status of the cattle dung used at the time of feeding. Maintenance requirements of this plant are far lesser than the floating drum biogas plants.

E-13 FLOATING-DRUM PLANT MADE OF PRE-FABRICATED FERROCEMENT COMPOUND UNITS

The ferro-cement type of construction can be applied either as a self supporting shell or an earth-pit lining. The vessel is usually cylindrical. Very small plants (volume under 6 m^3) can be prefabricated. As in the case of a fixed-dome plant, the ferro-cement gas holder requires special sealing measures (proven reliability with cemented on aluminium foil).

E-14 FIXED FILM REACTOR

Fixed-film activated sludge (FFAS) technology/package provides for additional biomass within a wastewater treatment facility in order to meet more stringent effluent parameters or increased loadings without the direct need for additional tank capacity. Industry practice for upgrading wastewater treatment plants usually focuses on increasing the bioreactor volume to provide the additional bacterial population required to meet the system kinetic needs. FFAS systems such as moving bed biofilm reactor (MBBR) allow for the additional bacterial population to exist on a fixed surface, thereby eliminating the need to increase the suspended growth population. FFAS systems add the benefits of fixed film systems into the suspended growth activated sludge process. Activated sludge has process flexibility and provides a high degree of treatment. Fixed film processes are inherently stable and resistant to organic and hydraulic shock loadings. Placing Fixed Film media into activated sludge basins combines the advantages of both of these approaches.

E-15 FLOATING FILMS REACTORS

The moving bed biofilm reactor (MBBR) process is based on the aerobic biofilm principle and utilizes the advantages of activated sludge and other biofilm systems without being restrained by their disadvantages. The basis of the process is the biofilm carrier elements that are made from polyethylene. The elements provide a large protected surface area for the biofilm and optimal conditions for the bacteria culture to grow and thrive. The biofilm that is created around each carrier element protects the bacterial cultures from operating excursions to yield a very robust system for those industrial facilities loaded with process fluctuations. The biofilm also provides a more stable home for the bacteria to grow, so there is less space required compared to other biological systems and far less controls. Essentially nutrient levels and DO levels are the only control points for the system. MBBRs can be designed for new facilities to remove BOD/COD from wastewater streams or for nitrogen removal. Existing activated sludge plants can be upgraded to achieve nitrogen and removal or higher BOD/COD capacity (up to 500 percent increases have been obtained).

E-16 BAG TYPE DIGESTERS

A balloon plant consists of a plastic or rubber digester bag, in the upper part of which the gas is stored. The inlet and outlet are attached direct to the skin of the balloon. When the gas space is full, the plant works like a fixed-dome plant, that is the balloon is not inflated; it is not very elastic. The fermentation slurry is agitated slightly by the movement of the balloon skin. This is favourable to the digestion process. Even difficult feed materials, such as water hyacinths, can be used in a balloon plant. The balloon material shall be UV-resistant. The advantages of this biogas plants are its low cost, ease of transportation, low construction (as it is important if the water table is high), high digester temperatures, and non-complicated cleaning, emptying and maintenance. The disadvantages of this biogas plant are its short life (about five years), and it is easily damaged. Balloon plants can be recommended wherever the balloon skin is not likely to be damaged and where the temperature is even and high. One variant of the balloon plant is the channel-type digester with *folia* and sunshade.

E-17 HIGH RATE SOLID DIGESTERS

Anaerobic Digestion systems can be operated at a wide range of total solids (TS) contents depending on the feedstock TS content and process design. Anaerobic digestion for high strength wastewater can be carried out at a very low TS content (< 1.0 percent) using high-rate anaerobic reactors, such as an anaerobic biofilter, UASB or expanded/fluidized bed reactor. For slurry feedstocks, such as sewage sludge, animal manure, and liquid food waste, Anaerobic digestion systems are usually designed to operate at low TS contents (< 15 percent) and are referred to as liquid anaerobic digestion systems. Another type of anaerobic digestion that operates at TS contents higher than 15 percent and digests solid organic wastes, such as the organic fraction of municipal solid waste (OFMSW) and crop residues, is defined as solid-state anaerobic digestion. High TS contents will reduce the mass transfer rate in anaerobic digestion and result in a retarded reaction rate and slow diffusion of intermediate products and inhibitors. The changes of volumetric reaction rate of lignocellulosic biomass in anaerobic digestion increase with TS content due to the increase of organic loading but then decrease at TS of around 20 percent due to the slow mass transfer and accumulation of inhibitors.

ANNEX F
(*Clause* 7.2)

REQUIREMENTS FOR DESIGN OF CIVIL CONSTRUCTION

F-1 GENERAL

This may include design and construction of feed storage area, feed handling system (pre-processing), digester feed chamber, anaerobic digester, digested slurry storage and processing for organic digestate manure, biogas storage system, purification and bottling unit/CO_2 extraction and processing unit/electricity generation unit, water storage tank, firefighting system, etc. (as applicable).All these works are required to deliver the civil structures complete in all respects including water retaining structures, gas leak proof construction of digester and gas holder (leakage tested), structural steel works, finishing works like handrailings, floorings, plastering, painting of civil and steel structures, roof water proofing, rain water pipes, plumbing and sanitary pipes and fittings (wherever applicable).

F-2 STRUCTURAL DESIGN

F-2.1 Reinforced Cement Concrete (RCC) Structure

All reinforced cement concrete (RCC) structures shall be constructed as per IS 456 and the following:

a) Foundations of structures are assumed to be offering fixed support; and

b) The column above RCC wall shall be assumed as pinned over RCC wall so that no moment is transferred to the RCC wall below.

F-2.2 Liquid Retaining Structure

All liquid retaining structures made up of concrete shall be as per IS 3370 (Part 1), IS 3370 (Part 2) and the following:

a) F.O.S. against uplift shall be 1.25 and against sliding it shall be 1.5.

F-2.3 Steel Structure

Fabrication and erection of all the steel structures shall be as per IS 800. Plates and different sections used in structures shall be as per following:

IS No.	*Title*
IS 1079	Cold formed light gauge sections
IS 1161	Tubular sections
IS 2062	Hot rolled sections and plates
IS 4923	Hollow sections (rectangular or square)

F-2.4 Loads

F-2.4.1 *Dead Loads*

Dead loads include the weight of all permanent construction including walls, floors roofs, partitions, staircase and fixed service equipment and other equipment including their contents. Dead Loads for design shall be in accordance with IS 875 (Part 1).

F-2.4.2 *Liquid and Soil Loads*

Tanks below ground shall be subjected to surcharge and lateral pressure due to soil. Following load cases shall be considered for the design of liquid retaining structures (LRS):

a) *For wall*-water inside tank full upto top of wall and no soil acting outside;

b) *For raft*-inside tank full;

c) Inside tank empty with soil and surcharge pressure of 1.0 MT/m^2 shall be considered on wall where ever required;

d) *For two compartments* -One shall be treated full up to top of wall and the other empty;

e) The following soil pressure co-efficient shall be considered for calculating lateral loads:

1) For free cantilever wall, the earth pressure coefficient shall be 0.33 for rest, it shall be 0.5, that is earth pressure co-efficient at rest;

2) For circular structure and propped wall earth pressure coefficient shall be 0.5; and

f) Ground water table, if any shall be considered in the design of structures.

F-2.4.3 *Imposed Loads*

The following minimum loads shall be considered in the design of structures:

a) Live loads on roofs = 150 kg/m^2;

b) Pump house operating floor = 1 050 kg/m^2;

c) Maintenance/storage /air blower floor = 750 kg/m^2;

d) Suspended switch gear, battery room = 1 000 kg/m^2;

e) Stairs, walkway and landing = 500 kg/m^2; and

f) Surcharge = 1 000 kg/m^2.

F-2.2.4 *Temperature Loads and Construction Joints*

Temperature load shall be considered half of 2/3 of difference between maximum and minimum temperature. The construction joints in buildings and tank structures shall be provided as per relevant standard/engineering practices.

F-2.4.5 *Impact and Vibratory Loads*

Structures subjected to impact or vibratory loads shall be considered as 2.5 times the weight of vibratory equipment, like pumps, motor, blower, compressor, etc.

ANNEX G
(*Clause* 8)

GENERAL REQUIREMENTS FOR ELECTRO-MECHANICAL WORKS SPECIFICALLY FOR MEDIUM AND LARGE SCALE PLANTS

G-1 GENERAL

This specifies the general requirements related to electro-mechanical works to be carried out. Material and design of all the equipments, valves, gates, electrical instruments, etc as per relevant Indian Standards shall be suitable for the duty requirement to ensure minimum design life of 15 years. However, the following minimum requirements given under **G-2** and **G-3** need to be adhered to.

G-2 MECHANICAL WORKS

Various parts and components required for mechanical works of biogas plants are given below, however, level of automation to be decided based on the biogas plant capacity:

G-2.1 Valves

a) All automatic valves may be electrically or electro-pneumatically actuated. Pneumatic valves shall have 5 - way acting solenoids and the requisite air pressure depending on the valve specifications as per IS 15045 (all parts);

b) Medium (2 000 m^3/day biogas and above) and large size plants: Entire plant/operations may be automated at desired level;

c) All valves of 500 mm diameter and above, and valves in discharge of pumps/blowers irrespective of size shall be electrically actuated as per IS 9334 and IS 8935;

d) Valves up to and including 200 mm diameter can be wafer/lugged wafer type. All valves above 200 mm diameter shall be double flanged;

e) All valves shall be provided with a dismantling joint for ease of maintenance. Dismantling joint can be common between two adjacent valves;

f) All valves 250 mm diameter and above shall be gear based as per IS/ISO 22109;

g) All valves shall be as per the requirements and of the same size as line size;

h) Valves in water line shall be butterfly type, valves in sludge lines shall be knife gate valves and valves in chemical lines shall be ball valves;

j) NRVs shall be either swing check or dual plate check valves as per IS 5312 (Part 1 and Part 2);

k) All valves shall be of PN10 pressure rating or at least 2 times the working pressure, whichever is higher;

m) All NRVs shall be double flanged. Ball valves shall be socketed or flanged type (in case of non-metallic) and flanged (in case of metallic); and

n) All butterfly valves shall be as per IS 13095, gate valves shall be as per IS/ISO 10434 and ball valves shall be as per IS 9890 and IS/ISO 17292.

G-2.2 Gates

a) Automatic gates shall be electrically actuated and not pneumatic actuated as per IS 9334 and IS 8935;

b) All gates of 1 000 mm × 1 000 mm size and above shall be automatic and electrically actuated;

c) All gates shall be thimble mounted as per IS 13349;

d) Gates shall be in cast iron construction with SS shaft; and

e) As required entire plant/operations shall be automated, operable through central operating system. All gates shall be required to be automatic to achieve this purpose.

G-2.3 Actuators

Electric actuators shall be as per IS 9334 and IS 8935.

G-2.4 Pipes and Fittings for Different Plant Utility

a) All process lines including sludge lines shall be HDPE pipelines as per IS 4984 of PN10 rating or Class K9 ductile iron pipelines as per IS 8329. All ductile iron pipe fittings shall conform to IS 9523 of pressure rating PN10 or 2 times the working pressure, whichever is higher;

b) Chemical process water and drinking water pipelines shall be CPVC pipelines as per IS 15778, 10 kg/cm^2 pressure rating or 2 times the working pressure, whichever is higher or SS304, Schedule 20 as per IS 17875 and IS 17876;

c) Air pipe shall be SS304, Schedule 20 as per IS 17875 and IS 17876 or thickness as required for pressure 2 times the working pressure, whichever is higher;

d) All buried pipes shall be laid on beddings as required to suit site conditions after leveling and compaction to minimum 90 percent proctor density. All over ground pipe work shall be suitably supported over pipe racks/structural steel supports and anchored to tanks/buildings/structures suitably facilitating easy replacements during maintenance as per relevant Indian Standard; and

e) All pipe work shall be suitably colour banded for the conveying fluid and direction of flow marked with appropriate colour as per IS 2379.

G-2.5 Hoists and Cranes

For medium and large size biogas plants according to requirements and local conditions, lifting equipment (hoists or cranes) shall be provided in all locations requiring lifting and shifting of material for operation and maintenance of plant.

G-2.6 Hardware

All hardware like nuts, bolts, washers, flanges, etc shall be suitable to meet the duty requirement, however components in contact with raw biogas shall be minimum SS304 or non corrosive materials for components use for raw biogas.

G-3 ELECTRICAL AND INSTRUMENTATION SYSTEMS

Electrical and Instrumentation systems for medium and large sized biogas plants shall be designed as per the relevant Indian Standards as applicable. Level of automation may be decided based on the biogas plant capacity. For large scale biogas plants used for power generation/CBG production, the installation of electrical equipments shall be as per IS 5572.

ANNEX H
(*Foreword*)

RECOMMENDED APPLICATIONS OF FINAL PRODUCT AND BY-PRODUCTS

H-1 COOKING

Biogas may be supplied to households for use in biogas cookstove for cooking purpose. The biogas cookstove shall be as per IS 8749.

H-2 ELECTRICITY GENERATION FROM BIOGAS (BIOMETHANE)

Biogas (biomethane) may be used for the generation of electricity using CNG engines. Hundred percent biogas engines may also be used for conversion of biogas into electricity as per the relevant Indian Standard.

H-3 DIGESTATE AS ORGANIC FERTILIZER

Organic fertilizer is a by-product of the digestion process and produced in solid and/or liquid form, from the digester. This prescribed composition of the solid organic fertilizer for digestate of biogas (biomethane) plants shall comply for the solid and liquid organic fertilizers produced from the biogas digester as prescribed in Table 10 for further packaging and sales.

Table 10 Specification of Organic Fertilizer
(*Clause* H-3)

Sl No.	Parameters	Solid organic fertilizer	Liquidorganic fertilizer
(1)	(2)	(3)	(4)
i)	Moisture, percent by weight	30 percent to 40 percent	90 percent to 97 percent
ii)	Particle size	Minimum 90 percent material should pass through 4.0 mm IS sieve	Minimum 90 percent material should pass through 4.0 mm IS sieve
iii)	Total organic carbon, percent by weight, *Min*	14	14
iv)	NPK nutrients (Total N, P_2O_5 and K_2O nutrient, percent), *Min* (For upgraded digestate based organic fertilizer the nos. for P_2O_5 and K_2O to be given)	1.2	1.2
v)	C : N ratio	< 20	< 20
vi)	*p*H	6.5 to 8.0	6.5 to 8.0
vii)	Conductivity (as ds/m), *Max*	4.0	4.0
viii)	Pathogens	Nil	Nil
ix)	Heavy metal content, mg/l, *Max*		
	a) Arsenic (As)	10	10
	b) Cadmium (Cd)	5	5
	c) Chromium (Cr)	50	50
	d) Copper (Cu)	300	300
	e) Mercury (Hg)	0.15	0.15
	f) Nickel (Ni)	50	50
	g) Lead (Pb)	100	100
	h) Zinc (Zn)	1 000	1 000

NOTES

1 Bio-CO_2 utilization: Bio-CO_2 separated from purification of biogas can be used in green house chambers for plant growth, for manufacturing of dry ice (food grade), fumigation in grain storage, liquefaction, CO_2 sequestration for algae growth, fire extinguishers, and chemical synthesis.

2 Liquid organic fertilizer can also be upgraded or amended with additional stable organic matter to improve quality.

3 Solid and liquid digestate may be upgraded to make:

a) Potassium and phosphate rich organic manure (PROM); and

b) Microbial inoculent enriched solid/liquid biofertilizer.

Digestate slurry from biogas plant may be separated through de-watering machines into two, solid and liquid fraction. In case of solid fraction (also known as fermented organic manure), moisture is to be maintained below 30 percent to 35 percent, as high moisture contents lead to higher microbial activity in storage and may end up losing organic carbon during storage. Liquid manure may be used as it is. Liquid manure is high volume and extremely low in

nutrients, generally used in bulk quantities in nearby agricultural fields.

Value addition of fermented organic manure (solid fraction):

a) Phosphate rich organic manure (PROM) — This can be prepared by mixing solid manure fraction with fine powder of rock phosphate to obtain final product with minimum of 8 percent P_2O_5 and 10 percent of organic carbon. Ratio of each ingredient can be worked out after analysis of all ingredients and standardizing to achieve the desired value; and

b) Organic manure containing 3 percent nutrients- This can be done by adding small quantity of caster or neem cake and/or rock phosphate to comply to the total NPK requirement of 3 percent.

NOTE — The liquid and solid outputs from the digester is rich in plant nutrients and organic matter for improving soil health. The subsequent use of the solid and liquid outputs of the biogas digesters needs to comply with one of the following, FCO standards on fermented organic manure (FOM), liquid fermented organic manure (LFOM) or *State's Pollution Control Boards* norms for discharge of effluents having similar properties.

ANNEX J
(*Foreword*)

COMMITTEE COMPOSITION
Renewable Energy Sources Sectional Committee, MED 04

Organisation	*Representative(s)*
Ministry of New and Renewable Energy, New Delhi	DR A. K. TRIPATHI (***Chairperson***)
Bharat Heavy Electrical Limited, New Delhi	SHRI AMRISH GUPTA
Biogas Forum India, New Delhi	SHRI A. R. SHUKLA
CSIR - Central Leather Research Institute, Chennai	DR P. SHANMUGAM
CSIR - Central Mechanical Engineering Research Institute, Durgapur	DR CHANCHAL LOHA SHRI SUBHO SAMANTA
Cement Manufacturers Association, New Delhi	SHRI Raju Goyal SHRIVAIBHAV GUPTA (*Alternate* I) SHRI MANMOHAN RATHI (*Alternate* II)
Central Arid Zone Research Institute, Jodhpur	DRANIL KUMAR SINGH DR PRIYABRATA SANTARA(*Alternate*)
Central Public Works Department, New Delhi	SHRI VIMAL KUMAR SHRI RAJIV GUPTA (*Alternate*)
Consumer Coordination Council, Noida	SHRIARUN KUMAR MISHRA SHRI R. K. KAPLASH (*Alternate*)
EMMVEE Photovoltaic Power Private Limited, Bengaluru	SHRIVIJAY KUMAR C. R. SHRIMANJUNATH ULLUR H. (*Alternate*)
India Meteorological Department, New Delhi	SHRIH.S. SAWHNEY DR ANIKENDER KUMAR (*Alternate*)
Indian Council of Agricultural Research, New Delhi	DR KANCHAN K. SINGH DR PANNA LAL SINGH (*Alternate*)
Indian Institute of Technology (BHU), Mechanical Engineering Department, Varanasi	SHRIS. KUMAR SHUKLA
Indian Institute of Technology Bombay, Mumbai	SHRI J. K. NAYAK DR SHIREESH KEDARE (*Alternate*)
Indian Institute of Technology Delhi, New Delhi	PROF DIBAKAR RAKSHIT PROF K. RAVI KUMAR (*Alternate*)
Indian Renewable Energy Development Agency Limited, New Delhi	SHRI SOM PAL SHRI S. K. DEY(*Alternate*)
International Copper Association India, Mumbai	SHRI DEBDAS GOSWAMI SHRI V. K. GUPTA (*Alternate*)
Maharashtra Energy Development Agency, Pune	SHRIMANOJ A. PISE SHRI HEMANT MANIKKULKARNI (*Alternate* I) SHRI ANAND V. KULKARNI (*Alternate* II) SHRI SAMEER GHODAKE (*Alternate*III)
Ministry of New and Renewable Energy, New Delhi	DR S. R. MEENA DR A. K. SINGHAL (*Alternate*)
Ministry of Ports, Shipping and Waterways, New Delhi	SHRIANIL PRUTHI
National Institute of Solar Energy, Gurugram	DR CHANDAN BANERJEE SHRI KISHORE K. MENON (*Alternate*)

Organisation	*Representative(s)*
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Rites Limited, Gurugram	SHRI RUPESH KUMAR SHRI MANISH TIWARI (*Alternate*)
Rajagiri School of Engineering and Technology, Kerala	DR VARGHESEPANTHALOOKARAN SHRIJOEL GEORGE (*Alternate*)
Regional Test Centre, Pune	PROF SANDESH R. JADKAR DR ANAGHA M. PATHAK (*Alternate* I) PROF KIRAN DESHPANDE (*Alternate* II)
Sardar Patel Renewable Energy Research Institute, Mechanical Engineering Department, Vallabh Vidyanagar	SHRIE. R. ASIM KUMAR JOSHI DR SHAISHAV SHARMA (*Alternate*)
Solar Thermal Federation of India, Pune	SHRI JAIDEEP N. MALAVIYA
The Energy and Resources Institute, New Delhi	SHRI N. K. RAM
In Personal Capacity (*C-103 A, JVTS Garden Chaterpur Extension, New Delhi -110074*)	SHRI ATAM KUMAR
BIS Directorate General, New Delhi	SHRI RAJNEESH KHOSLA, SCIENTIST 'F'/SENIOR DIRECTOR AND HEAD (MECHANICAL ENGINEERING) [REPRESENTING DIRECTOR GENERAL (*Ex-officio*)]

Member Secretary
SHRI AMAN DHANAWAT
SCIENTIST 'B'/ASSISTANT DIRECTOR
(MECHANICAL ENGINEERING), BIS

Panel for Standardization in Biogas Plant, MED 04 : P2

Organisation	*Representative(s)*
Biogas Forum India, New Delhi	DR A. R. SHUKLA (***Convener***)
Arka BRENStech Pvt Ltd, Gurugram, Haryana	SHRI SRINIVAS KASULLA
BDTC, Bangalore	DR V. KUMAR GOUDA
Blue Planet Environmental Solutions India Pvt. Ltd.,New Delhi	SHRI SUMEDH BAPAT
Biogas Forum India, New Delhi	DR A. R. SHUKLA
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CSIR-National Environmental Engineering Research Institute (NEERI), Nagpur, Maharashtra	DR GANESH KALE
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Ministry of New and Renewable Energy, New Delhi	DR S. R. MEENA DR PABITRA MOHAN BARIK (*Alternate*)
Punjab Agricultural University, Ludhiana, Punjab	SHRI S. S. SOOCH
Sardar Swaran Singh National Institute of Bio-Energy (SSS-NIBE), Kapurthala, Punjab	DR SACHIN KUMAR
BIS, New Delhi	SHRI AMAN DHANAWAT

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Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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Annexure - B2

No. 300/2/2020-Waste To Energy
Government of India
Ministry of New and Renewable Energy
(Waste to Energy Division)

Atal Akshay Urja Bhawan,
Opposite CGO Complex
Lodhi Road, New Delhi-110 003
Date: 02-11-2022

To,

The Pay & Accounts Officer,
Ministry of New & Renewable Energy
New Delhi-110003

Subject: Administrative approval for implementation of Waste to Energy Programme under the Umbrella scheme of National Bioenergy Programme for duration of FY 2021-22 to 2025-26 (Phase-I)- Reg.

Sir/Madam,

I am directed to convey the sanction of the President of India for the implementation of the National Bioenergy Programme for a period of 01.04.2021 to 31.03.2026 with the outlay of Rs.858 crore under Phase-I. The National Bioenergy Programme will comprise of the following sub-schemes:

i) **Waste to Energy Programme** (*Programme on Energy from Urban, Industrial and Agricultural Wastes /Residues*)

ii) **Biomass Programme** (*Scheme to Support Manufacturing of Briquettes & Pellets and Promotion of Biomass (non-bagasse) based cogeneration in Industries*)

iii) **Biogas Programme**

2. Guidelines for the Waste to Energy Programme are enclosed as **Appendix**.

3. The approved budget outlay of Rs.858 crore under Phase-I also includes the committed liabilities of the sanctions issued under the various sub-schemes of the National Bioenergy Programme up to 31st March 2021.

4. Budget outlay of sub-schemes of the National Bioenergy Programme is given as below:

Arun Kumar

Sub-schemes	Budget outlay of Phase-I (Rs in crore)
Waste to Energy Programme	600
Biomass Programme	158
Biogas Programme	100
	Rs. 858 crore

5. Municipal Solid Waste (MSW)/Refused Derived Fuel (RDF) to power projects based thermal technologies (Incineration, Gasification, Pyrolysis etc.) are not supported under the Waste to Energy Programme.

6. The balance committed liabilities under the National Bioenergy Programme to be carried forward beyond 31.03.2026 should not exceed 50% of the total outlay of the National Bioenergy Programme after excluding committed liabilities as on date of EFC (i.e. 27.06.2022).

7. In addition to regular applications for seeking CFA under the Programme, following points are emphasized:

i. 'In-principle' approval for grant of Central Financial Assistance (CFA) to eligible proposals, except for the proposals covered under paragraph -5 above, which were received up to 31.03.2021 but 'In-principle' approvals could not be accorded thereafter as the National Bioenergy Programme was continued only for clearing committed liabilities may be considered under this administrative approval. 'In-principle' approvals and subsequent release of CFA to such proposals shall be governed by the relevant Waste to Energy Programme guidelines prevailing at the time of the receipt of the concerned proposals.

ii. (a) 'In-principle' approval for grant of CFA to eligible project proposals submitted to the Ministry after 31.03.2021 and till the issuance of new guidelines of Waste to Energy Programme will also be considered under this administrative approval.

(b) Further, the applications of projects commissioned during this period (after 31.03.2021 and till the issuance of till the issuance of new guidelines of Waste to Energy Programme) may also be considered under this administrative approval for according 'In-principle' approval for CFA. Applications of such projects should be submitted within three months of date of notification of the guidelines.

8. The expenditure on Waste to Energy Programme will be met from the budget provisions given under Bio-Power Head.

9. Indian Renewable Energy Development Agency Limited (IREDA) shall be the implementing agency for implementation of the Waste to Energy Programme.

Arun Kumar

10. This issues in exercise of the powers conferred on this Ministry and with the concurrence of IFD Division vide their diary No. 196 dated 01.11.2022.

11. This has approval of Hon'ble Minister for New and Renewable Energy.

Yours faithfully,

Aseem Kumar

(Aseem Kumar)
Director

Copy for information and necessary action to:

1) All Central Government Ministries and Departments.
2) NITI Aayog, Sansad Marg Area, New Delhi.
3) Renewable Energy/Power/Energy Departments of all States & UTs.
4) Principal Director of Audit, Scientific Audit-II,DGACR Building, I.P. Estate, Delhi-110002
5) Indian Renewable Energy Development Agency Limited (IREDA), 3rd Floor, August Kranti Bhawan, Bhikaji Cama Place, New Delhi-110066
6) State Nodal Agencies for Renewable Energy (SNAs) of all States/UTs.
7) Sardar Swaran Singh National Institute of Renewable Energy (SSS-NIBE), Kapurthala , Punjab.
8) Heads of all Biogas Development and Training Center (BDTC).
9) Heads of Banks/Financial Institutions.

Internal Distribution:

a. PS to Hon'ble Minister of Power and New and Renewable Energy
b. PS to Hon'ble Minister of State for New and Renewable Energy and Chemicals & Fertilizers
c. PSO to Secretary, MNRE
d. All Group Heads and Advisors/JS (DDJ)/JS(LB)/JS&FA/Eco. Advisor, MNRE
e. CCA,MNRE/Cash Section, MNRE
f. Director (NIC) to upload the Guidelines on Ministry's Website.
g. Sanction folder

Aseem Kumar

(Aseem Kumar)
Director

Guidelines for implementation of

Waste to Energy Programme

"Programme on Energy from Urban, Industrial and Agricultural Wastes/Residues"

Government of India

Ministry of New and Renewable Energy

New Delhi – 110003

November - 2022

1. INTRODUCTION

1.1. Name of the Programme: "Programme on Energy from Urban, Industrial and Agricultural Wastes/Residues". It may also be referred as "Waste to Energy Programme".

1.2. Objective: The objective of the programme is to support the setting up of Waste to Energy projects for generation of Biogas/ BioCNG/ Power/ producer or syngas from urban, industrial and agricultural wastes/residues.

1.3. Scope: The programme provides Central Financial Assistance (CFA) to project developers and service charges to implementing/inspection agencies in respect of successful commissioning of Waste to Energy plants for generation of Biogas, Bio-CNG/enriched Biogas/Compressed Biogas, Power/ generation of producer or syngas.

2. FUNDING PATTERN

2.1. Standard CFA pattern: Standard pattern of CFA for grant of 'In-principal Approval' to Waste to Energy projects under the programme is as follows:

S.No.	Type of project	Standard CFA rate @ installed capacity of the plant
1	Biogas	Rs 0.25 Cr per 12000cum/day (maximum CFA of Rs. 5.0 Cr/project)
2	BioCNG / Enriched Biogas/ Compressed Bio Gas	-Rs 4.0 Cr per 4800 kg/day *(for BioCNG generation from new biogas plant)* -Rs 3.0 Cr per 4800 kg/day *(for BioCNG generation from existing Biogas plant#)* -Maximum CFA of Rs. 10.0 Cr/project for both cases.
3	Power *(based on Biogas)*	-Rs 0.75 Cr/MW *(for power generation from new biogas plant)* -Rs 0.5 Cr /MW *(for power generation from existing Biogas plant#)* -Maximum CFA of Rs. 5.0 Cr/project for both cases.
4	Power based on bio & agro-industrial waste (other than MSW through incineration process).	Rs 0.4 Cr/MW (maximum CFA of Rs. 5.0 Cr/project)
5	Biomass Gasifier for electricity/thermal applications	o Rs. 2,500 per kW_e with dual fuel engines for electrical application o Rs. 15,000 per kW_e with 100% gas engines for electrical application o Rs. 2 lakh per 300 kW_{th} for thermal applications.

*#**Note:** In case Developer is setting up a new BioCNG/ Power plant based on Biogas already available or generated from already commissioned/operational/existing biogas plant or have already availed financial assistance from Government of India for Biogas plant, then CFA will be provided only for conversion of biogas to BioCNG (@Rs 3.0 Cr per 4800 kg/day) or biogas to power (Rs 0.5 Cr /MW), as mentioned in the table above.*

2.2. Special CFA pattern

i) Special Category States: In case the Waste to Energy plants are set up in Special Category States (NE Region, Sikkim, Himachal Pradesh and Uttarakhand), Jammu & Kashmir, Ladakh, Lakshadweep and Andaman & Nicobar Islands, the eligible CFA would be 20% higher than Standard CFA pattern given in para 2.1 above.

ii) Biomethanation plants set up in registered Gaushala/Shelter: Biogas/BioCNG/Power (biogas based) generation plants based on cattle dung as main feedstock set up by Gaushalas independently or through joint ventures/partnerships will be eligible for 20% higher CFA than Standard CFA pattern given in para 2.1 above. These Gaushalas (Shelters) should be registered with the respective State Government.

2.3. Service Charge to Implementing Agency and Inspection Agency

i) Implementing agency (IA) shall be provided a service charge @1% of total CFA (minimum of Rs 50,000/-) for receiving and processing the applications. Indian Renewable Energy Development Agency Limited (IREDA) shall be the implementing agency. However the Ministry of New and Renewable Energy (MNRE) may change the IA by way of a suitable notification.

ii) Inspection Agency would be provided service charge @ Rs 1% of the eligible CFA (minimum of Rs 50,000/-) towards monitoring of implementation progress, performance inspection and verification of generation record, and post installation monitoring of the plants.

3. TERMS & CONDITIONS

i) Developers shall share plant generation data with MNRE or any other agency designated by MNRE, except in the case of Biomass Gasifiers, through installation of SCADA System/remote monitoring system. (This is applicable for project proposals submitted after notification of this guideline).

ii) Expansion of Plants: Grant of CFA to plants which intend to add capacity to the existing plants shall also be considered. CFA for such plants will be considered only for the enhanced capacity by way of installation of new plant and machinery. Applications received for

expansion projects will be processed as per guidelines existing at the time of submission of the application for expansion.

iii) Central financial assistance from any other Central Govt. Ministry should not be claimed for proposed plant for which application has been submitted to this Ministry.

iv) Waste to Energy (WtE) plants based on waste heat, waste plastics, waste tires or such other polymer waste shall not be eligible for CFA.

v) Biogas plants of size upto 250 kW capacity for power generation and upto 2500 m3/day for Biogas generation capacity are covered under Biogas Programme and shall not be eligible under this programme.

vi) Plants installed with new equipment/machinery only shall be eligible for CFA under this programme.

vii) Municipal Solid Waste (MSW)/Refused Derived Fuel (RDF) to power projects based thermal technologies (Incineration, Gasification, Pyrolysis etc.) are not supported under the Waste to Energy programme.

4. PROCEDURE FOR AVAILING CFA

4.1. Submission of proposal:

i) The proposal for grant of "In-Principle" approval of CFA will be accepted through BioURJA Portal (https://biourja.mnre.gov.in) before commissioning of the proposed plant [except for the projects mentioned in clause 4.1(iii)]. **The last date for submitting the applications under these guidelines shall be 31.12.2025**. List of documents to be submitted is placed at **Annexure-I (Stage-I).**

ii) ***Proposals submitted to the Ministry on or before 31.03.2021 under Waste to Energy Programme (notified vide letter no. 22/222/2016-17-WTE dated 30.07.2018 & 28.02.2020) but 'In-principle' approvals could not be accorded thereafter as the programme was continued only for clearing committed liabilities:*** 'In-principle' approvals and subsequent release of CFA to such proposals, except Municipal Solid Waste (MSW)/Refused Derived Fuel (RDF) to power projects based thermal technologies, shall be governed by the relevant guidelines prevailing at the time of the receipt of the concerned proposals.

iii) ***Proposals received in the Ministry from 01.04.2021 till the issuance of these guidelines for Waste to Energy Programme:*** Eligible proposals falling under this category shall be governed by these guidelines. Waste to Energy projects which have been commissioned during

aforementioned period, shall also be considered as eligible for grant of CFA under this programme. The applications of such projects should be submitted within three months of date of notification of these guidelines.

iv) Incomplete proposal in any form and without requisite approvals/documents will be rejected. The rejection of the proposal will be intimated preferably within 60 days of submission of the proposal in the BioURJA Portal. However, fresh proposal doing away with all shortcomings may be resubmitted before commissioning of the plant or 31.12.2025 whichever is earlier.

4.2. "IN-PRINCIPLE" APPROVAL:

i) **For projects with debt/loans from FIs/Banks**: In case loan drawn by the developer of Waste to Energy plant is equal or more than from eligible CFA, the Implementation Agency shall receive the applications through BioURJA portal, examine the applications and shall forward the consolidated proposal to Ministry on bimonthly basis. The Ministry shall issue an "In-Principle" approval with the concurrence of IFD and approval of Secretary, MNRE. For projects with loan, Ministry/ implementing agency will go by the appraisal of the project by the lending bank/FI.

ii) **For projects without debt/loan or projects wherein loan drawn by the developer of Waste to Energy plant is less than the eligible CFA**, the Implementation Agency shall receive the applications through BioURJA portal, examine the applications and thereafter the applications will be put up to Project Appraisal Committee (PAC). Only PAC recommended applications will be forwarded to Ministry in a consolidated manner on bimonthly basis. The Ministry shall issue an "In-Principle" approval with the concurrence of IFD and approval of Secretary, MNRE.

iii) The "In-Principle" approval will preferably be accorded to the proposals forwarded by IREDA preferably within 40 days of forwarding the proposal to Ministry.

4.3. Commissioning of the plant:

i) The time period for commissioning is 24 months for WTE plants and 12 months for Biomass Gasifiers from the date of "In-Principle" approval.

ii) After submission of application in the BioURJA portal, if developers intend to commission the plant before "In-Principle" approval of CFA is accorded, prior intimation of commissioning the plant to IA is mandatory. However, accord of "In-Principle" approval for grant of CFA shall be subject to fulfillment of the eligibility conditions as mentioned in these guidelines.

iii) In case of delay for reasons not attributable to the developer, a suitable extension of time over the original period of commissioning may be granted by Secretary, MNRE provided an application is made by the developer, with supporting documents, 30 days before the

original date of commissioning. If no such application is received by Implementing Agency and commissioning does not happen within the stipulated period (including the extended period), the "In-Principle" approval of CFA shall be treated as cancelled and no CFA shall be released.

4.4. Plant performance:

i) Inspection team will visit the plant for performance inspection based on request from the developer. The performance inspection of the plant will have to be carried out within 18 months from the date of commissioning beyond which "In-Principle" approval will be cancelled except in those cases where reason(s) of delay in inspection is (are) beyond the control of Developer. For such cases, an extension of suitable period over the original performance inspection period can be granted by Secretary, MNRE provided an application is made by the developer, with supporting documents, before the completion of original inspection period of 18 months as given above.

ii) The developer may choose any one of the following agencies for inspection of the plant:-

(a) Concerned State Nodal Agencies for Renewable Energy (SNAs); **or**
(b) Sardar Swaran Singh National Institute of Bio-Energy (SSS-NIBE); **or**
(c) Biogas Technology Development Centre (BTDC) (*List at **Annexure-VIII***).

iii) Performance testing of the plant would inter-alia imply the following:-

a) Waste to Energy Plants: The condition of successful commissioning of the Waste to Energy plants would imply operation of the plants for atleast 3 consecutive months, including continuous operation for at least 72 hours at an average of 80% of the rated capacity of the plant.

In case of biomethanation plants (Biogas, BioCNG, Power based on biogas), continuous operation of the plant implies continuous operation of digester (raw biogas generation) for 72 hours.

Based on the performance of the project for at least three consecutive months, following graded structure for release of CFA based on average PLF over a period of atleast three months shall be applicable: -

Average PLF achieved during minimum 3 consecutive months	**% of eligible CFA**
≥80%	100%
≥ 60% and < 80%	80%
≥ 50% and < 60%	60%
<50%	0%

b) Biomass Gasifiers: The condition of successful commissioning for Biomass gasifier would imply operation of the Gasifier for atleast 3 consecutive months, including continuous operation for at least 3 consecutive days at an average PLF of 60% of rated capacity (taking 12 Hrs per day as standard operating hours).

In case of Biomass Gasifier, data of consumption/saving of conventional fuel can also be accepted for release of CFA.

4.5. Submission of documents for release of CFA:

i) Claim for release of CFA by developer should be made in the BioURJA portal within 3 months of the inspection of the plant by Inspection Team. List of documents to be submitted is placed at **Annexure-I** (**Stage-II**).

ii) The implementing agency shall then examine the proposals for release of funds and shall forward the consolidated demand, in respect of all projects eligible for release of CFA as per scheme guidelines, to MNRE on monthly basis.

4.6. Disbursement of CFA

i) Disbursement after plant commissioning (Standard process): Applicable for all types of projects except BioCNG plants under SATAT Initiative.

a) In case of Self-financed Projects or projects wherein loan drawn by the developer of Waste to Energy plant is less than the eligible CFA, the CFA shall be disbursed to developer's bank account.

b) Bank financed: In case loan drawn by the developer of Waste to Energy plant is equal or more than from eligible CFA, CFA shall be disbursed to developer's loan account maintained in the lending FI/bank.

ii) Advance disbursement during Construction Phase: BioCNG plants which have signed BioCNG (CBG) purchase agreement with Government Oil Marketing Companies (OMCs) under SATAT Programme of Ministry of Petroleum & Natural Gas and have also availed project loan of atleast 50% of the total project cost from FI(s)/Bank(s) shall be eligible for advance disbursement of CFA during construction phase. The CFA will be released by the Ministry in two installments as below:

a) First installment of upto 50% of "In-Principle" approved CFA may be released during the construction phase to the lending FI(s)/Bank(s) subject to disbursement of at least 50% of loan amount by the FI/Bank. This may be treated as interest free loan until the release of second instalment of CFA. Documents required for availing advance disbursement of CFA during construction phase is given as below:

1) MNRE's "In-Principle" Approval letter.
2) Request letter for advance disbursement of CFA from lending Bank/FI.**#**
3) Loan disbursement letter indicating loan amount disbursed by lending bank/FI.
4) Furnishing of Bank Guarantee to the IA for an amount equal to the advance CFA for which the project is eligible. The bank guarantee should initially be valid for a period of four years from the date issue. Thereafter the project developer will have to extend the validity of the bank guarantee as required by the IA so as to cover the period permissible for successful performance testing, commissioning and release of CFA. The bank guarantee will be enchased if the project developer fails to adhere to the permissible timelines for successful commissioning & performance testing or submission of documents for release of CFA. The bank guarantee will be released along with the disbursement of CFA. **#**
5) Mandate form for payment transfer duly certified by FI/Bank for loan account.**#**
6) High resolution Photographs of the plant site showing progress of installation.
7) Consent to Establish (CTE) from State Pollution Control Board for the plant.
8) EIA clearance, if applicable.
9) Approval for storage & filling of Bio-CNG Plant from Petroleum and Explosives Safety Organization (PESO), Nagpur, if applicable.
10) Non-NPA certificate from the lending banks/FIs if loan availed.**#**

#Documents (marked with #) are also required to be submitted in original to Implementing Agency.

(b) Second instalment of balance CFA shall be released after commissioning of the plant and submission of documents as per **Annexure-I** **(Stage-II)**. Second installment will be settled as per standard process described under clause 4.3 to 4.6(i). The amount disbursed during construction phase will be adjusted during disbursement of second installment and any surplus amount in lieu of under performance of the projects that could have been disbursed to developer shall be recovered from the Bank/FI.

(iii) The service charge to implementing agencies and inspection agencies shall be released at the time of release of CFA after commissioning and performance testing of the plant.

(iv) The above disbursements of CFA to eligible projects will be done by MNRE/Implementing Agency in accordance with procedure specified for release of funds by Ministry of Finance.

5. PROJECT MONITORING MECHANISM

Developers shall share plant generation data with MNRE or any other designated agency, except in the case of Biomass Gasifiers, through installation of SCADA System/remote monitoring system.

The aforesaid programme is subject to change(s) and modification(s) as may be decided by the MNRE, Govt. of India from time to time, and subject to availability of funds. The Ministry shall in no way be liable for expenditure incurred by promoters for pre-project preparation or other activities, merely on the basis of this circular and / or related announcement by the Ministry. In case of any ambiguity on interpretation of any provisions of the programme, the decision of the Ministry shall be final and binding. It is clarified that mere submission of the proposal should not be construed as "In-Principle" approval of the project for grant of CFA.

***

ANNEXURES

Annexure-I

Stage-1

List of documents required to be uploaded on BioURJA Portal for "In-Principle" Approval**:**

1. **Forwarding letter#** from:
   (i) Developer in case of self-financed projects (*As governed by clause 4.6(i) (a)*) **or**
   (ii) Lead FI/Bank in case of debt financing/loans (*As governed by clause 4.6(i) (b)*)
   (*Format at Annexure-II*).
2. Detailed Project Report (DPR) (*As per Annexure-III*).
3. Loan sanction letter, if loan availed
4. Techno-economic Feasibility Report (*for projects based on debt/loan as governed by clause 4.6(i) (b)*).
5. Undertaking on a non–judicial stamp paper of Rs 500/- (*As per Annexure-IV*).**#**
6. Latest High Resolution Photographs of the proposed plant site (with timestamp)

Stage-2

List of documents required to be uploaded on BioURJA Portal for claiming release of CFA:

1. Commissioning Certificate issued by DISCOM for Grid Power projects, OMCs/ Inspection Agency for remaining projects. (*As per Annexure-V*)
2. Plant Inspection report. (*Format at Annexure-VI*)
3. Performance Inspection Report with 72 hours and 3 months Performance data (*Format at Annexure-VII*)
4. Mandate form for payment transfer duly certified by FI for loan account.**#**
5. Photographs of the plant with high resolution.
6. Consent to Operate (CTO) from State Pollution Control Board for the plant.
7. EIA clearance, if applicable.
8. Approval for storage & filling of Bio-CNG Plant from Petroleum and Explosives Safety Organization (PESO), Nagpur, if applicable.
9. Non-NPA certificate from the lending banks/FIs if loan availed.
10. Loan disbursement letter, if availed
11. Access details of SCADA system/remote monitoring system

Note: For *Biomass Gasifier projects, document at sr. no. 1,2,3,4,5,10 only are required.*

#Documents (marked with #) are required to be submitted in original to Implementing Agency. However, developers are required to produce original of other documents as and when required by IA.

Annexure II

FORMAT FOR FORWARDING LETTER BY LEAD BANK/FI

F.No. <letter no.>
Date <date>

To,

Subject: Application of M/s <*developer name*> for availing Central Financial Assistance (CFA) for setting up of < *project details***> at <*location*> under <*Programme name*>-reg**

We are forwarding the application and proposal of M/s <*developer name*> for Central Financial Assistance (CFA) for setting up of <*project details*> at <*location*> under <*Programme name*>. The project is financed by us.

1. We endorse and authenticate the financial parameters incorporated in the proposal and consider the project to be **technically feasible and economically viable**. We also confirm that the aforementioned project is under-installation as on date and not commissioned yet. We do hereby recommend this project for "In-Principle" approval and release of eligible CFA as per Programme guidelines.

2. In view of the request by the applicant, please find enclosed the following documents for consideration of their application for the CFA:

<List of Documents submitted wrt Programme guidelines>

Thanking you.

<Name>
<Sign and stamp>

CC:
<developer name>

Annexure III

INDICATIVE FORMAT FOR DPR

S.No.	Description
(A) TECHNICAL & COMMERCIAL	
1.	Introduction
2.	Project at a Glance and Executive Summary
3.	Justification of the project capacity (Analyse potential and characteristics of various suitable feedstock)
4.	Availability of Feed Materials, its types & procurement procedure
5.	Technology description- • Description of main Plant Equipment, Auxiliary Equipment and systems with technical specifications • Description of Plant Electrical System • Plant Instrumentation and Control system
6.	Schematics and Drawings
7.	Project implementation – Execution and management plan Engineering Procurement and Construction plan
8.	Plant layout, land area requirement & existing infrastructure facilities
9.	Operation & Maintenance set up
10.	Manpower requirement
11.	Environment impact/protection management (Government regulation and clearance required), if applicable
12.	Socio-economic impact in the region due to project implementation
13.	Project cost estimate (site development, civil works, plant machinery, roads & building, water supply & public health, electrical works, fire protection system, office equipment, furniture & automation etc.)
14.	Cost of generation, financial analysis and Techno economic feasibility
15.	Risk and sensitivity analysis

Annexure IV

FORMAT FOR UNDERTAKING

We M/s <developer> do hereby solemnly declare and affirm as under:

1. That proposed project for generation of <details> using <waste> is situated at <address>. The proposed plant will have configuration of all required standard equipment and components as per Programme guidelines.
2. We certify that all machinery/equipment/plant for which CFA is being applied are new. CFA for the new equipment/machinery/plant under reference has not been taken earlier from any programme/scheme of the Government of India nor will it be taken from any programme or scheme of any other Ministry/Department of Government of India in future. In case of violation of this clause the Implementing Agency/MNRE will be entitled to recover the CFA released for <project> by MNRE with interest from us.
3. We will operate the above mentioned <project> for minimum 10 years after its commissioning and shall not dislocate the same without prior permission of the Ministry.
4. We will share generation data with MNRE or any other designated agency through installation of SCADA System/remote monitoring system.
5. We will take all necessary statutory clearances for the proposed plant from appropriate Central Govt./State Govt/Statutory bodies/institutions/agencies authorized to grant such clearances before establishing or commissioning of the plant as applicable for the particular stage of the project.
6. The Implementing Agency/MNRE shall have the right to get all the project related data to publish success stories/case studies/technical papers and for inspection and evaluation on the operation and performance aspects of the plants.
7. Above content of this affidavit are true and correct to the best of my knowledge and acceptable to the undersigned.

Authorized Signatory (Sign & stamp)
Name:_____
Designation: _____

Date: <_____> **Place: <_____>**

Annexure V

FORMAT OF COMMISSIONING CERTIFICATE

MNRE "In-Principle" approval no. and date:	
Project name:	
Details of Plants commissioned:	
Project commissioned by :	
Commissioning Date:	
Commissioning witnessed by: (Attach Photographs of the plant's commissioning)	

This is to certify that the commissioning of the plant with installed capacity of <installed capacity & output> has been successfully carried out on <Date> by < Developer's Name > under supervision of <Inspection agency> as per specification, drawings with acceptable quality. Process and MNRE's "In-Principle" approval/guideline.

Developer's Name:	**Commissioning Authority:**
Company name: contact name: title: contact information: Signature & Stamp: Date:	Agency name: contact name: title: contact information: Signature & Stamp: Date:

Annexure VI

FORMAT FOR INSPECTION REPORT BY INSPECTION AGENCY

MNRE "In-Principle" approval No. _____
Capacity of the project as per "In-Principle" approval: ……..
Installed capacity of the Project: ……..
Name of the Inspecting Agency:

General Information

1.	Name and Address of the beneficiary	
2.	Date of commissioning	
3.	Size of the plant/Model	
4.	Capacity of the plant	
5.	Total Cost of the project	
6.	CFA as per MNRE "In-Principle" approval	

Inspection Details:

1. Visiting Date :-
2. Visiting Official:-
3. Biogas Generated/ day:-
4. Bio-CNG Generated/ Power Generation per day:-
5. Biogas/Bio-CNG/Power Generation Data:
   a. 72 Hours operation indicating date and time
   b. 3 Months Operation Report with date:-
6. Rated Capacity ---- % observed during the inspection
7. Use of Biogas/Bio-CNG/Power produced in the Plant:-

This is to certify that the above information given by me on behalf of my firm/ company is correct in all respects and no factual information has been suppressed.

(**Signature of the Applicant)**
With Stamp

(**Signature of the Verifying Officer from Inspection Agency)**
With Stamp

ANNEXURE – VII

FORMAT FOR PLANT PERFORMANCE REPORT

MNRE "In-Principle" approval No. _____
Capacity of the project as per "In-Principle" approval: ……..
Installed capacity of the Project: ……..
Name of the Inspection Agency:
Name & Address of the beneficiary organization & Project Site:

S. No.	**Date (dd/mm/yyyy)**	**Plant operating hours**	**Daily feedstock feeding**	**Actual Raw biogas Generation recorded from Energy meter**	**Actual BioCNG/ electricity units produced Per day recorded from Energy meter reading**	**Rated Biogas/ BioCNG/ Power generation capacity**	**PLF (%)**
					A	*B*	**(A/B)*100**
		Hrs	Tons/ day	(Cubic Metre/ Day)	kg/Day or kWh as applicable	kg/Day or kWh as applicable	

1. Signature of the Beneficiary

2. Name/Signature/Stamp of the authorized Officer of Inspection Agency

Date:

Place:

ANNEXURE – VIII

LIST OF BIOGAS DEVELOPEMNT & TRAINING CENTER (BDTCS)

1. Head, BDTC, Department of Mechanical Engineering, Indian Institute of Technology, Guwahati-781039, Assam. Email: lopab@iitg.ac.in

2. Head, BDTC, Centre for Rural Development & Technology (CRDT), Indian Institute of Technology, Delhi-110016. Email: vkvijay@rdat.iitd.ernet.in; ram.chandra6dec@gmail.com

3. Head, BDTC, Department of Civil Engineering, Punjab Agricultural University (PAU), Ludhiana- 141004, Punjab. Email: sssooch@rediffmail.com

4. Head, Coordinator, BDTC, Deptt. Of Renewable Energy Engineering, College of Technology & Engineering (CTAE), Maharana Pratap University of Agriculture and Technology (MPUAT), Udaipur- 313001. Email: nlpanwar@rediffmail.com

5. Head, BDTC, Centre of Energy Studies and Research (CESR), Devi Ahilya Vishwavidyalaya (DAVV), Indore-452017, Madhya Pradesh Email: cesrdirector@gmail.com

6. Head, BDTC, School of Biotechnology, Kalinga Institute of Industrial Technology (KIIT) University, Campus-XI, Bhubaneswar-751024. Email: smishra@kiitbiotech.ac.in,

7. Head, BDTC, Department of Agricultural Engineering, University of Agricultural Sciences (UAS), Gandhi Krishi Vignana Kendra (GKVK), Bangalore- 560065, Email: hod.agengg.uasb@gmail.com; vkgouda@gmail.com

8. Head, BDTC, Department of Bio Energy, Agricultural Engineering College & Research Institute, Tamil Nadu Agricultural University (TNAU), Coimbatore-641003, Tamil Nadu. Email: bioenergy@tnau.ac.in ,

DEFINITIONS

1. **Biodegradable waste** means any organic material that can be degraded by micro-organisms into simpler stable compounds;
2. **Biomethanation/ Anaerobic digestion** means a process which entails enzymatic decomposition of the organic matter/ biodegradable waste by microbial action to produce methane rich biogas;
3. **Biogas** means a gas produced through Biomethanation/ Anaerobic digestion of organic matter like fruit & vegetable waste, cattle dung, press mud, crop residues etc.;
4. **BioCNG/Enriched Biogas/CBG** to be produced shall meet the specifications of BIS IS 16087: 2016 or any other further revisions in the said specifications;
5. **Biogas based power project**–The project that produces electricity from biogas using 100% biogas fired engine or through firing in boiler or any other technology;
6. **Biomass** resources are the biodegradable and non-edible fraction of products, wastes and residues from agriculture, forestry and related industries as well as the biodegradable fraction of industrial and municipal wastes.
7. **Biomass Gasifier for Thermal Application**–The project that produces producer gas/sysgas from biomass/biowaste through gasification process using Gasifier system for utilizing the produced gas for thermal applications;
8. **Biomass Gasifier for Electrical Application**–The project that produces electricity from producer gas/sysgas using 100% producer gas engine or dual fuel engine;
9. BioURJA Portal (www.Biourja.mnre.gov.in)
10. **'Expansion project'** shall include any addition of new capacity to the existing operating plant;
11. **Gasification**: the process of incomplete combustion of biomass/biowaste resulting in production of combustible gases consisting of a mixture of carbon monoxide (CO), hydrogen (H2) and traces of methane (CH4) which is called producer gas/syn gas;
12. **Incineration**: means an process involving burning or combustion of solid waste to thermally degrade waste materials at high temperatures;
13. **'Installed capacity**' or 'IC' means the name plate capacity of the generating unit.
14. **Municipal solid waste based power projects**–The project that generates electricity using municipal solid waste as fuel based on Rankine cycle technology or any approved technology.
15. **'Municipal solid waste'** means and includes solid or semi-solid domestic waste, sanitary waste, commercial waste, institutional waste, catering and market waste and other non-residential wastes, street sweepings, silt removed or collected from the surface drains, horticulture waste, agriculture and dairy waste, treated bio-medical waste excluding industrial waste, bio-medical waste and e-waste, battery waste, radio-active waste generated in the area under the local authorities and other entities mentioned in rule 2 of MSW 2016.
16. **'Plant Load Factor'** or '(PLF)' is ratio of average electricity/energy generated by the plant to the maximum electricity/energy that could have been generated in a given time.

17. Project Commissioning: Project is termed as commissioned when installation of equipment and machineries to achieve the as per rated project capacity is completed and plant starts generating the desired output.

18. Project Cost includes cost of all plant machinery, equipment, building and other structures excluding land cost.

19. Pyrolysis is the heating of an organic material, such as biomass/biowaste, in the absence of oxygen.

20. State Nodal Agency (SNA), for the purpose of this programme, is an agency in a State as may be designated by MNRE for carrying out inspection of the waste to energy plant;

21. "Waste" for the purpose of this guideline is biowaste such as fruit & vegetable waste, cattle dung, agricultural and forestry waste/residue (e.g., straws and stalks) or by-products of processing operations of agricultural produce (e.g., husks, shells, deoiled cakes, etc);.

22. Waste to Energy: project means a facility that processes wastes to produce biogas, bioCNG or electricity.

23. Waste to Energy Project Developer (Developer) means any Company, Consortium of Companies or a Joint Venture (JV)/ Special Purpose Vehicle (SPV) interested in seeking the CFA under the programme. The company or a partner of the Consortium, JV/ SPV interested in availing the benefits of the programme can be Local Bodies / Municipal Corporations, Govt. or Private Sector Companies/ firms, Central Public Sector Undertaking (CPSU), Joint Sector Companies, Trusts, NGO, Societies, Cooperatives, Entrepreneurs, Partnership firms, Limited Liability Partnerships, Energy Service Companies (ESCOs).

Annexure - B3

रजिस्ट्री सं० डी० एल०-33004/99 REGD. NO. D. L.-33004/99

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पेट्रोलियम और प्राकृतिक गैस मंत्रालय

अधिसूचना

नई दिल्ली, 4 जून, 2018

मिसिल सं.-पी-13032(16)/18/2017-सीसी.—दिनांक 4 अगस्त, 2017 की सां. आ. सं.2492 (ई) द्वारा भारत के राजपत्र में प्रकाशित भारत सरकार (कारोबार का आबंटन) तीन सौ पैंतीसवें संशोधन नियम, 2017 के तहत प्रदत्त शक्तियों का प्रयोग करते हुए केन्द्र सरकार वर्ष 2009 में नवीन और नवीकरणीय ऊर्जा मंत्रालय के जरिए लागू की गई राष्ट्रीय जैव ईंधन नीति के अधिक्रमण में एक संशोधित जैव ईंधन नीति एतद्वारा बनाती है, नामत:-

1. (1) इस नीति को राष्ट्रीय जैव ईंधन नीति-2018 कहा जाएगा।
   (2) यह नीति मंत्रिमंडल द्वारा अनुमोदन की तारीख अर्थात 16.5.2018 से प्रभावी होगी।

2. इस नीति का पाठ संलग्न है।

राष्ट्रीय जैव ईंधन नीति-2018

1.0 प्रस्तावना

संख्या पी-13032)16)18/2017-सीसी -- 1.1 भारत दुनिया की सबसे तेजी से बढ़ती अर्थव्यवस्थाओं में से एक है और आगामी कुछ दशकों तक जनसांख्यिकीय लाभ भी इसे मिलता रहेगा। विकास का उद्देश्य समावेश पर केंद्रित है, समावेश अर्थात राष्ट्रीय विकास, प्रौद्योगिकी उन्नयन एवं क्षमता निर्माण, आर्थिक विकास, इक्विटी और मानव कल्याण का साझा विजन। नागरिकों के जीवन स्तर के स्तर को बढ़ाने के लिए ऊर्जा एक महत्वपूर्ण इनपुट है। देश की ऊर्जा नीति का उद्देश्य ऊर्जा क्षेत्र में सरकार की हालिया महत्वाकांक्षी घोषणाओं को पूरा करना है, जैसे 2019 तक सभी सेन्सस (जनगणना) गांवों का विद्युतीकरण, 2022 तक 24x7 बिजली और 175 जीडब्ल्यू की नवीकरणीय ऊर्जा क्षमता, 2030 तक 33% -35% तक ऊर्जा

उत्सर्जन की तीव्रता में कमी और वर्ष 2030 तक बिजली मिश्रण में गैर-जीवाश्म ईंधन आधारित क्षमता की 40% से अधिक साझेदारी का उद्देश्य है। भले ही आने वाले दशक में तेल, गैस, कोयला, नवीकरणीय संसाधनों, परमाणु और हाइड्रो ऊर्जा के योगदान में संभावित विस्तार हो, ऊर्जा भंडार में जीवाश्म ईंधन की एक ख़ासी हिस्सेदारी जारी रहेगी। हालांकि, परंपरागत या जीवाश्म ईंधन संसाधन सीमित, गैर- नवीकरणीय और प्रदूषणकारी हैं, इसलिए इनका समझदारी से उपयोग किए जाने की आवश्यकता है । जबकि दूसरी ओर, नवीकरणीय ऊर्जा संसाधन स्वदेशी, गैर प्रदूषणकारी और वास्तव में अक्षय हैं। भारत प्रचुर नवीकरणीय ऊर्जा संसाधनों से संपन्न है। इसलिए, हर संभव तरीके से इनका उपयोग प्रोत्साहित किया जाना चाहिए। राष्ट्रीय जैव ईंधन नीति – 2018, जैव ईंधन पर पहले की राष्ट्रीय नीति की उपलब्धियों पर आधारित है और नवीकरणीय क्षेत्र में उभरती हुई विकास की पुन: परिभाषित भूमिका के अनुरूप नए एजेंडे का निर्माण करती है।

1.2 विश्व बाजार में कच्चे तेल की कीमत में उतार-चढ़ाव होता रहा है। इस तरह के उतार-चढ़ाव दुनिया भर की विभिन्न अर्थव्यवस्थाओं में, विशेष रूप से, विकासशील देशों पर दबाव डाल रहे हैं। सड़क परिवहन क्षेत्र भारत के सकल घरेलू उत्पाद (जीडीपी) का 6.7% है। वर्तमान में, परिवहन ईंधन की 72% अनुमानित मांग केवल डीजल और इसके बाद पेट्रोल 23% मांग और शेष अन्य ईंधन जैसे सीएनजी, एलपीजी इत्यादि पूरी करते हैं जिसकी मांग लगातार बढ़ रही है। अस्थायी अनुमानों ने संकेत दिया है कि वित्त वर्ष 2017-18 में पेट्रोलियम उत्पादों के स्वदेशी उपभोग के लिए 210 एमएमटी कच्चा तेल आवश्यक है। घरेलू कच्चे तेल का उत्पादन केवल 17.9% मांग को पूरा करने में सक्षम है, जबकि शेष आयातित कच्चे तेल से पूरा होता है। जब तक स्वदेशी तौर पर उत्पादित नवीकरणीय फीडस्टॉक के आधार पर पेट्रो आधारित ईंधन का विकल्प/पूरक वैकल्पिक ईंधन का विकास नहीं होता तब तक भारत की ऊर्जा सुरक्षा कमजोर रहेगी। इन चिंताओं को दूर करने के लिए, सरकार ने 2022 तक आयात निर्भरता को 10 प्रतिशत तक कम करने का लक्ष्य रखा है।"

1.3 सरकार ने पांच आयामी नीति अपनाकर, जिसमें घरेलू उत्पादन बढ़ाना, जैव ईंधन और नवीकरण, ऊर्जा दक्षता मानदंड अपनाना, रिफाइनरी प्रक्रियाओं में सुधार और मांग प्रतिस्थापन शामिल करके तेल और गैस क्षेत्र में आयात निर्भरता को कम करने के लिए एक रोड मैप तैयार किया है। इसमें भारतीय ऊर्जा बास्केट में जैव ईंधन के लिए एक रणनीतिक भूमिका की परिकल्पना की गई है।

1.4 जैव ईंधन नवीकरणीय बायोमास संसाधनों और अपशिष्ट पदार्थों जैसे प्लास्टिक, नगरपालिका ठोस अपशिष्ट (एमएसडब्लू), अपशिष्ट गैसों आदि से प्राप्त किया जाता है और इसलिए पारंपरिक ऊर्जा संसाधनों की आपूर्ति द्वारा पर्यावरण के अनुकूल संपोषणीय तरीके से, आयातित जीवाश्म ईंधन पर निर्भरता कम करने और भारत की शहरी और विशाल ग्रामीण आबादी की ऊर्जा आवश्यकताओं को पूरा करने के लिए उच्च स्तर की राष्ट्रीय ऊर्जा सुरक्षा प्रदान करने की आवश्यकता है।

1.5 ऊर्जा सुरक्षा और पर्यावरण संबंधी मुददों के कारण वैश्विक स्तर पर जैव ईंधन को महत्वपूर्ण माना गया है। जैव ईंधन के उपयोग को प्रोत्साहित करने के लिए कई देशों ने अपनी घरेलू आवश्यकताओं को पूरा करने हेतु विभिन्न कार्यप्रणालियों, प्रोत्साहन और सब्सिडी के माध्यम को अपनाया है। ग्रामीण विकास और रोजगार सृजन के लिए एक प्रभावी उपकरण के रूप में, एक प्रथम उपाय के रूप में भारत में जैव ईंधन में स्वदेशी फीडस्टॉक के उत्पादन को बढ़ावा देना होगा।

1.6 पिछले दशक में, सरकार ने एथेनॉल मिश्रित पेट्रोल कार्यक्रम, राष्ट्रीय बायो डीजल मिशन, बायोडीजल अपमिश्रण कार्यक्रम जैसे सुव्यवस्थित कार्यक्रमों के माध्यम से देश में जैव ईंधन को बढ़ावा देने के लिए कई प्रयास किए हैं। पिछले अनुभवों और मांग आपूर्ति की स्थिति के आधार पर, सरकार ने मूल्य निर्धारण, प्रोत्साहन, इथेनॉल उत्पादन के लिए वैकल्पिक मार्ग खोलकर, थोक और खुदरा ग्राहकों को बायोडीजल की बिक्री, अनुसंधान एवं विकास आदि पर ध्यान केंद्रित करके इन कार्यक्रमों में सुधार किया है। इन उपायों से देश में जैव ईंधन कार्यक्रम में सकारात्मक प्रभाव पड़ा है।

1.7 भारत में जैव ईंधन का कार्यनीतिक महत्व है, क्योंकि इससे सरकार द्वारा चलाए जा रहे मेक इन इंडिया और स्वच्छ भारत अभियान जैसे प्रयासों में अच्छे परिणाम प्राप्त हो रहे हैं और यह किसानों की आय को दुगुना करने, आयात में कमी करने, रोजगार सृजन करने, अपशिष्ट से सम्पदा का निर्माण करने के महत्वाकांक्षी लक्ष्यों के साथ एकीकृत करने के लिए शानदार अवसर प्रदान करता है। इसके साथ ही, देश की मौजूदा जैव विविधता को स्थानीय आबादी के लिए सम्पदा सृजन

करने के लिए सुदूर इलाकों का उपयोग करके और स्थायी विकास के लिए योगदान करके इसका अधिकतम उपयोग किया जा सकता है।

1.8 विश्व स्तर पर, जैव ईंधन ने पिछले दशक में ध्यान आकर्षित किया है और जैव ईंधन के क्षेत्र में हुए विकास की गति के साथ तालमेल बनाए रखना जरूरी है। अंतरराष्ट्रीय परिप्रेक्ष्य और राष्ट्रीय परिदृश्य के संदर्भ में इस नीति का उद्देश्य जैव ईंधन के उत्पादन के लिए स्वदेशी फीडस्टॉक्स के प्रयोग से नए सिरे से ध्यान देना है। यह नीति नई फीडस्टॉक्स पर आधारित अगली पीढ़ी के जैवईंधन की रूपांतरण तकनीक के विकास और देश की जैव विविधता का उपयोग करके घरेलू स्तर पर उपलब्ध फीडस्टॉक को बढ़ावा देने पर भी निर्भर है। भारत में जैव ईंधन के विकास के लिए दृष्टि, लक्ष्य, रणनीति और अवधारणा का निर्धारण तकनीकी रूपरेखा, वित्तीय, संस्थागत हस्तक्षेप और सक्षम तंत्र के माध्यम से किया गया है।

2.0 विजन और लक्ष्य

2.1 इस नीति का उद्देश्य आने वाले दशक के दौरान देश के ऊर्जा और परिवहन क्षेत्रों में जैव ईंधन के उपयोग को बढावा देना है। नीति का उद्देश्य घरेलू फीडस्टॉक को बढ़ावा देना और जैव ईंधन के उत्पादन के लिए इसकी उपयोगिता के साथ-साथ एक स्थायी तरीके से नए रोजगार के अवसर पैदा करने के अलावा राष्ट्रीय ऊर्जा सुरक्षा, जलवायु परिवर्तन के अल्पीकरण में योगदान करते हुए जीवाश्म ईंधन का तेजी से विकल्प बनाना है। साथ ही, यह नीति जैव ईंधन बनाने के लिए अग्रिम तकनीकों के आवेदन को प्रोत्साहित करेगी।

2.2 पॉलिसी का लक्ष्य बाजार में जैव ईंधन की उपलब्धता को सुगम बनाना है जिससे उसके मिश्रण प्रतिशत में वृद्धि होगी। वर्तमान में पेट्रोल में इथेनॉल का सम्मिश्रण प्रतिशत लगभग 2.0% है और डीजल में बायोडीजल मिश्रण प्रतिशत 0.1% से कम है। 2030 तक पेट्रोल में इथेनॉल के 20% मिश्रण और डीजल में बायोडीजेल का 5% मिश्रण का प्रस्ताव है। यह लक्ष्य निम्नलिखित के माध्यम से हासिल किए जाएंगे:

क) घरेलू उत्पादन में वृद्धि के द्वारा की जा रही इथेनॉल / बायोडीजल आपूर्ति को बढ़ाना

ख) द्वितीय पीढ़ी (2 जी) बायो रिफाइनरीज की स्थापना

सी) जैव ईंधन के लिए नए फीडस्टॉक का विकास

घ) जैव ईंधन में परिवर्तित करने वाली नई प्रौद्योगिकियों का विकास

ई) जैव ईंधन के लिए उपयुक्त वातावरण बनाना और मुख्य ईंधन इसे एकीकृत करना

3.0 परिभाषाएं और कार्यक्षेत्र

3.1 इस नीति के उद्देश्य के लिए जैव ईंधन की निम्नलिखित परिभाषाएं लागू होंगी:

i 'जैव ईंधन' नवीकरणीय संसाधनों से उत्पादित ईंधन हैं और परिवहन, स्टेशनरी, पोर्टेबल और अन्य अनुप्रयोगों के लिए डीजल, पेट्रोल या अन्य जीवाश्म ईंधन के स्थान पर अथवा उसके साथ मिश्रण में इसका प्रयोग किया जाता है;

ii नवीकरणीय संसाधन कृषि, वानिकी, वृक्ष आधारित तेल, अन्य गैर-खाद्य तेलों और संबंधित उद्योगों के साथ-साथ औद्योगिक और नगरपालिका अपशिष्टों के बायोडिग्रेडेबल अंशों के उत्पादों, अपशिष्टों और अवशेषों के बायोडिग्रेडेबल अंश हैं।

3.2 नीति के अंतर्गत "जैव ईंधन" के रूप में ईंधन की निम्नलिखित श्रेणियां शामिल है जिसे परिवहन ईंधन के रूप में या स्टेशनरी अनुप्रयोगों में इस्तेमाल किया जा सकता है: -

i. 'बायोएथेनॉल': बायोमास से उत्पन्न इथेनॉल जैसे कि चीनी युक्त सामग्री, जैसे गन्ना, चुकंदर, मीठे चारा आदि; स्टार्च युक्त मकई, कसावा, पके आलू, शैवाल आदि; और, सेल्यूलोजिक सामग्रियों जैसे कि बगैस, लकड़ी का कचरा, कृषि और वन अवशेष या औद्योगिक अपशिष्ट जैसे अन्य नवीकरणीय संसाधन;

ii. 'बायोडीजल': गैर-खाद्य वनस्पति तेलों, एसिड तेल, खाना पकाने के तेल या पशु वसा और जैव-तेल से बने फैटी एसिड के मिथाइल या एथिल एस्टर;

iii. 'उन्नत जैव ईंधन': (1) लिगोनोक्लुलोजिक फीडस्टॉक्स (जैसे कृषि और वनों के अवशेष, जैसे चावल और गेहूं के भूसे / मकई सीओएस और स्टेवर / बैगेस, वुडी बायोमास), गैर-खाद्य फसलों (यानी घास, शैवाल) से उत्पन्न ईंधन या औद्योगिक कचरे और अवशेष प्रवाह, (2) कम सीओ$_2$ उत्सर्जन या उच्च जीएचजी में कमी और भूमि उपयोग के लिए खाद्य फसलों के साथ प्रतिस्पर्धा नहीं करते। द्वितीय पीढ़ी (2 जी) एथेनॉल, ड्रॉप-इन ईंधन, शैवाल आधारित 3 जी जैव ईंधन, जैव-सीएनजी, जैव-मेथनॉल, जैव-मेथनॉल से उत्सृजित दि मिथाइल ईथर (डीएमई) जैव-हाइड्रोजन, एमएसडब्ल्यू के साथ ईंधन में गिरावट जैसे ईंधन स्रोत/ फीडस्टॉक सामग्री "उन्नत जैव ईंधन" के रूप में मान्य होंगे।

iv. 'ड्रॉप-इन ईंधन': बायोमास, कृषि अपशिष्टों, निगम ठोस अपशिष्ट (एमएसडब्लू), प्लास्टिक अपशिष्ट, औद्योगिक अपशिष्ट आदि से उत्पादित तरल ईंधन, जो कि एमएस, एचएसडी और जेट ईंधन के लिए भारतीय मानकों पर खरा उतरता है और जो यथावत या मिश्रित रूप में बाद में, इंजन सिस्टम में किसी भी संशोधन के बिना वाहनों में उपयोग किया जाता है और वर्तमान पेट्रोलियम वितरण प्रणाली का उपयोग कर सकता हैं।

v. 'जैव-सीएनजी': जैव-गैस का शुद्ध रूप जिसकी संरचना और ऊर्जा क्षमता जीवाश्म आधारित प्राकृतिक गैस के समान है और इसे कृषि अवशेषों, पशुओं के गोबर, खाद्य अपशिष्ट, एमएसडब्लू और सीवेज पानी से उत्पन्न किया जाता है।

4.0 रणनीति और दृष्टिकोण

4.1 सरकार जैव ईंधन के उपयोग को बढ़ावा देने एवं प्रोत्साहन हेतु बहु-आयामी दृष्टिकोण को इस प्रकार अपना रही है:

- एथेनॉल मिश्रित पेट्रोल (ईबीपी) प्रोग्राम के माध्यम से कई फीडस्टॉक्स से प्राप्त एथेनॉल का उपयोग करके पेट्रोलियम में एथेनॉल का सम्मिश्रण ।
- सेकंड जनरेशन (2जी) एथेनॉल प्रौद्योगिकियों का विकास और इसका व्यावसायीकरण।
- स्टेशनरी, कम आरपीएम इंजनों में सीधे वनस्पति तेल के इस्तेमाल सहित कई फीडस्टॉक की खोज करके बायोडीजल ब्लेंडिंग कार्यक्रम के माध्यम से डीजल में बायोडीजल को सम्मिश्रित करना ।
- एमएसडब्लू, औद्योगिक अपशिष्ट, बायोमास आदि से बने ड्रॉप-इन ईंधन पर विशेष ध्यान।
- जैव-सीएनजी, जैव-मेथनॉल, डीएमई, जैव-हाइड्रोजन, जैव-जेट इंधन आदि सहित उन्नत जैव ईंधनों पर विशेष ध्यान ।

4.2 इस नीति का मुख्य बल स्वदेशी फीडस्टॉक से जैव ईंधन की उपलब्धता सुनिश्चित करना है। इस दिशा में कदम बढ़ाते हुए, देश भर में बायोमास के मूल्यांकन के लिए राष्ट्रीय बायोमास भंडार तैयार किया जाएगा।

4.3 जैव ईंधन की मांग और आपूर्ति के दरम्यान पुनः संतुलन बनाने के प्रयास तहत, सरकार का उद्देश्य जैव ईंधन के घरेलू उत्पादन, भंडारण और वितरण के संबंध में जब भी आवश्यकता पड़े सभी हितधारकों को शामिल करते हुए परामर्शी अवधारणा अपनाकर जरूरी अंतर- हस्तक्षेप करना है।

4.4 इस कार्यनीति के अंतर्गत समय-समय पर ऐसे उपयुक्त वित्तीय एवं राजकोषीय उपाय किए जाएंगे जिससे जैव ईंधन के विकास और संवर्धन को समर्थन मिले ताकि विभिन्न क्षेत्रों में इनका उपयोग बढ़े।

4.5 विभिन्न अंतिम-उपयोग अनुप्रयोगों के लिए फीडस्टॉक उत्पादन और जैव ईंधन प्रसंस्करण के सभी पहलुओं तक पहुँच के लिए अनुसंधान, विकास और प्रतिपादन का समर्थन किया जाएगा। उन्नत जैव ईंधन और अन्य नए फीडस्टॉक के विकास के लिए जोर दिया जाएगा।

5.0 अंतर- हस्तक्षेप एवं समुचित प्रक्रियाएँ

क. फीडस्टॉक की उपलब्धता एवं इसका विकास

5.1 भारत में, बायोएथेनॉल कई स्रोतों से उत्पन्न किया जा सकता है जैसे कि शर्करा युक्त सामग्री, स्टार्च युक्त सामग्री, सेल्यूलोज और पेट्रोरसायनिक मार्ग सहित लिगोनोसेलुलोज सामग्री। लेकिन, इथनॉल मिश्रित पेट्रोलियम (ईबीपी) कार्यक्रम की मौजूदा नीति गैर-खाद्य फीडस्टॉक जैसे शीरा, सेलूलोज़ और पेट्रोकेमिकल रूट सहित लिगोनोलेल्ज सामग्री से बायोएथेनॉल की खरीद की अनुमति देती है । इसी तरह, किसी भी खाद्य / गैर खाद्य तेल से बायोडीजल का उत्पादन किया जा सकता है। हालांकि, सम्मिश्रण कार्यक्रम के लिए उपयोग क्ये जाने वाला बायोडीजल वर्तमान में आयातित स्रोतों जैसे पाम स्टीयरिन से निर्मित किया जा रहा है।

5.2 देश में जैव ईंधन के उत्पादन के लिए संभावित घरेलू कच्चे माल के रूप निम्न पदार्थ उपलब्ध हैं,

एथेनॉल उत्पादन के लिए :	बी-शीरा, गन्ने का रस, घास के रूप में बायोमास, कृषि अवशेष (चावल का पुआल, कपास की डंठल, मकई के कोष, लकड़ी का बुरादा, खोई इत्यादि), शक्कर युक्त सामग्री, जैसे चुकंदर, चारा इत्यादि और स्टार्च युक्त सामग्री जैसे मकई, कसावा, सड़ा हुआ आलू आदि, अनाज जैसे गेहूं, चावल इत्यादि के खराब दाने जो कि खाने योग्य नहीं हों, आधिक्य के समय अनाज के कण । शैवाल युक्त फीडस्टॉक और समुद्री शैवाल की खेती भी एथेनॉल उत्पादन के लिए एक संभावित फीडस्टॉक हो सकती है।
बायोडीजल उत्पादन के लिए:	अखाद्य तिलहन, इस्तेमाल किया हुआ खाना पकाने का तेल (UCO), पशुओं की चर्बी, एसिड आयल, शैवाल फीडस्टॉक इत्यादि।
उन्नत जैव ईंधन के लिए :	बायोमास, एमएसडब्लू, औद्योगिक अपशिष्ट, प्लास्टिक अपशिष्ट आदि ।

5.3 ईबीपी कार्यक्रम के तहत एथेनॉल की खरीद के लिए कच्चे माल का दायरा बढ़ाया जाएगा। इस नीति में बी-शीरे और सीधे गन्ने के रस से एथेनॉल के उत्पादन की अनुमति होगी। इस नीति में मानव उपभोग हेतु अयोग्य खराब खाद्यानो जैसे गेहूं, टूटे चावल आदि से एथेनॉल का उत्पादन करने की भी अनुमति होगी। एक कृषि फसल वर्ष के दौरान जब कृषि और किसान कल्याण मंत्रालय द्वारा यह अनुमान लगाया जाए कि खाद्यान्न की पैदावार आपूर्ति से काफी अधिक होगी तो इस नीति के तहत प्रस्तावित राष्ट्रीय जैव ईंधन समन्वय समिति के अनुमोदन के आधार पर, इस अतिरिक्त खाद्यान्न की मात्रा को एथेनॉल में परिवर्तित करने की अनुमति होगी। एथेनॉल उत्पादन के लिए इस मार्ग के खुलने से न केवल खाद्यान्न आधारित डिस्टिलरीज की स्थापित क्षमता का उपयोग करने में मदद मिलेगी, अपितु न्यूनतम निवेश के साथ पूरी तरह से विकसित 1जी तकनीक का इस्तेमाल करके इसमें उन सभी कच्चे सामग्रियों को भी शामिल किया जा सकेगा, जिनसे एथेनॉल का उत्पादन किया जा सकता है।

5.4 औद्योगिक स्थापना को बढ़ावा देने के लिए अतिरिक्त उपलब्ध बायोमास वाले स्थानों की पहचान और ऊर्जा घास और बेकार जमीन पर छोटी अवधि की फसलों का उपयोग जैसे फीडस्टॉक का उत्पादन इस दिशा में निर्णायक होगा। देश में अधिशेष बायोमास वाले स्थानों की पहचान करने पर विशेष बल दिया जाएगा।

5.5 जैव ईंधन उत्पादन के लिए स्वदेशी फीडस्टॉक की आपूर्ति बढ़ाने में ग्राम पंचायत और समुदाय महत्वपूर्ण भूमिका निभाएंगे। फ़ीडस्टॉक पीढ़ी के लिए बंजर भूमि के उपयोग से संबंधित मामलों में, ग्राम पंचायत/तालुकों के स्थानीय समुदायों को पौधों के लिए गैर-खाद्य तिलहन/फसलों जैसे पोंगामिया पिन्नता (करंज), मेलिया अजादिरचट्टा (नीम), एरंड, जाट्रोपा केरकस, कॉलोफिलम इनोफिलम, सिमरोबा ग्लॉका, हिबिस्कस कैनबिनस आदि के पौधारोपण के लिए प्रेरित किया जा सकता है। पूरे देश में बायोएथेनॉल के उत्पादन के लिए अतिरिक्त फीडस्टॉक बनाने के लिए लघु रोटेशन फसल जैसे कि मीठे ज्वार और ऊर्जा घास जैसे मिसकेनथुस जाईगंटम, स्विचग्रास (पैनिकम विग्राटम), विशालकाय रीड (अरुंडो डोनाक्स) इत्यादि को बंजर भूमि में लगाया जा सकता है।

5.6 जहाँ वर्षा निर्भर परिस्थितियों के चलते केवल एक ही फसल में उगाई जाती है, वहाँ के किसानों को तिलहन के साथ ही अपनी सीमान्त भूमि पर अलग-अलग बायोमास की विविध प्रजातियों को अंतर फसल एवं दूसरी फसल के रूप में लगाने के लिए प्रोत्साहित किया जाएगा।

5.7 स्थानीय निकायों, राज्यों और संबंधित हितधारकों के साथ बेहतर तालमेल रखकर सम्बद्ध समुदायों के लिए समुचित आपूर्ति श्रृंखला तंत्र, फीडस्टॉक कलेक्शन केंद्र और उचित मूल्य तंत्र विकसित किए जाएंगे।

5.8 एमएसडब्लू, औद्योगिक अपशिष्ट, प्लास्टिक कचरा आदि जैसे कचरे की पर्याप्त मात्रा देश भर में उपलब्ध संग्रह तंत्र के साथ उपलब्ध है। यह जैव-सीएनजी, ड्रॉप-इन ईंधन, जैव-मेथनॉल, डीएमई, जैव-हाइड्रोजन आदि जैसे जैव ईंधन पैदा करने के लिए फीडस्टॉक के रूप में कार्य करेगा।

ख. सम्मिश्रण और बायोरिफाइनरी कार्यक्रम

5.9. एथेनॉल मिश्रित पेट्रोल कार्यक्रम

5.9.1 वर्तमान में, ईबीपी कार्यक्रम के लिए एथेनॉल चीनी उद्योग के उप-उत्पाद के रूप में शीरा उत्पाद से आ रहा है। गन्ना और चीनी उत्पादन के वर्तमान स्तर (क्रमशः 350 एमएमटी और 26-28 एमएमटी प्रति वर्ष) में उपलब्ध अधिकतम शीरा लगभग 13 एमएमटी है, जो लगभग 300 करोड़ लीटर अल्कोहल / एथेनॉल का उत्पादन करने के लिए पर्याप्त है। वर्तमान में, शराब / एथेनॉल का उत्पादन करने के लिए सी-भारी शीरा का इस्तेमाल किया जा रहा है।

5.9.2 चीनी की उपलब्धता के अनुसार एथेनॉल उत्पादन के लिए बी-भारी शीरा रूट को अपनाने के लिए प्रोत्साहित किया जाएगा। एक एमएमटी शुगर के उत्सर्ग पर 60 करोड़ लीटर इथनॉल का उत्पादन किया जा सकता है। इस विकल्प का उपयोग करने से एथेनॉल उत्पादन में सहयोगी डिस्टिलरीज़ में सुधार हो सकेगा। मिश्रण प्रतिशत को बढ़ाने के लिए सीधे गन्ने के रस से एथेनॉल उत्पादित किए जाने की अनुमति होगी।

5.9.3 एथेनॉल के उत्पादन के लिए अन्य वैकल्पिक कच्ची सामग्रियां जैसे कि शुगर युक्त सामग्री- चुकन्दर, ज्वार, आदि तथा स्टार्च युक्त जैसे - मकई, कसावा, सड़ा हुआ आलू आदि जैसे सामग्रियों का पहली पीढ़ी की पूर्णरूपेण विकसित प्रौद्योगिकियों का उपयोग करके किया जाएगा। राष्ट्रीय जैव-ईंधन समन्वय समिति के निर्णय के अनुसार खाद्यान की अधिशेष उपलब्धता होने पर खाद्यानों जैसे मक्का आदि से एथेनॉल उत्पादित किए जाने की अनुमति होगी।

5.10 दूसरी पीढ़ी (2 जी) एथेनॉल

5.10.1 शीरे के माध्यम से एथेनॉल उत्पादन की अपनी सीमाएं हैं और मद्यपान और केमिकल उद्योगों में इसका प्रतिस्पर्धात्मक उपयोग होने से ईबीपी कार्यक्रम के लिए यह उपलब्ध हो पाएगा, इसकी संभावना में संदेह है। यह वारंट पारंपरिक शीरा रूट और गन्ना रस रूट से अलग एथेनॉल के अन्य स्रोतों की तलाश करता है।

5.10.2 भारत में किए गए कुछ अध्ययनों में प्रति वर्ष **120 -160** एमएमटी की अतिरिक्त बायोमास उपलब्धता का संकेत दिया गया है, जिसे परिवर्तित करने पर प्रति वर्ष **3000** करोड़ लीटर एथेनॉल प्राप्त किया जा सकता है। अतिरिक्त बायोमास / कृषि अपशिष्ट जो सेल्यूलोसिक और लिग्नोकेल्लोसिक किस्म की सामग्री है, इसको दूसरी पीढ़ी (**2** जी) की प्रौद्योगिकियों का उपयोग करके एथेनॉल में परिवर्तित किया जा सकता है। भारत सरकार ने ग्रामीण अर्थव्यवस्था और ईबीपी कार्यक्रम को आगे बढ़ाने में बायोमास की भूमिका को मान्यता दी है और शीरे के अलावा पेट्रोकेमिकल मार्ग सहित अन्य गैर-खाद्य फीडस्टॉक जैसे सेल्यूलोजिक और लिग्नॉसेल्यूलोजी सामग्री से उत्पादित एथेनॉल की खरीद की अनुमति दी है बशर्ते कि संबंधित बीआईएस मानकों का अनुपालन होता हों। इस नीति के तहत कार्रवाई के लिए निम्नलिखित क्षेत्रों की परिकल्पना की गई है:

5.10.3 प्रोत्साहन: वैश्विक रूप से, 2 जी इथेनॉल उद्योग प्रोत्साहनों के माध्यम से संचालित किया जाता है क्योंकि अभी इस प्रौद्योगिकी को व्यावसायिक पैमाने पर सिद्ध होना है और इस प्रकार उत्पादित एथनॉल अधिक पर्यावरण सापेक्ष है। यह 2 जी एथनॉल बायो रिफाइनरीज के बुनियादी ढांचागत विकास को संचालित करने में एक प्रमुख साधन होगा।

5.10.4 ऑफटेक आश्वासन: सार्वजनिक क्षेत्र की तेल विपणन कंपनियाँ निजी हितधारकों को आश्वस्त बाजार प्रदान करने और 2 जी एथनॉल अभ्युपायों में सहायता देने के लिए 15 वर्ष की अवधि के लिए 2 जी एथनॉल आपूरकों के साथ एथनॉल खरीद समझौते (ईपीए) पर हस्ताक्षर करने के लिए सहमत हो गई हैं। सार्वजनिक क्षेत्र की गैस विपणन कंपनियों द्वारा जैव-सीएनजी को 2जी इथनॉल बायो रिफाइनरीज में प्रमुख उप-उत्पाद और परिवहन ईंधन होने के कारण ऑफटेक आश्वासन के तहत लाया जाएगा।

5.11. बायोडीजल सम्मिश्रण कार्यक्रम

5.11.1 फीडस्टॉक उपलब्धता से संबंधित बाधाओं के कारण देश में डीजल में बायोडीजल का समग्र सम्मिश्रण 0.5 प्रतिशत से कम रहा है। इसके अलावा, सम्मिश्रण कार्यक्रम के लिए जो भी बायोडीजल आ रहा है वह आयातित स्रोतों से तैयार होता है। इस कार्यक्रम की दीर्घकालिक सफलता के लिए इस प्रकार के बायोडीजल उत्पादन के लिए घरेलू कच्चे माल का सुनिश्चय करना अत्यावश्यक है।

5.11.2 घरेलू उत्पादित/अपशिष्ट कूकिंग ऑयल (यूसीओ/डब्ल्यूसीओ) में बायोडीजल उत्पादन के स्रोत होने की संभावना है। लेकिन विभिन्न छोटे भोजनालयों/विक्रेताओं और व्यापारियों के माध्यम से खाद्य स्ट्रीम के लिए यूसीओ के उपयोग के तौर तरीके में बदलाव लाना है। खाद्य प्रवाह में यूसीओ के प्रवेश को रोकने और बायोडीजल उत्पादन के लिए इसकी आपूर्ति बढ़ाने के लिए उपयुक्त संग्रहण तंत्र विकसित करने के लिए कड़े मानदंड बनाने पर फोकस किया जाएगा।

5.12 अन्य जैव ईंधन (ड्रॉप-इन-ईंधन, जैव-सीएनजी, जैव-हाइड्रोजन,जैव-मेथनॉल, डीएमई,आदि)

5.12.1 नीति आयोग द्वारा बनाए गए अपशिष्ट से ऊर्जा कार्यबल ने अनुमान लगाया है कि भारत में हर वर्ष 62 एमएमटी नगरीय ठोस अपशिष्ट (एमएसडब्लू) होता है। रिफ्यूज्ड उत्सर्जित ईंधन, बायो गैस/बिजली और कृषि में सहायता के लिए इस अपशिष्ट में खाद सहित ड्रॉप-इन-ईंधन तैयार करने और बिजली उत्पन्न करने की भारी क्षमता है।

5.12.2 विश्वभर में, कचरे को ड्राप-इन-ईंधन, जैव-सीएनजी, जैव-हाइड्रोजन आदि जैसे जैव ईंधनों में परिवर्तित करने के लिए उपलब्ध प्रौद्योगिकियां नवप्रवर्तनशील चरण में हैं और इन्हें व्यावसायिक स्तर पर साबित होने की जरूरत है। ऐसे कचरे का जैव-सीएनजी में रूपांतरण एक मॉडल है जिसे ग्रामीण इलाकों में ऊर्जा की मांग को पूरा करने और पर्यावरण संबंधी मसलों को करने के लिए प्रोत्साहित किया जाएगा। इस नीति के अनुरूप प्रति यूनिट संसाधित अपशिष्ट से बायो-सीएनजी का अधिक उत्पादन करने वाली प्रोद्योगिकियां प्रोत्साहित की जाएंगी। विभिन्न प्रोत्साहनों और ऑफटेक आश्वासन के माध्यम से उन्नत ईंधनों के उत्पादन के लिए ऐसे संयंत्र लगाने में भी वृद्धि की जाएगी। इसी तरह, रिफाइनरियों सहित कई उद्योगों में हाइड्रोजन का उपयोग सबसे महंगे ईंधन के रूप में पता लगाया गया है। बायोमास और अपशिष्ट से उत्पादित वायो-हाइड्रोजन, अन्वेषण करने के लिए दिलचस्प प्रस्ताव होगा।

5.12.3 विश्वभर में, परिवहन ईंधन के रूप में मोटर स्प्रिट के साथ सम्मिश्रण में मेथनॉल के उपयोग का पता लगाया गया है। इसी प्रकार कृषि अपशिष्टों, प्राकृतिक गैस, उच्च राख कोयला आदि सहित विभिन्न स्रोतों से ही इसका उत्पादन किया

जा सकता है। इस समय भारत मेथनॉल का विशेष आयातक है। अतिरिक्त बायोमास उपलब्धता में जैव-मेथनॉल और बायो-बॉटियनॉल के उत्पादन की संभावना है और भारतीय परिवहन व्यवस्था में उसके अनुप्रयोग का पता लगाया जाएगा।

5.12.4 डाय-मिथाइल ईथर (डीएमई) मेथनॉल के 2 अणुओं से पानी के 1 अणु को निकालकर प्राप्त किया जाता है, जो एक रासायनिक प्रक्रिया है, जो आमतौर पर उत्प्रेरक की सहायता से प्राप्त होती है। आरएंडडी संस्थानों द्वारा प्रोपेन के विकल्प के रूप में घरेलू एलपीजी में (डीएमई) का उपयोग किया जा रहा है। डीएमई धीमे आरपीएम डीजल इंजनों में डीजल के लिए एक विकल्प भी हो सकता है और इसलिए व्यापक उपयोग, औद्योगिक अनुप्रयोग और संभावित ईंधन के रूप में डीएमई की स्वीकृति मेथनॉल के औद्योगिक उत्पादन को बढ़ावा देने के लिए उचित है।

5.12.5 उच्च तेल घटक, सीमित अपशिष्ट स्ट्रीम और न्यूनतम भूमि आवश्यकताओं (बायोमास की तुलना में), उत्पादन मार्ग पर निर्भरता की दृष्टि से शैवाल (3 जी) से जैव ईंधन के उत्पादन की काफी अच्छी संभावनाएँ हैं। वर्तमान में, इस तरह के ईंधन का उत्पादन अपने प्रारंभिक चरण में है और वाणिज्यिक व्यवहार्यता के संबंध में आगे की परीक्षण की आवश्यकता है। तकनीकी-व्यावसायिक व्यवहार्यता प्राप्त करने के लिए शैवाल आधारित जैव ईंधन और इस विषय पर अपेक्षित आर एंड डी को प्रोत्साहित किया जाएगा।

ग. वित्त व्यवस्था

5.13 सरकार वित्तीय संस्थानों द्वारा उधार देने के उद्देश्य से प्राथमिक क्षेत्र के तौर पर जैव ईंधनों के बायोडीजल के उत्पादन व भंडारण और वितरण के बुनियादी ढांचे के लिए तेल निष्कासन/निष्कर्षण और प्रसंस्करण इकाइयों की घोषणा करने पर विचार करेगी।

5.14 कार्बन वित्तपोषण के अवसरों सहित जैव ईंधन विकास के लिए बहु-पक्षीय और द्विपक्षीय वित्त पोषण के स्रोतीकरण को प्रोत्साहित किया जाएगा।

5.15 जैव ईंधन क्षेत्र में संयुक्त उद्यम और निवेश को प्रोत्साहित किया जाएगा। जैव ईंधन प्रौद्योगिकियों में 100% विदेशी प्रत्यक्ष निवेश (एफडीआई) को स्वचालित अनुमोदन मार्ग के माध्यम से प्रोत्साहित किया जाएगा, बशर्ते कि इस प्रकार उत्पादित जैव ईंधन घरेलू उपयोग के लिए ही हो।

घ. वित्तीय और राजकोषीय प्रोत्साहन

5.16 सरकार जैव ईंधन के लिए व्यवहार्यता अंतरण वित्तपोषण, सब्सिडी और अनुदान सहित वित्तीय प्रोत्साहनों का विस्तार करने पर विचार करेगी। सरकार उन्नत जैव ईंधन के रूप में द्वितीय पीढ़ी (2 जी) इथनॉल, ड्रॉप-इन ईंधन, बायो-सीएनजी, शैवाल आधारित 3 जी जैव ईंधन, जैव-मेथनॉल, डीएमई, जैव-हाइड्रोजन आदि का वर्गीकरण करेगी। वित्तीय प्रोत्साहन देने के लिए एक राष्ट्रीय जैव ईंधन फंड पर विचार किया जा सकता है।

5.17 2जी इथनॉल बायो रिफाइनरीज स्थापित करने के लिए स्टेकहोल्डर्स को प्रोत्साहित करने के लिए इस पॉलिसी में टैक्स क्रेडिट, संयंत्र खर्च पर अग्रिम मूल्यह्रास, 1 जी इथनॉल के साथ-साथ अंतर मूल्य निर्धारण, व्यवहार्यता गैप फंडिंग (वीजीएफ) आदि के रूप में वित्तीय प्रोत्साहन के साथ प्रारंभिक "उन्नत बायो ईंधन" उद्योग को प्रोत्साहित करने पर विचार करना है। "उन्नत जैव ईंधन" कार्यक्रम को आगे बढ़ाने के लिए योजनाएं शुरू की जाएंगी।

5.18 जैव ईंधन फीडस्टॉक के निर्माण और शुद्ध या मिश्रित रूप में जैव ईंधन के उपयोग पर सीओ 2 उत्सर्जन की बचत के लिए कार्बन क्रेडिट पैदा करने के अवसरों का पता लगाया जाएगा।

5.19 नाबार्ड और अन्य सार्वजनिक क्षेत्र के बैंकों को वित्त पोषण, साफ्ट ऋण आदि के माध्यम से वित्तीय सहायता प्रदान करने के लिए प्रोत्साहित किया जाएगा।

ङ. अनुसंधान एवं विकास और प्रदर्शन

5.20 दूसरी पीढ़ी के विकास और घरेलू फीडस्टॉक का उपयोग करने वाले उन्नत जैव ईंधनों के लिए मजबूत प्रौद्योगिकी फोकस आवश्यक है। यह पॉलिसी इनोवेशन को प्रोत्साहित करती है और अनुसंधान एवं विकास गतिविधियां करते समय विकसित / उभरती प्रौद्योगिकियों का उपयोग करते हुए जैव ईंधनों के क्षेत्र में अनुसंधान एवं विकास (आर एंड डी) और

प्रदर्शन पर बल देती है। अनुसंधान और विकास गतिविधियां जैव ईंधन उत्पादन, बागान, प्रसंस्करण और रूपांतरण प्रौद्योगिकियों के लिए नए कच्चे माल के विकास के क्षेत्र में होंगे। विभिन्न अंत-उपयोग अनुप्रयोगों और उप-उत्पादों के उपयोग की क्षमता बढ़ाने के लिए दक्षता सुधार और नवाचार को प्रोत्साहित किया जाएगा। स्थानीय फीडस्टॉक्स के आधार पर स्वदेशी अनुसंधान एवं विकास तथा प्रौद्योगिकी विकास को उच्च प्राथमिकता दी जाएगी। जहां संभव हो पेटेंट पंजीकृत किए जाएंगे। स्पष्ट रूप से परिभाषित लक्ष्य और उपलब्धियों के साथ बहु संस्थानों को शामिल करते हुए बायोईंधनों के क्षेत्र में अनुसंधान कार्यक्रम में सहयोग किया जाएगा।

5.21 गहन अनुसंधान एवं विकास कार्य के अभिज्ञात क्षेत्रों में शामिल है.

(क): बायो ईंधन फीडस्टाक उत्पादन

(ख): अभिज्ञात फीडस्टॉक से उन्नत अंतरण प्रोद्योगिकियां

(ग): बायो ईंधनों के आशोधनों सहित अन्त्य प्रयोक्ता अनुप्रयोगों की प्रोद्योगिकियां

(घ): बायो ईंधनों के उप उत्पादों का उपयोग

5.22 जैव ईंधन उत्पादन के लिए प्रायोगिक/ प्रदर्शन परियोजनाएं स्थापित की जाएंगी। अनुसंधान संगठनों, आर एंड डी के लिए संस्थानों और प्रदर्शन परियोजनाओं की स्थापना, उच्च प्रौद्योगिकी वाले क्षेत्रों में विशेष केंद्रों के लिए अनुदान प्रदान किया जाएगा। मौजूदा अनुसंधान एवं विकास केन्द्रों को मजबूत किया जाएगा और व्यापक उपयोग/अनुप्रयोग के लिए अनुसंधान संगठन, संस्थाओं और उद्योगों के बीच संबंध स्थापित किए जाएंगे। सरकार अनुसंधान एवं विकास तथा प्रौद्योगिकी के क्षेत्र में उद्योग की भागीदारी को प्रोत्साहित करेगी, जिसमें उद्योग को सुविधा प्रदान करने के बारे में जानकारी प्रदान की जाएगी।

5.23 कम से कम जीएचजी उत्सर्जन के लिए अंतरराष्ट्रीय मंचों पर हमारी प्रतिबद्धताओं को देखते हुए जैव ईंधन क्षेत्र में उभरती हुई प्रौद्योगिकी के जीवन चक्र विश्लेषण (एलसीए) महत्वपूर्ण है। प्रोत्साहित कार्य निष्पादन एलसीए रिपोर्ट का वादा और जलवायु परिवर्तन पर हमारी प्रतिबद्धताओं के अनुसार, प्रदर्शन/ व्यावसायिक स्तर पर परवर्ती तैनाती के लिए प्रायोगिक चरण में प्रौद्योगिकियों को स्वच्छ प्रौद्योगिकी के रूप में प्रोत्साहित किया जाएगा।

5.24 राष्ट्रीय, द्विपक्षीय और बहुपक्षीय अनुसंधान कार्यक्रमों के माध्यम से ज्ञान को जोड़ने के लिए संबंधित मंत्रालयों के साथ-साथ अकादमिक और उद्योग के प्रतिनिधियों वाले जैव ईंधन के क्षेत्रों में अनुसंधान और विकास को बढ़ावा देने के लिए एक संकेंद्रित समूह का गठन किया जा सकता है।

च. गुणवत्ता मानक

5.25 विभिन्न जैव ईंधन और अंत उपयोग अनुप्रयोगों के लिए मानकों और प्रमाणीकरण की शुरुआत के साथ-साथ परीक्षण विधियों, प्रक्रियाओं और प्रोटोकॉल का विकास प्राथमिकता पर किया जाएगा। भारतीय मानक ब्यूरो (बीआईएस) ने पहले से ही स्वैच्छिक और मिश्रित रूप अनुप्रयोगों के लिए बायोएथनॉल, बायोडीजल के मानकों का विकास किया है। उच्च सम्मिश्रण स्तर के लिए विनिर्देशों का विकास चल रहा है।

5.26 भारतीय मानक ब्यूरो (बीआईएस) मौजूदा मानकों की समीक्षा करेगा और उन्हें अपडेट करेगा, साथ ही विभिन्न अंत-उपयोग अनुप्रयोगों के लिए उपकरणों और प्रणालियों के नए मानकों को विकसित करेगा। उत्पाद के प्रदर्शन और विश्वसनीयता के लिए दिशा-निर्देश सभी प्रासंगिक हितधारकों के परामर्श से भी विकसित और संस्थागत होंगे

5.27 यह नीति आवश्यक कौशल सेटों के विकास को प्रोत्साहित करेगी ताकि जैव ईंधन उद्योग की नई मांगों के अनुकूल होने के लिए प्रशिक्षित और कुशल जनशक्ति उपलब्ध हो।

छ. जैव ईंधनों का वितरण एवं विपणन

5.28 तेल विपणन कंपनियां जैव ईंधनों का भंडारण, वितरण और विपणन जारी रखेंगे। जैव ईंधनों की आवश्यकताओं को पूरा करने के लिए वे भंडारण, वितरण और विपणन बुनियादी ढांचे को बनाए रखने और सुधारने के लिए मुख्य रूप से जिम्मेदार

होंगे। सरकार गुणवत्ता मानक सुनिश्चित करने, सम्मिश्रण प्रतिशतता के बारे में उपभोक्ता जागरूकता, वारंटी की आवश्यकता आदि जैसे घटकों के आधार पर जैव ईंधनों के वितरण और विपणन के लिए अन्य कंपनियों को अनुमति देने पर भी विचार कर सकती है।

ज. जैव ईंधनों का मूल्य निर्धारण

5.29 इस उद्देश्य के लिए गठित एक समिति की सिफारिश के आधार पर वर्तमान में ईबीपी कार्यक्रम के लिए पहली पीढ़ी के एथनॉल आधारित शीरे की कीमत का निर्धारण सरकार द्वारा निर्धारित किया जा रहा है। डीजल में मिश्रण के लिए बायोडीजल की खरीद के लिए ओएमसी द्वारा मूल्य निर्धारित किया जा रहा है। बाजार की स्थितियों, घरेलू बाजार में जैव ईंधन की उपलब्धता, आयात प्रतिस्थापन आवश्यकता आदि सहित विभिन्न कारकों के आधार पर सरकार प्रशासित कीमतों या बाजार निर्धारित कीमतों से पहली पीढ़ी के जैव ईंधन को प्रोत्साहित करना जारी रखेगी। उन्नत जैव ईंधनों को और प्रोत्साहित करने के लिए एक अंतर मूल्य दिया जाएगा। उन्नत जैव ईंधन के लिए अंतर मूल्य निर्धारण के लिए तंत्र का निर्णय राष्ट्रीय जैव ईंधन समन्वय समिति द्वारा किया जाएगा।

6.0 जैव ईंधनों का आयात एवं निर्यात

6.1 जैव ईंधन का देशी उत्पादन व्यावहारिक और युक्तियुक्त प्रोत्साहनों के एक सेट से प्रोत्साहित किया जाएगा। जैव ईंधनों का आयात काफी हद तक हतोत्साहित होगा। जैव ईंधन के आयात की अनुमति देने का निर्णय देश में जैव ईंधनों की उपलब्धता, अंतरराष्ट्रीय कीमतों और अन्य कारकों के आधार पर राष्ट्रीय जैव ईंधन समन्वय समिति द्वारा लिया जाएगा।

6.2 इस नीति ने फीडस्टॉक उत्पादन के लिए बंजर भूमि का उपयोग करते हुए जैव ईंधन के लिए स्वदेशी फीडस्टॉक की आपूर्तियों को बढ़ाने के लिए प्रोत्साहित किया है। तथापित, घरेलू फीडस्टॉक की उपलब्धता और सम्मिश्रण की आवश्यकता के आधार पर, जैव डीजल के उत्पादन के लिए फीडस्टॉक के आयात को आवश्यकता की सीमा तक अनुमति होगी। प्रस्तावित इस नीति के तहत राष्ट्रीय जैव ईंधन समन्वय समिति द्वारा फीडस्टॉक आयात की आवश्यकताओं का निर्णय लिया जाएगा।

6.3 चूंकि घरेलू जैव-ईंधनों की उपलब्धता देश की आवश्यकता से बहुत कम है इसलिए जैव-ईंधनों के निर्यात की अनुमति नहीं होगी।

7.0 स्टेक धारकों की भूमिका

7.1 सभी हितधारकों अर्थात मंत्रालयों / विभागों, राज्य सरकारों, किसानों, व्यवसाय और उद्योग और व्यावसायिकों की निम्नलिखित क्षेत्रों में सक्रिय भागीदारी सुनिश्चित की जाएगी:

i) बंजर भूमि पर टिकाऊ तरीके से फ़ीडस्टॉक का उत्पादन

ii) किसानों को अपने सीमांत भूमि पर फ़ीड स्टॉक की किस्मों को विकसित करने के लिए प्रोत्साहन

iii) फीडस्टॉक के लिए उपयुक्त आपूर्ति श्रृंखला की स्थापना

iv) फीडस्टॉक स्टोरेज इंफ्रास्ट्रक्चर

v) एकल खिड़की की मंजूरी और शीघ्र स्वीकृति

vi) जैव ईंधन संयंत्रों के लिए कर प्रोत्साहन, सब्सिडी वाली बिजली, पानी की आपूर्ति, एक्सेस सड़कों इत्यादि जैसे प्रोत्साहन

क. राज्यों की भूमिका

7.2 जैव ईंधन कार्यक्रम का सफलतापूर्वक कार्यान्वयन राज्यों की सक्रिय भागीदारी पर काफी हद तक निर्भर करता है। जिन राज्यों ने अपने यहां जैव ईंधन बोर्ड स्थापित किए हैं उनके अनुभवों को उपयोग करके अन्य राज्यों में जैव ईंधन बोर्ड स्थापित किए जाएंगें तथा राज्य सरकारों को अपने यहां जैव ईंधन के विकास एवं बढ़ावे के लिए इन एजेंसियों/बोर्डों को उपयुक्त रूप से सशक्त बनाने के लिए प्रोत्साहित किया जाएगा। अन्य स्टेक धारकों को भी कार्यक्रम हेतु नामंकित किया जाएगा।

7.3 राज्य सरकारें को अखाद्य तिलहन पौधों की रोपण या जैव ईंधन के अन्य फीडस्टॉक्स हेतु भूमि के प्रयोग तथा इस प्रकार के पौधों को उगाने के लिए परती तथा खाली पडी सरकारी भूमि के आवंटन पर भी निर्णय लेने की आवश्यकता होगी। समस्त मूल्य श्रृंखला में जैव ईंधन परियोजनाओं को सहारा देने के लिए आवश्यक बुनियादी ढ़ांचे का भी निर्माण करना होगा।

7.4 जैव ईंधन पौधों को लगाने के लिए एकल खिड़की की मंजूरी देने हेतु राज्यों को भी प्रोत्साहित किया जाएगा। राज्य सरकारें राजकोषीय प्रोत्साहनों, कर छूट, सब्सिडी वाली बिजली की आपूर्ति, प्राथमिकता से सब्सिडी दरों पर भूमि आवंटन के साथ शुरुआती कुछ जैव ईंधन संयंत्रों को सहारा देने के लिए प्रतिबद्ध रहेंगी।

ख. मंत्रालयों/विभागों की भूमिका

7.5 देश में जैव ईंधन कार्यक्रम के प्रभावी कार्यान्वयन हेतु विभिन्न मंत्रालयों और विभागों की भूमिका को निम्न सारणीबद्ध किया गया है :

मंत्रालय/विभाग	भूमिका
पेट्रोलियम एवं प्राकृतिक गैस मंत्रालय	• जैव ईंधन के विकास के हेतु समग्र समन्वय मंत्रालय • राष्ट्रीय जैव ईंधन नीति और इसका कार्यान्वयन • जैव ईंधन के आवेदन पर अनुसंधान, विकास और प्रदर्शन • जैव ईंधन का विपणन और वितरण • जैव ईंधन के मिश्रण का स्तर • मूल्य निर्धारण और खरीद नीति का विकास और कार्यान्वयन • विवाद निवारण • उन्नत जैव ईंधन अनुसंधान और क्षमता निर्माण के लिए अंतरराष्ट्रीय सहयोग को बढ़ावा देना • परिवहन ईंधन के लिए एमएसडब्लू
ग्रामीण विकास मंत्रालय	ग्रामीण आजीविका कार्यक्रमों मनरेगा आदि के साथ बागवानी, आपूर्ति श्रृंखला गतिविधियां।
कृषि और सहयोग विभाग (कृषि और परिवार कल्याण मंत्रालय)	अन्य मंत्रालयों के साथ समन्वय करके जैव ईंधन के लिए वृक्षारोपण और नर्सरी के जरिए संयंत्र सामग्री का उत्पादन।
पर्यावरण, वन और जलवायु परिवर्तन मंत्रालय (एमईईएफ और सीसी)	• वन भूमि पर जैवईंधन वृक्षारोपण और जैव ईंधन से संबंधित पर्यावरण संबंधी मुद्दे • बागानों और आपूर्ति श्रृंखला के रखरखाव में समुदायों की भागीदारी
विज्ञान और प्रौद्योगिकी मंत्रालय (जैवप्रौद्योगिकी विभाग तथा विज्ञान एवं प्रौद्योगिकी विभाग)	• विविध फीडस्टॉक्स पर अनुसंधान एवं विकास और जैव ईंधन विकास के लिए प्रौद्योगिकियों में सुधार। • जैव ईंधन (बायोफ्यूल) क्षेत्र में नवाचार और अत्याधुनिक अनुसंधान को बढ़ावा देना। • बायोरिफ़ाइनरी और वैल्यू वर्धित उत्पादों के लिए प्रौद्योगिकियों का विकास।
सड़क परिवहन और राजमार्ग मंत्रालय	• परिवहन क्षेत्र में जैव ईंधन के उपभोग / उपयोग को बढ़ावा दें।
रेल मंत्रालय	• जैव ईंधन की खपत / उपयोग को प्रोत्साहन ।
उपभोक्ता मामलों के विभाग (एम ओ सीए, एफ व पी डी)	• अनांतिम उपयोग हेतु जैव ईंधन की गुणवत्ता नियंत्रण को सुनिश्चित करने के लिए विनिर्देशों, मानकों और कोडों को निर्धारित करना ।
भारी उद्योग और सार्वजनिक उद्यम मंत्रालय	• बाजार में उपलब्ध जैव ईंधन के अनुकूल बनाने के लिए उपस्कर निर्माताओं को सलाह देना।
नवीन और नवीकरणीय ऊर्जा मंत्रालय	• बायोमास / शहरी, औद्योगिक और कृषि कचरे से बायोगैस के माध्यम से ऊर्जा उत्पन्न / उत्पन्न करना।
आवास और शहरी गरीबी उन्मूलन मंत्रालय	• एमएसडब्लू की उपलब्धता हेतु नगर निकायों और राज्यों के साथ समन्वय करना। यह शहरी क्षेत्रों में पालिकाओं के ठोस अपशिष्ट सहित जैवईंधन हेतु आवश्यक फीड स्टॉक है, जिसके लिए इस मंत्रालय द्वारा नीतियों को जारी किया जा रहा है।
उपभोक्ता, खाद्य एवं सार्वजनिक वितरण मंत्रालय, खाद्य और सार्वजनिक वितरण विभाग	• एथेनॉल डिस्टिलरीज स्थापित करने के लिए चीनी क्षेत्र में उपयुक्त वित्तीय प्रोत्साहन देने के लिए डीएफपीडी

8.0 अंतरराष्ट्रीय सहयोग

8.1 जैव ईंधन के क्षेत्र में नए सिरे से ध्यान देने के कारण, राष्ट्रीय प्राथमिक के अनुसार अंतरराष्ट्रीय स्तर पर वैज्ञानिक और तकनीकी सहयोग स्थापित किए जाएंगे । इसमें अनुसंधान एवं विकास संस्थानों और उद्योगों से जुड़े संयुक्त अनुसंधान और प्रौद्योगिकी विकास, क्षेत्रीय अध्ययन, पायलट पैमाने के सयंत्र और प्रदर्शन परियोजनाओं में सहयोग शामिल होगा। प्रौद्योगिकियों को साझा करने और वित्तपोषण के लिए उपयुक्त द्विपक्षीय और बहु-पार्श्व सहयोग कार्यक्रम विकसित किए जाएंगे।

9.0 संस्थागत तंत्र

क. केंद्र में जैव ईंधन नीति संस्थागत तंत्र

9.1 व्यावसायिक नियमों के आबंटन के तहत, देश में जैव ईंधन के विकास और उन्नयन के विभिन्न पहलुओं के साथ व्यवहार करते हुए विविध मंत्रालयों को जिम्मेदारी सौंपी जा रही है। शामिल व्यापक दृष्टिकोण / कार्य क्षेत्र के कारण विभिन्न विभागों और एजेंसियों के बीच तालमेल आवश्यक है। यह जैव ईंधन विकास, उन्नयन और उपयोग के विभिन्न पहलुओं पर नीति मार्गदर्शन और प्रारंभिक समीक्षा के लिए एक सशक्त समिति की अपेक्षा है।

9.2 पेट्रोलियम और प्राकृतिक गैस मंत्री की अध्यक्षता वाली राष्ट्रीय जैव ईंधन समन्वय समिति (एनबीसीसी) स्थापित करने की परिकल्पना की गई है। संबंधित मंत्रालयों के प्रतिनिधि इस समिति के सदस्य होंगे। समग्र समन्वयन, प्रभावी अंत-से-अंत के कार्यान्वयन तथा जैव ईंधन कार्यक्रमों की निगरानी प्रदान करने हेतु समिति समय-समय पर बैठक आयोजित करेगी। राष्ट्रीय जैव ईंधन समन्वय समिति की निम्न प्रकार संरचना होगी:

अध्यक्ष : पेट्रोलियम और प्राकृतिक गैस मंत्री

सदस्य:

i. सचिव, पेट्रोलियम और प्राकृतिक गैस मंत्रालय

ii. सचिव, ग्रामीण विकास विभाग, ग्रामीण विकास मंत्रालय

iii. सचिव, कृषि, सहयोग और किसान कल्याण, कृषि और किसान कल्याण मंत्रालय

iv. सचिव, पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय

v. सचिव, विज्ञान और प्रौद्योगिकी विभाग, विज्ञान और प्रौद्योगिकी मंत्रालय

vi. सचिव, व्यय विभाग, वित्त मंत्रालय

vii. सचिव, सड़क परिवहन और राजमार्ग मंत्रालय

viii. अध्यक्ष, रेलवे बोर्ड

ix. सचिव, खाद्य और सार्वजनिक वितरण विभाग, उपभोक्ता, खाद्य और सार्वजनिक वितरण मंत्रालय

x. सचिव, भारी उद्योग विभाग, भारी उद्योग और सार्वजनिक उद्यम मंत्रालय

xi. सचिव, जैव प्रौद्योगिकी विभाग, विज्ञान और प्रौद्योगिकी मंत्रालय

xii. सचिव, नवीन और नवीकरणीय ऊर्जा मंत्रालय

xiii. सचिव, आवास और शहरी गरीबी उन्मूलन मंत्रालय

xiv. मुख्य कार्यकारी अधिकारी, नीति आयोग

xv. संयुक्त सचिव (रिफाइनरी), पेट्रोलियम और प्राकृतिक गैस मंत्रालय - सदस्य सचिव सचिव, पेट्रोलियम और प्राकृतिक गैस मंत्रालय

9.3 जैव ईंधन के कार्य समूह– जैव ईंधन कार्यक्रम के कार्यान्वयन के मोनीटरन हेतु एक कार्य समूह गठित किया जाएगा। इस कार्य समूह की रचना निम्न प्रकार होगी—

अध्यक्ष: संयुक्त सचिव (रिफाइनरी), पेट्रोलियम और प्राकृतिक गैस मंत्रालय

सदस्य :

i) एमओपीएंडएनजी द्वारा नामांकित जैव ईंधनों के क्षेत्र में प्रख्यात विशेषज्ञ

ii) जैव ईंधनों के क्षेत्र में अनुसंधान और शैक्षणिक संस्थानों के तकनीकी विशेषज्ञ

iii) उपर्युक्त 9.2 में उल्लेखित प्रासंगिक मंत्रालयों / विभागों के प्रतिनिधि

iv) ओएमसी के प्रतिनिधि

v) पीसीआरए के प्रतिनिधि

vi) उद्योग, सीएसआईआर लैब, राष्ट्रीय शर्करा संस्थान और जैव ईंधन संघ से विशेषज्ञ/ प्रतिनिधि

ख. राज्य स्तर पर जैव ईंधन संस्थागत तंत्र

9.4 राष्ट्रीय जैवईंधन नीति के प्रावधानों और रूप रेखा के अनुरूप राज्य स्तरीय जैव ईंधन विकास बोर्ड की स्थापना को यह नीति प्रोत्साहित करती है। छत्तीसगढ़, उत्तरप्रदेश, कर्नाटक, राजस्थान और उत्तराखंड जैसे पांच राज्यों में इस प्रकार के बोर्ड कार्य कर रहे हैं। राज्य सरकारें इन बोर्डों को अनुदान देती हैं जो इनके कार्य के लिए पूर्णत: जवाबदेह है। जैव ईंधन पर राष्ट्रीय नीति के व्यापक उद्देश्यों के अनुसार अन्य राज्यों को अपने यहां जैव ईंधन को बढ़ावा देने के लिए इसी प्रकार के बोर्ड स्थापित करने के लिए प्रोत्साहित किया जाएगा। मौजूदा बोर्डों को सहयोगात्मक गतिविधियों को बढ़ावा देने हेतु प्रोत्साहित किया जाएगा ताकि जैव ईंधन कार्यक्रम में अधिक से अधिक राज्य भाग ले सकें।

संदीप पौण्डरीक, संयुक्त सचिव

MINISTRY OF PETROLEUM AND NATURAL GAS

NOTIFICATION

New Delhi, the 4th June, 2018

F. No.P-13032(16)/18/2017-**CC.—**In exercise of the powers conferred under Government of India (Allocation of Business) Three Hundred and Thirty Fifth Amendment Rules, 2017 published in the Gazette of India vide S.O. No.2492 (E) dated the 4th August, 2017, the Central Government, through Ministry of Petroleum & Natural Gas, in supersession of National Policy on Biofuels, promulgated through the Ministry of New & Renewable Energy, in 2009, hereby makes a revised policy on biofuels, namely: **—**

1. **(1)** This policy may be called National Policy on Biofuels,- 2018.

(2) This policy shall be effective from the date of approval by the Cabinet i.e. 16-05-2018.

2. The Text of the policy is annexed.

National Policy on Biofuels - 2018

1.0 PREAMBLE

1.1 India is one of the fastest growing economies in the world and will continue to enjoy the demographic dividend for few decades. The Development Objectives focus on Samavesh – Inclusion, shared vision of National development, technology upgradation & capacity building, economic growth, equity and human well-being. Energy is a critical input towards raising the standard of living of citizens. The energy strategy of country aims to chart the way forward to meet the Government's recent ambitious announcements in the energy domain such as electrification of all census villages by 2019, 24x7 electricity & 175 GW of renewable energy capacity by 2022, reduction in energy emissions intensity by 33%-35% by 2030 and share of non-fossil fuel based capacity in the electricity mix is aimed at above 40% by 2030. Even if there is likely expansion in the energy contribution of oil, gas, coal, renewable resources, nuclear and hydro in the coming decade, fossil fuels will continue to occupy a significant share in the energy basket. However, conventional or fossil fuel resources are limited, non-renewable, polluting and, therefore, need to be used prudently. On the other hand, renewable energy resources are indigenous, non-polluting and virtually inexhaustible. India is endowed with abundant renewable energy resources. Therefore, their use should be encouraged in every possible way. This National Policy on Biofuels - 2018 builds on the achievements of the earlier National Policy on Biofuels and sets the new agenda consistent with the redefined role of emerging developments in the Renewable Sector.

1.2 The crude oil price has been fluctuating in the world market. Such fluctuations are straining various economies the world over, particularly those of the developing countries. Road transport sector accounts for 6.7% of India's Gross Domestic Product (GDP). Currently, diesel alone meets an estimated 72% of transportation fuel demand followed by petrol at 23% and balance by other fuels such as CNG, LPG etc. for which the demand has been steadily rising. Provisional estimates have indicated that crude oil required for indigenous consumption of petroleum products in FY 2017-18 is about 210 MMT. The domestic crude oil production is able to meet only about 17.9% of the demand, while the rest is met from imported crude. India's energy security will remain vulnerable until alternative fuels to substitute/supplement petro-based fuels are developed based on indigenously produced renewable feedstock. To address these concerns, Government has set a target to reduce the import dependency by 10 per cent by 2022."

1.3 Government has prepared a road map to reduce the import dependency in Oil & Gas sector by adopting a five pronged strategy which includes, Increasing Domestic Production, Adopting biofuels & Renewables, Energy Efficiency Norms, Improvement in Refinery Processes and Demand Substitution. This envisages a strategic role for biofuels in the Indian Energy basket.

1.4 Biofuels are derived from renewable biomass resources and wastes such as Plastic, Municipal Solid Waste (MSW), waste gases etc. and therefore seek to provide a higher degree of national energy security in an environmentally friendly and sustainable manner by supplementing conventional energy resources, reducing dependence on imported fossil fuels and meeting the energy needs of India's urban and vast rural population.

1.5 Globally, biofuels assume importance due to growing energy security and environmental concerns. To encourage use of biofuels several countries have put forth different mechanisms, incentives and subsidies suiting to their domestic requirements. As an effective tool for rural development and generating employment, the primary approach for biofuels in India is to promote indigenous feedstock production.

1.6 Over the last decade, Government has undertaken multiple interventions to promote biofuels in the Country through structured programmes like Ethanol Blended Petrol Programme, National Biodiesel Mission, Biodiesel Blending Programme. Learning from the past experiences and demand supply status, Government has revamped these programmes by taking steps on pricing, incentives, opening alternate route for ethanol production, sale of biodiesel to bulk and retail customers, focus on R&D etc. These steps have impacted the biofuels programme in the Country positively.

1.7 Biofuels in India is of strategic importance as it augers well with the ongoing initiatives of the Government such as Make in India & Swachh Bharat Abhiyan and offers great opportunity to integrate with the ambitious targets of doubling of Farmers Income, Import Reduction, Employment Generation, Waste to Wealth Creation. Simultaneously, the existing biodiversity of the Country can be put to optimum use by utilizing drylands for generating wealth for the local populous and in turn contribute to the sustainable development.

1.8 Globally, biofuels have caught the attention in last decade and it is imperative to keep up with the pace of developments in the field of biofuels. This policy aims to bring in renewed focus taking into context the international perspectives and National scenario primarily by utilization of indigenous feedstocks for production of biofuels. The

Policy also dwells on the development of the next generation biofuel conversion technologies based on new feedstocks and promote domestically available feedstock exploring, utilizing the Country's biodiversity. Vision, Goals, Strategy and Approach to the development of biofuels in India is set out through technological framework, financial, institutional interventions and enabling mechanisms.

2.0 THE VISION AND GOALS

2.1 The Policy aims to increase usage of biofuels in the energy and transportation sectors of the country during the coming decade. The Policy aims to utilize, develop and promote domestic feedstock and its utilization for production of biofuels thereby increasingly substitute fossil fuels while contributing to National Energy Security, Climate Change mitigation, apart from creating new employment opportunities in a sustainable way. Simultaneously, the policy will also encourage the application of advance technologies for generation of biofuels.

2.2 The Goal of the Policy is to enable availability of biofuels in the market thereby increasing its blending percentage. Currently the ethanol blending percentage in petrol is around 2.0% and biodiesel blending percentage in diesel is less than 0.1%. An indicative target of 20% blending of ethanol in petrol and 5% blending of biodiesel in diesel is proposed by 2030. This goal is to be achieved by

(a) reinforcing ongoing ethanol/biodiesel supplies through increasing domestic production

(b) setting up Second Generation (2G) bio refineries

(c) development of new feedstock for biofuels

(d) development of new technologies for conversion to biofuels.

(e) creating suitable environment for biofuels and its integration with the main fuels.

3.0 DEFINITIONS AND SCOPE

3.1 The following definitions of biofuels shall apply for the purpose of this Policy:

i. 'Biofuels' are fuels produced from renewable resources and used in place of or in blend with, diesel, petrol or other fossil fuels for transport, stationary, portable and other applications;

ii. Renewable resources are the biodegradable fraction of products, wastes and residues from agriculture, forestry, tree based oil other non-edible oils and related industries as well as the biodegradable fraction of industrial and municipal wastes.

3.2 The scope of the Policy encompasses following categories of fuels as "Biofuels" which can be used as transportation fuel or in stationery applications:—

i. 'bioethanol': ethanol produced from biomass such as sugar containing materials, like sugar cane, sugar beet, sweet sorghum etc.; starch containing materials such as corn, cassava, rotten potatoes, algae etc.; and, cellulosic materials such as bagasse, wood waste, agricultural and forestry residues or other renewable resources like industrial waste;

ii. 'biodiesel': a methyl or ethyl ester of fatty acids produced from non-edible vegetable oils, acid oil, used cooking oil or animal fat and bio-oil;

iii. 'Advanced biofuels': Fuels which are (1) produced from lignocellulosic feedstocks (i.e. agricultural and forestry residues, e.g. rice & wheat straw/corn cobs & stover/bagasse, woody biomass), non-food crops (i.e. grasses, algae), or industrial waste and residue streams, (2) having low CO_2 emission or high GHG reduction and do not compete with food crops for land use. Fuels such as Second Generation (2G) Ethanol, Drop-in fuels, algae based 3G biofuels, bio-CNG, bio-methanol, Di Methyl Ether (DME) derived from bio-methanol, bio-hydrogen, drop in fuels with MSW as the source / feedstock material will qualify as "Advanced Biofuels".

iv. 'drop-in fuels': Any liquid fuel produced from Biomass, agri-residues, wastes such as Municipal Solid Wastes (MSW), Plastic wastes, Industrial wastes etc. which meets the Indian standards for MS, HSD and Jet fuel, in pure or blended form, for its subsequent utilization in vehicles without any modifications in the engine systems and can utilize existing petroleum distribution system.

v. 'bio-CNG': Purified form of bio-Gas whose composition & energy potential is similar to that of fossil based natural gas and is produced from agricultural residues, animal dung, food waste, MSW and Sewage water.

4.0 STRATEGY AND APPROACH

4.1 Government is adopting a multi-pronged approach to promote and encourage use of biofuels by

- o Blending ethanol in petrol through Ethanol Blended Petrol (EBP) Programme using ethanol derived from multiple feedstocks
- o Development of Second Generation (2G) ethanol technologies and its commercialization
- o Blending biodiesel in diesel through Biodiesel Blending Programme exploring multiple feedstocks including straight vegetable oil in stationery, low RPM engines
- o Focus on drop-in fuels produced from MSW, industrial wastes, biomass etc.
- o Focus on advanced biofuels including bio-CNG, bio-methanol, DME, bio-hydrogen, bio-jet fuel etc.

4.2 The major thrust of this policy is to ensure availability of biofuels from indigenous feedstock. As a step in this direction, a National Biomass Repository will be created by conducting appraisal of biomass across the Country.

4.3 While attempt will be made to rebalance the biofuel demand and supply side, Government aims to undertake necessary interventions as and when required with respect to domestic production, storage and distribution of biofuels adopting a consultative approach by involving all stakeholders.

4.4 Strategy will include adopting appropriate financial and fiscal measures periodically to support development and promotion of biofuels thereby enlarging their utilization in different sectors.

4.5 Research, development and demonstration will be supported to cover all aspects from feedstock production and biofuels processing for various end-use applications. Thrust will also be given to development of advanced biofuels and other new feedstocks.

5.0 INTERVENTIONS AND ENABLING MECHANISMS

A. Feedstock Availability & its Development

5.1 In India, Bioethanol can be produced from multiple sources like sugar containing materials, starch containing materials, celluloses and lignocelluloses material including petrochemical route. However, the present policy of Ethanol Blended Petrol (EBP) Programme allows bioethanol to be procured from non-food feed stock like molasses, celluloses and lignocelluloses material including petrochemical route. Similarly, biodiesel can be produced from any edible/non edible oil. However, biodiesel coming for the blending programme is presently being manufactured from imported sources like palm stearin.

5.2 Potential domestic raw materials for production of biofuels in the Country are,

For Ethanol Production :	B-Molasses, Sugarcane juice, biomass in form of grasses, agriculture residues (Rice straw, cotton stalk, corn cobs, saw dust, bagasse etc.) , sugar containing materials like sugar beet, sweet sorghum, etc. and starch containing materials such as corn, cassava, rotten potatoes etc., Damaged food grains like wheat, broken rice etc. which are unfit for human consumption, Food grains during surplus phase. Algal feedstock and cultivation of sea weeds can also be a potential feedstock for ethanol production
For Biodiesel Production :	Non- edible Oilseeds, Used Cooking Oil (UCO), Animal tallow, Acid Oil, Algal feedstock etc.
For Advanced Biofuels :	Biomass, MSW, Industrial waste, Plastic waste etc.

5.3 The scope of raw material for procurement of ethanol under EBP Programme will be increased. The policy will allow production of ethanol from B Molasses as well as directly from sugarcane juice. The policy will also allow production of ethanol from damaged food grains like wheat, broken rice etc. which are unfit for human consumption. During an agriculture crop year when there is projected over supply of food grains as anticipated by the Ministry of Agriculture & Farmers Welfare, the policy will allow conversion of these surplus quantities of food grains to ethanol, based on the approval of National Biofuel Coordination Committee proposed under this Policy. Opening of this route for ethanol production will not only help in utilizing the installed capacities of grain based distilleries but also cover all the

raw materials from which ethanol can be produced harnessing fully developed 1G technologies with minimum investment.

5.4 Identification of locations with surplus available biomass and generation of feedstock such as energy grasses and short gestation crops by utilizing wastelands will be pivotal for promoting Industrial set up. Focus shall be laid on identifying surplus biomass pockets in the country.

5.5 Village Panchayat and communities will play crucial role in augmenting indigenous feedstock supplies for biofuel production. In cases relating to usage of wastelands for feedstock generation, local communities from Gram Panchayats/ talukas will be encouraged for plantations non-edible oil seeds bearing trees/ crops such as Pongamia pinnata (Karanja), Melia azadirachta (Neem), castor, Jatropa Carcus, Callophylum Innophylum, Simarouba glauca, Hibiscus cannabbinus etc. Short Rotation Crops such as sweet sorghum and energy grasses e.g. *Miscanthus gigantum*, switchgrass (*Panicum vigratum*), giant reed (*Arundo donax*) etc. will also be planted in wastelands for generating additional feedstock for bioethanol production across country.

5.6 Farmers will be encouraged to grow variety of different biomass as well as oil seeds on their marginal lands, as inter crop and as second crop wherever only one crop is raised by them under rain fed conditions.

5.7 Suitable supply chain mechanisms, feedstock collection centres and fair price mechanisms for the engaged community will be developed in coordination with Local Bodies, States and concerned stakeholders.

5.8 Ample quantity of wastes such as MSW, Industrial waste, Plastic waste etc. is available across country with established collection mechanism. This will serve as a feedstock for generating biofuels such as bio-CNG, drop-in fuels, bio-methanol, DME, bio-hydrogen etc.

B. Blending & Bio-refinery Programme

5.9. Ethanol Blended Petrol Programme

5.9.1 Currently, ethanol for EBP programme is coming from molasses route as a by-product of sugar Industry. At the present levels of cane and sugar production (about 350 MMT & 26-28 MMT per annum respectively), the maximum quantity of molasses available is about 13 MMT, which is sufficient to produce about 300 crore litres of alcohol/ethanol. Currently, C- Heavy Molasses is being used to produce alcohol/ethanol.

5.9.2 Adoption of B- heavy Molasses route for ethanol production will be encouraged as per availability of sugar. One MMT of Sugar sacrificed can produce 60 crore litres of ethanol. By utilizing this option participation by distilleries for ethanol production would improve. Ethanol will also be allowed to be produced directly from sugarcane juice to increase blending percentage.

5.9.3 Other alternate raw materials for production of ethanol such as sugar containing materials like sugar beet, sweet sorghum, etc. and starch containing materials such as corn, cassava, rotten potatoes etc. using first generation fully developed technologies will be promoted. During surplus availabilty of foodgrains, ethanol will also be allowed to ve produced from foodgrains like corn etc, as per decision of National Bio Fuel Coordination Commiittee.

5.10 Second Generation (2G) Ethanol

5.10.1 Ethanol production through Molasses route has limitations and its competitive usage in Potable liquor & Chemical industries leaves little scope to enhance its availability for EBP Programme in a big way. This warrants exploring other sources of ethanol, apart from conventional molasses and sugarcane juice route.

5.10.2 Few studies undertaken in India have indicated a surplus biomass availability to the tune of 120 -160 MMT annually which, if converted, has the potential to yield 3000 crore litres of ethanol annually. Surplus biomass / agricultural waste which has cellulosic and lignocellulosic content, can be converted to ethanol using second generation (2G) technologies. Government of India recognized the role of biomass in taking the rural economy & EBP programme forward and has allowed procurement of ethanol produced from other non-food feedstock besides molasses, like cellulosic and lignocelluloses materials including petrochemical route, subject to meeting the relevant BIS standards. Following areas for action have been envisaged under the policy:

5.10.3 Incentives**:** Globally, 2G ethanol industry is driven by incentives as the technology is yet to be proven at commercial scale and the ethanol so produced is more environment friendly. This will be a major instrument in driving the infrastructural growth of 2G Ethanol Bio refineries.

5.10.4 Offtake Assurance: Public Sector Oil Marketing Companies have agreed to sign Ethanol Purchase Agreements (EPAs) with 2G Ethanol suppliers for period of 15 years to provide assured market to Private stakeholders and support 2G Ethanol initiatives. Bio-CNG, being one of the major by-product in 2G Ethanol Biorefineries and transport fuel, will be brought under offtake assurance by the Public sector Gas marketing companies.

5.11. Biodiesel Blending Programme

5.11.1 The overall blending percentage of biodiesel in diesel has been less than 0.5 percent in the country due to constraints pertaining to feedstock availability. Moreover, whatever biodiesel is coming for the blending programme is manufactured from imported sources. Thus ensuring domestic raw material for biodiesel production is integral for long term success of this programme.

5.11.2 In-house produced Used/Waste cooking oil (UCO/WCO) offers potential to be a source of biodiesel production. However, the same is marred by diversion of UCO to edible stream through various small eateries/vendors & traders. Focus will be laid upon laying down the stringent norms for avoiding the entry of UCO in food stream and developing a suitable collection mechanism to augment its supply for biodiesel production.

5.12 Other Biofuels (Drop-in-fuels, Bio-CNG, Bio-Hydrogen, Bio-methanol, DME, etc.)

5.12.1 Task force on Waste to Energy created by NITI Aayog has estimated generation of 62 MMT of Municipal Solid Waste (MSW) annually in India. This waste has a huge potential of producing drop-in fuels and generate power including Refused Derived fuel, biogas/electricity and compost to support agriculture.

5.12.2 World over, technologies available for converting wastes into Biofuels such as drop-in fuels, bio-CNG, bio-Hydrogen etc. are in nascent stage and need to be proven on commercial scale. Conversion of such wastes into bio-CNG is a model which will be promoted for meeting the energy demand in rural areas and address the environmental issues. Technologies providing higher yield of bio-CNG per unit of waste processed will be promoted in line with the policy. Setting up of such plants for production of advanced fuels will also be promoted through various incentives and offtake assurance. Similarly, Hydrogen, one of the costliest fuel, has found its use in many industries including Refineries. bio-hydrogen, produced from biomass and wastes, will be interesting proposition to explore.

5.12.3 World over, methanol has found its use as transport fuel in blended form with motor spirit. The same can be produced from various sources including agriculture residues, natural gas, high ash coal etc. Presently, India is a net importer of methanol. Surplus biomass availability offers potential for production of bio-methanol & bio-butanol and their application in Indian transport system will be explored.

5.12.4 Di-Methyl Ether (DME) is obtained by removing 1 molecule of water from 2 molecules of methanol, which is a chemical process, usually aided by catalyst. Use of (DME) in domestic LPG as a substitute of Propane is being explored by the R& D institutions. DME can also be a substitute for diesel in slow RPM diesel engines and hence promotion of industrial production of methanol is pertinent for widespread usage, industrial application & acceptance of DME as potential fuel.

5.12.5 Production of biofuels from Algae (3G) has promising potential in terms of high oil content, limited waste streams and minimal land requirements (compared to biomass), depending on the production pathway. Presently, the production of such fuels is at its nascent stage and need further examination with respect to commercial viability. Algae based biofuels & requisite R&D on the subject will also be promoted to attain techno-commercial viability.

C. Financing

5.13 Government will consider declaring oil expelling/extraction and processing units for production of biodiesel and storage and distribution infrastructure for biofuels as a priority sector for the purpose of lending by financial institutions.

5.14 Sourcing of multi-lateral and bi-lateral funding would be encouraged for biofuel development including carbon financing opportunities.

5.15 Joint ventures and investments in the biofuel sector would be encouraged. 100% Foreign Direct Investment (FDI) in biofuel technologies would be encouraged through automatic approval route provided biofuel so produced is for domestic use only.

D. Financial and Fiscal Incentives

5.16 Government will consider extending financial incentives including viability gap funding, subsidies and grant for biofuels. Government will classify Second Generation (2G) Ethanol, drop-in fuels, bio-CNG, algae based 3G biofuels, bio-methanol, DME, bio-hydrogen etc." as "Advanced Biofuels". A National Biofuel Fund may be considered for providing financial incentives.

5.17 The policy envisages incentivizing the nascent "Advanced Biofuel" industry with fiscal incentives in the form of tax credits, advance depreciation on plant expenditure, differential pricing vis-à-vis 1G Ethanol, Viability Gap Funding (VGF) etc. for encouraging stakeholders to set up 2G Ethanol Bio refineries. Schemes will be launched to take the "Advanced Biofuel" programme forward.

5.18 Opportunities of generating carbon credits for the savings on CO_2 emissions on the account of biofuel feedstock generation and use of biofuels, in pure or blended form, will be explored.

5.19 NABARD and other Public Sector Banks will be encouraged to provide funding, financial assistance through soft loans etc.

E. Research & Development and Demonstration

5.20 Strong technology focus is imperative for the development of second generation and advanced biofuels utilizing domestic feedstock. The Policy would encourage Innovation and provide thrust to Research & Development (R&D) and Demonstration in the field of biofuels by utilizing developed / emerging technologies while undertaking R&D activities. The R&D activities will be in the areas of developing new raw material for biofuel production, plantations, processing and conversion technologies. Efficiency Improvement and Innovation for maximizing efficiencies of different end-use applications and utilization of by-products will be encouraged. High priority will be accorded to indigenous R&D and technology development based on local feedstocks. Patents would be registered wherever possible. Research programme in the field of biofuels involving multiple institutions with clearly defined goals and milestones would be supported.

5.21 Identified areas of intensive R&D work include

(a): Biofuel feedstock production

(b): Advanced conversion technologies from identified feedstock

(c): Technologies for end use applications including modifications for biofuels

(d): Utilization of bi-products of biofuels

5.22 Pilot/ Demonstration projects will be set up for biofuel production. Grants would be provided to Research Organizations, Institutions for undertaking R&D and setting up demonstration projects, specialized centers in high technology areas. Existing R&D centres would be strengthened and linkages would be established between the research organization, institutions and industry for wider usage/application. Government will encourage participation of the Industry in R&D and technology development including transfer of know-how would be facilitated to the Industry.

5.23 Life Cycle Analysis (LCA) of emerging Technologies in biofuel sector is crucial keeping in view our commitments at international forums for reduced GHG emissions. Technologies at pilot stage with encouraging performance, promising LCA reports and in accordance to our commitments on Climate change, will be promoted as Clean Technology for subsequent deployment at demonstration / commercial scale.

5.24 A focused group may be constituted to promote Research and Development in the areas of biofuels having representatives of academic and industry besides relevant Ministries to provide knowledge connect through national, bilateral and multilateral research programmes.

F. Quality Standards

5.25 Development of test methods, procedures and protocols would be taken up on priority along with introduction of standards and certification for different biofuels and end use applications. The Bureau of Indian Standards (BIS) has already evolved standards for bioethanol, biodiesel for standalone and blended form applications. Development of specifications for higher blending levels are underway.

5.26 The Bureau of Indian Standards (BIS) would review and update the existing standards, as well as develop new standards for devices and systems for various end-use applications. Guidelines for product performance and reliability would also be developed and institutionalized in consultation with all relevant stakeholders.

5.27 The policy will encourage development of required skill sets so that trained and skilled manpower is available for adapting to the new demands of the biofuel industry.

G. Distribution & Marketing of Biofuels

5.28 Oil Marketing Companies will continue to store, distribute and market biofuels. They will be primarily responsible for maintaining and improving the storage, distribution and marketing infrastructure to meet the requirements of biofuels. Government may also consider to allow other players to distribute and market biofuels depending upon factors like ensuring quality standards, consumer awareness about blending percentages, warranty requirements etc.

H. Pricing of Biofuels

5.29 At present, the price of first generation molasses based ethanol for EBP Programme is being determined by the Government based on the recommendation of a Committee constituted for this purpose. For procurement of biodiesel for blending in diesel, the price is being determined by OMCs. The Government will continue to incentivise first generation biofuels by administered prices or market determined prices depending upon various factors including market conditions, availability of biofuels in domestic market, import substitution requirement, etc. The advanced biofuels will be given a differential pricing to further incentivise them. The mechanism for differential pricing for advanced biofuels will be decided by the National Biofuel Coordination Committee.

6.0 IMPORT & EXPORT OF BIOFUELS

6.1 Indigenous production of biofuels would be encouraged by a set of practical and judicious incentives. The Policy emphasizes development of domestic Biofuel Industry and Feedstock. Allowing import will adversely affect domestic biofuels and hence import of biofuels will not be allowed.

6.2 The policy encourages augmenting indigenous feedstock supplies for biofuel production utilizing the wastelands for feedstock generation. However, depending upon availability of domestic feedstock and blending requirement, import of feedstock for production of bio diesel would be permitted to the extent necessary. Feedstock import requirements will be decided by the National Biofuel Coordination Committee proposed under this Policy.

6.3 As the domestic biofuels availability is much lower than the Country's requirement, export of biofuels will not be allowed.

7.0 ROLE OF STAKE HOLDERS

7.1 Active participation of all stakeholders viz. Ministries/Departments, the State Governments Farmers, Business & Industry and Professionals will be ensured in following areas:

(i) Generation of feedstock in sustainable manner on wastelands.

(ii) Encourage farmers to grow varieties of feed stock on their marginal lands

(iii) Establishment of suitable supply chain for feedstock.

(iv) Feedstock storage infrastructure.

(v) Single window clearances & expeditious approvals.

(vi) Incentives such as tax incentives, subsidized power, water supply, access roads etc. to biofuel Plants

A Role of States

7.2 The successful implementation of biofuel programme largely depends on the active participation of the States. The learning experiences of the States who have set up Biofuel Development Boards will be utilized for setting up Biofuel Boards in other States and the State Governments would be encouraged to suitably empower these agencies/boards for development and promotion of biofuels in their respective States. Other Stake holders will also be enrolled for the programme.

7.3 State Governments would also be required to decide on land use for plantation of non-edible oilseed bearing plants or other feedstocks of biofuels and on allotment of Government wasteland, degraded land for raising such plantations. Creation of necessary infrastructure would also have to be facilitated to support biofuel projects across the entire value chain.

7.4 States will also be encouraged for granting single window clearances in setting up biofuel plants. State Governments will also be pursued for supporting initial few Biofuel plants with fiscal incentives, tax rebates, supply of subsidized power, land allocation on priority at subsidized rates.

B. Role of Ministries/Departments

7.5 The role of different Ministries and Departments for effective implementation of biofuels programme in the Country is tabulated below:

Ministry/Department	**Role**
Ministry of Petroleum & Natural Gas	• Overall Coordinating Ministry for development of biofuels • National Biofuel policy & its implementation • Research, Development & Demonstration on applications of biofuels • Marketing and Distribution of biofuels • Blending levels of biofuels • Development & Implementation of Pricing & Procurement Policy • Dispute redressal • Foster international collaboration for advance Biofuel research and Capacity Building • MSW to transportation fuels
Ministry of Rural Development	• Plantation, Supply Chain activities along with Rural livelihood programmes, MGNREGA etc.
Department of Agriculture & Cooperation (Ministry of Agriculture & FW)	• Production of plant materials through Nurseries and plantations for biofuels in coordination with other Ministries
Ministry of Environment, forest and Climate Change (MoEF&CC)	• Biofuel plantations in forest lands and environmental issues concerning biofuels • Involvement of communities in maintenance of plantations and supply chain
Ministry of Science and Technology (Department of Biotechnology and Department of Science & Technology)	• R&D&D on various feedstocks and improvement of technologies for Biofuel development. • Promote innovation and cutting edge research in Biofuel area. • Development of technologies for bio-refinery and value added products.
Ministry of Road Transport and Highways	• Encourage consumption/usage of Biofuels in transport sector
Ministry of Railways	• Encourage consumption/usage of Biofuels
Department of Consumer Affairs (Ministry of CA, F&PD)	• Laying down specifications, standards and codes for ensuring quality control of biofuels for end uses
Ministry of Heavy Industries and Public Enterprises	• To advise Manufacturers of Equipment for making them compatible with biofuels available in the market
Ministry of New & Renewable	• To generate/produce energy through biogas including enriched biogas,

Energy	bio-CNG and bio-power etc. from biomass/urban, industrial and agricultural waste.
Ministry of Housing & Urban Poverty Alleviation	• To coordinate with States and ULBs for the availability of MSW as an important feed stock for biofuels including municipal solid waste in urban areas for which the policies are being enunciated by this Ministry
Ministry of Consumer Affairs, Food & Public Distribution, Department of Food & Public Distribution	• DFPD to provide suitable financial incentives to the sugar sector for setting up of ethanol distilleries

8.0 INTERNATIONAL COOPERATION

8.1 Owing to renewed focus in the field of biofuels, scientific and technical cooperation will be established internationally in accordance with national priorities. This will include cooperation in joint research and technology development, field studies, pilot scale plants and demonstration projects involving R&D institutes and industry. Appropriate bilateral and multi-lateral cooperation programmes for sharing of technologies and funding would be developed.

9.0 INSTITUTIONAL MECHANISMS

A. Biofuel Policy Institutional Mechanism at the Centre

9.1 Under the Allocation of Business Rules, responsibilities have also been allocated to various Ministries to deal with different aspects of biofuel development and promotion in the country. Synergy is required between various departments and agencies due to the broader outlook/scope of work involved. This calls for an empowered Committee for policy guidance and early review on different aspects of biofuel development, promotion and utilization.

9.2 It is envisaged to set up a National Biofuel Coordination Committee (NBCC) headed by the Minister, Petroleum and Natural Gas and representatives of concerned Ministries would be the Members of this Committee. The Committee would meet periodically to provide overall coordination, effective end-to-end implementation and monitoring of biofuel programmes. The National Biofuel Coordination Committee will have the following composition:

Chairman: Minister of Petroleum & Natural Gas

Members:

i. Secretary, Ministry of Petroleum & Natural Gas

ii. Secretary, Department of Rural Development, Ministry of Rural Development

iii. Secretary, Department of Agriculture, Cooperation and Farmers Welfare, Ministry of Agriculture & Farmers Welfare

iv. Secretary, Ministry of Environment, Forest & Climate Change

v. Secretary, Department of Science & Technology, Ministry of Science & Technology

vi. Secretary, Department of Expenditure, Ministry of Finance

vii. Secretary, Ministry of Road Transport and Highways

viii. Chairman Railway Board

ix. Secretary, Department of Food & Public Distribution, Ministry of Consumer Affairs, Food & Public Distribution

x. Secretary, Department of Heavy Industry, Ministry of Heavy Industries and Public Enterprises

xi. Secretary, Department of Bio-Technology, Ministry of Science & Technology

xii. Secretary, Ministry of New & Renewable Energy

xiii. Secretary, Ministry of Housing & Urban Poverty Alleviation

xiv. CEO, NITI Aayog

xv. Joint Secretary (Refinery), Ministry of Petroleum & Natural Gas – Member Secretary

9.3 Working Group on Biofuels - In order to monitor the implementation of biofuel programme, a Working Group will be setup. This Working Group will have the following composition:—

Chairman: Joint Secretary (Refinery), Ministry of Petroleum & Natural Gas

Members:

(i) Eminent experts in the field of biofuels nominated by MoP&NG

(ii) Technical experts from research and academic institutions in the field of biofuels

(iii) Representatives from relevant Ministries/Departments as mentioned in 9.2 above

(iv) Representatives of OMCs

(v) Representative of PCRA

(vi) Representatives/ Experts from the Industry, CSIR Lab, National Sugar Institute & Biofuel Associations

B. Biofuel Institutional Mechanism at the States Level

9.4 The policy encourages setting up of State Level Biofuel Development Boards in line with the broad contours and provisions of this National Policy on Biofuels. Five such Boards are functional in the States of Chattisgarh, Uttar Pradesh, Karnataka, Rajasthan and Uttarakhand. The State Governments aid these Boards and are entirely responsible for their functioning. Other States will be encouraged to set up similar boards to promote biofuels in their respective States in line with the broader objectives of this National Policy on Biofuels. The existing boards will be encouraged to undertake handholding activities so that more and more States participate in the biofuel programme.

SANDEEP POUNDRIK, Jt. Secy.

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Abellon

Ref No: ACEL/CERC/24/007 **Date:** 04.03.2024

To,
The Chief (Regulatory Affairs)
Central Electricity Regulatory Commission ("**CERC**")
New Delhi

Subject: Request for inclusion of Auxiliary fuel to extent of 4-5% in Municipal Solid Waste ("**MSW**") to Energy Plant for Start-up and Shut-down activity of the MSW plants as well as temperature stabilization during monsoon.

Respected Sir,

We, Abellon CleanEnergy Ltd. ("**ACEL**") are an integrated waste management company based at Gujarat and are engaged in scientific disposal of Municipal Solid Waste ("**MSW**") at our Waste-to-Energy ("**WTE**") Facilities. We have commissioned Gujarat's first MSW to Energy project under Public-Private Partnership (PPP) model at Jamnagar on 15 November, 2021 and three WTE Projects are currently under development at Rajkot, Vadodara and Ahmedabad.

We write with reference to draft Central Electricity Regulatory Commission (Terms and Conditions for Tariff determination from Renewable Energy Sources) Regulations, 2024 issued dated 17.02.2024.

The WTE sector is currently in nascent stages in India and is facing several challenges and hurdles. The WTE projects are established under PPP model with the sole objective of solving the waste crisis of the country which are well defined in the Swachh Bharat Mission guidelines.

We seek that Auxiliary fuel to be allowed during the start-up and shutdown activity of the MSW based WTE plants. If during start-up activity use of auxiliary fuel is not allowed, the boiler can't be lighten up due to the low Gross Calorific ("**GCV**") of the MSW/RDF. And during Shut-down Activity the temperature of 850 °C is required to maintain to burn complete waste available at the Boiler which is possible only with the help of Auxiliary fuel.

The Gujarat Pollution Control Board("**GPCB**") has issued Standard Operating procedures ("**SOP**") for utilisation of Non-recyclable Solid Wastes ("**NRSW**") (including Plastic Waste), ETP Sludge, Deinking Sludge from Waste Paper based Paper Mills and Refused Derived Fuel ("**RDF**") in Industrial Boiler / Waste to Energy Plant in the month of November 2023. The relevant para of the GPCB SOP are reproduced in **exhibit 1**.

Abellon Cleanenergy Limited
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After reading GPCB SOP, it's inferred that in order to use MSW/RDF into the combustion chamber of Boiler, the minimum temperature of boiler should be 850 °C or above. If MSW/RDF are inserted in the Boiler before temperature of 850 °C, the harmful gases such as Dioxin and Furans will be released, which is threat for the environment. Similarly, during the Shut-down Activity the waste(MSW/RDF) left in the Boiler are required to be burn completely, which is only possible with the help of auxiliary fuel. Thus, WTE plants are require to use auxiliary fuel to maintain a temperature of 850°C during start-up and shut-down activity of the MSW/RDF based WTE Plants.

Further, during monsoon season the MSW/RDF fuel has more moisture content. In order to mitigate the impact of moisture and keep the WTE plant running and maintain the adequate temperature, it is required to use auxiliary fuel to keep the plant running at required efficiency.

The European Commission published a report on *"Best available Techniques (BAT) reference document for Waste Incineration"* prepared by European Integrated Pollution Prevention and Control Bureau (EIPPCB) in year 2019. This BAT reference document for Waste Incineration forms part of a series presenting the results of an exchange of information between EU Member States, the industries concerned, non-governmental organizations promoting environmental protection and the Commission, to draw up, review and, where necessary, update BAT reference documents.

The said report suggest that during the star-up activity of the plant, the best practice is to insert waste in the combustion temperature after temperature of 850 °C is achieved. It is not advisable to insert waste before the temperature of 850 °C. During shutdown, to keep the furnace temperature at the desired level until there is no more unburnt waste in the furnace. The use of Auxiliary fuel which is of non-waste(coal or coke) type has been described which will help in enhancing the temperature of combustion chamber to required level during start-up, Shut down and plant operation. The relevant para of the European Commission BAT report are re produced in **exhibit 2**.

Although, Europe has allowed fossil fuel (coal or coke) as auxiliary fuel, however, in the interest of environment and robust compliance to objectives we are suggesting Biomass to be used as auxiliary fuel, which is renewable in nature.

Hon'ble CERC and Hon'ble Gujarat Electricity Regulatory Commission in their tariff orders/Regulations are silent about use of other fuel for the MSW/RDF based WTE plants. In the absence of clear guidelines for use of auxiliary fuel, it will be difficult to run the plant in a complaint manner.

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Our Request :

We request the Hon'ble CERC to address our concerns in the draft Central Electricity Regulatory Commission (Terms and Conditions for Tariff determination from Renewable Energy Sources) Regulations, 2024:

1. Allow the provision to use auxiliary fuel in the MSW/RDF based WTE plants to maintain optimum temperature of 850 °C during start-up activity, shut down activity and operations during Monsoon session in the plant to avoid release of *dioxin & Furans*.
2. To allow Biomass as auxiliary fuel to extent of 4-5% of MSW/RDF in the WTE plants as a temperature stabilizer.

We believe that the fulfilling our request will enhance the performance of the WTE plants for scientifically disposing of the waste and thus avoid the emission of any harmful gases.

We look forward to your valuable support and consideration in interest of the development of the WTE sector in the country.

Thanking you,

Yours faithfully,

For, **Abellon CleanEnergy Ltd.**

_____

(Authorized Signatory)

CC:

1. **Senior Adviser Renewable energy, CERC, New Delhi**

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Exhibit

Exhibit 1:

The relevant para of the Gujarat Pollution Control Boards, Standard Operating Procedure (SOP) for Utilization of Non- recyclable Solid Wastes (NRSW) (including Plastic Waste), ETP Sludge, Deinking Sludge from Waste Paper based Paper Mills And Refused Derived Fuel (RDF) in Industrial Boiler / Waste to Energy Plant in the month of November 2023, is reproduced below:

"5.1 Design and Operational Aspects of Boiler:

a) *A well designed waste to energy/ steam boiler having capacity not less than 10 TPH is to be provided for the purpose. It should be suitably designed for feeding and combustion of different type of wastes mentioned in this SOP.*
b) *Combustion system of boiler must be designed to maintain combustion temperature above 850 degree centigrade with a flue gas residence time at least 2 seconds during combustion to avoid formation of dioxin & Furans.*
c) *The auxiliary fuel is to be used to reach required temperature of 850 degree centigrade before starting waste feeding.*
d) *Automatic startup of auxiliary fuel system is to be provided for maintaining the temperature at 850 degree centigrade, in case temperature starts going down. However, characteristics of the waste feed should be preferably such that it will not require auxiliary fuel more than 20% of total fuel requirement.*
e) *Startup/ shutdown procedure following above requirement is to be derived and strictly followed to maintain combustion temperature above 850 degree centigrade with gas residence time of 2 seconds all the times.*
f) *Fuel firing system of Waste to Energy shall consist of Silo / Fuel Feed Hopper, Ram Feeder, Combustion Grate with hydraulic drive.*
g) *The combustion chamber to be scientifically designed and sized for the*
h) *complete combustion of carryovers and controlling the super heater inlet gas temperature and also to ensure providing proper residence time for the complete combustion of non-recyclable solid waste.*
i) *Air system should have a facility to supply primary (combustion) and secondary air to the boiler.*
j) *The combustion chamber should be provided with an adequate special refractory to counter the erosion and corrosion as well as to ensure that heat is contained within the combustor. Refractory with higher percentage of silicon carbide is preferred.*
k) *Flue gas shall pass through super heaters, evaporators, economizer, flue gas cleaning systems, ID fans before final exhaust into the atmosphere through*

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chimney of adequate height.

l) The combustor must be designed in line with the best available technologies to ensure stable and continuous operation and complete burnout of the waste and flue gases."

Exhibit 2.

Relevant para from the European Commission report on "*Best available Techniques (BAT) reference document for Waste Incineration*" prepared by European Integrated Pollution Prevention and Control Bureau (EIPPCB) year 2019

"2.3.1.7 Auxiliary burners

At start-up, auxiliary burners are used to heat up the furnace to a specified temperature before any waste is added. During operation, the burners are switched on automatically if the temperature falls below the specified value. During shutdown, the burners are used until there is no more unburnt waste in the furnace to keep the furnace temperature at the desired level

1.3.2 Rotary kilns

Rotary kilns are very robust and almost any waste, regardless of type and composition, can be incinerated. Rotary kilns are, in particular, very widely applied for the incineration of hazardous wastes and most hazardous clinical waste is incinerated in high-temperature rotary kiln incinerators. [64, TWG 2003]

Operating temperatures of rotary kilns range from around 500 °C (as a gasifier) to 1450 °C (as a high-temperature ash melting kiln). ***Higher temperatures are sometimes encountered, but usually in non-waste incineration applications. When used for conventional oxidative combustion, the kiln temperature is generally above 850 °C****. Kiln temperatures in the range of 900–1 200 °C are typical when incinerating hazardous wastes.*

Generally, and depending on the waste input, the higher the operating temperature, the greater the risk of fouling and thermal stress damage to the refractory kiln lining. Some kilns have a cooling jacket (using air or water) that helps to extend refractory life, and therefore the time between maintenance shutdowns.

2.4.3.1 Energy inputs to waste incinerators

In addition to the energy in the waste, there are other inputs to the incinerator that need to be recognised when considering the energy efficiency of the plant as a whole.

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Electricity inputs

Electricity is needed to run the process. The source can be external or circulated.
Steam/heat/hot water inputs
Steam (or hot water or other heat carrier) can be used in the process. The source can be external or circulated.
Non-waste fuels
Non-waste fuels are used to:

i. *Preheat the combustion air;*
ii. ***Increase the temperature in the combustion chamber to the required level during start-up before the plant is fed with waste;***
iii. ***Ensure that the required combustion chamber temperatures are maintained during plant operation;***
iv. ***Maintain the temperature in the combustion chamber at the required level during shutdown, while there is still unburned waste in the plant;***
v. *Heat up the flue-gas for treatment in specific devices, such as selective catalytic reduction SCR or bag filters;*
vi. *Heat up the flue-gas (e.g. after wet scrubbers) in order to avoid bag filter and stack corrosion, and to suppress plume visibility."*

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Standard Operating Procedure (SOP)
for
Utilization of Non-recyclable Solid Wastes (NRSW) (including Plastic Waste), ETP Sludge, Deinking Sludge from Waste Paper based Paper Mills
and
Refused Derived Fuel (RDF) in Industrial Boiler / Waste to Energy Plant

November, 2023

Gujarat Pollution Control Board
Sector 10-A, Gandhinagar

Publication date: November, 2023

Disclaimer:

The purpose of this SOP is to standardize the process and provide guidance to the Industry. This document does not entitle any entity for any sort of relaxation/ exemption from prescribed norms or any of the conditions prescribed under any environmental law/ rules. This SOP does not overrule any Notification, Office Memorandum, Guidelines of CPCB/ MoEF&CC.

1. Introduction

A number of waste paper based paper mills technically considered as Recycle Fiber (RCF) based paper mills are operating in the state of Gujarat. These paper mills while recycling waste papers, are generating various non-recyclable solid wastes (NRSW) including plastic waste in different proportion along with ETP sludge and deinking sludge, a disposal of which is a complex issue.

All recycle fiber based paper mill are utilizing mainly imported waste paper as a raw material while manufacturing various end products like MG craft paper, duplex boards etc. and that generates NRSW & other wastes.

Initially Gujarat Paper Mill Association (GPMA) had tied up with cement industry for utilization of plastic wastes and rejects generated by member industries for co-processing; however, need was felt by GPMA to use these wastes for the recovery of energy from the wastes through waste to energy boiler. Moreover, Circular Economy concept also promotes the utilization of the wastes as resource.

These wastes are having calorific value and therefore suitable for energy recovery as per **"SWM Rules-2016"**. CPCB has also prepared SOP in December – 2016 titled ***"SOP for utilization of ETP sludge generated from pulp and paper industry (chemical sludge (primary sludge) of ETP including sludge from secondary clarifier)"*** for energy recovery in boiler(s) for steam or electricity generation.

Board in the past issued trial permissions to few paper mills through Gujarat Paper Mills Association (GPMA) for the utilization of plastic waste into boiler as fuel subject to detailed study by the institute of national repute.

CSIR-NEERI has conducted a detailed study in this regard at 14 TPH capacity waste to energy vertical type boiler of a RCF mill (a member of GPMA). NEERI caried out study through trials for various combination of wastes (viz. plastic waste, biological ETP sludge and deinking sludge) and monitored various pollutants like PM, SO2, NOx, TOC, HCl, HF, Heavy Metals, Dioxin & Furan. The trials were successful. The outcome of study shows encouraging results. NEERI came out with the broad guidelines in this regard.

2. Need of SOP

Since Gujarat houses more than 100 waste paper based paper mills, there is huge generation of wastes from this mills require environmentally sound management & disposal. There is a need of alternate option to co-processing of these wastes. In the context, Board received requests from many such recycle fiber based paper mills and waste to energy plants for utilization of plastic waste, refused derived fuel (RDF), NRSW to use as a fuel following waste to energy concept. A need was felt to prepare detailed standard operating procedure so as to manage and dispose

these wastes in environmentally sound manner. Based on study carried out by NEERI on the subject and recommendation, the SOP is prepared for utilization of plastic & other wastes in industrial boiler.

3. Aim of SOP

The aim of this SOP is to facilitate utilization of Non-recyclable solid wastes (NRSW) including plastic waste, ETP sludge & deinking sludge (from waste paper based paper mill) and RDF in industrial boiler in environmentally sound manner.

4. Scope of SOP

a) This SOP is applicable as follow:

Type of wastes	Source of generation	Utilization
Non-recyclable solid wastes (NRSW) including plastic waste, ETP sludge & deinking sludge	Waste paper based paper mill	As fuel in Industrial boiler (atmospheric / pressurized / circulating fluidized bed combustion) or Waste to energy plants
Refused derived fuel (RDF)	Municipal solid waste	

b) This SOP is applicable to all existing and proposed Industrial Boiler and Waste to Energy plant intended to use wastes as above. ***The existing units shall have to upgrade their existing facility compliant to this SOP and have to submit the design and performance evaluation as well as adequacy of the system operations certified by Schedule-I Auditor within two months.***

5. Standard operating procedure for utilization of Non-recyclable solid wastes (NRSW) including plastic waste, ETP sludge & deinking sludge (from waste paper based paper mill) and RDF in industrial boiler and waste to energy plants.

5.1 Design and Operational Aspects of Boiler:

a) A well designed waste to energy/ steam boiler having capacity not less than 10 TPH is to be provided for the purpose. It should be suitably designed for feeding and combustion of different type of wastes mentioned in this SOP.

b) Combustion system of boiler must be designed to maintain combustion temperature above 850 degree centigrade with a flue gas residence time at least 2 seconds during combustion to avoid formation of dioxin & Furans.

c) The auxiliary fuel is to be used to reach required temperature of 850 degree centigrade before starting waste feeding.

d) Automatic startup of auxiliary fuel system is to be provided for maintaining the temperature at 850 degree centigrade, in case temperature starts going down. However, characteristics of the waste feed should be preferably such that it will not require auxiliary fuel more than 20% of total fuel requirement.

e) Startup/ shutdown procedure following above requirement is to be derived and strictly followed to maintain combustion temperature above 850 degree centigrade with gas residence time of 2 seconds all the times.
f) Fuel firing system of Waste to Energy shall consist of Silo / Fuel Feed Hopper, Ram Feeder, Combustion Grate with hydraulic drive.
g) The combustion chamber to be scientifically designed and sized for the complete combustion of carryovers and controlling the super heater inlet gas temperature and also to ensure providing proper residence time for the complete combustion of non-recyclable solid waste.
h) Air system should have a facility to supply primary (combustion) and secondary air to the boiler.
i) The combustion chamber should be provided with an adequate special refractory to counter the erosion and corrosion as well as to ensure that heat is contained within the combustor. Refractory with higher percentage of silicon carbide is preferred.
j) Flue gas shall pass through super heaters, evaporators, economizer, flue gas cleaning systems, ID fans before final exhaust into the atmosphere through chimney of adequate height.
k) The combustor must be designed in line with the best available technologies to ensure stable and continuous operation and complete burnout of the waste and flue gases.

5.2 Air Pollution Control Mechanism:

a) A well designed flue gas cleaning system is to be provided to achieve the required emission norms.
b) Selective Non-Catalytic Reduction (SNCR) system should be provided for control of NOx by injecting ammonia or any other suitable reagent.
c) A dry flue gas cleaning system in first pass shall consist of addition of hydrated lime powder and powdered activated carbon (PAC). The facility for reagent storage (silo), preparation, and delivery section shall be provided.
d) Hydrated lime powder section is meant for the removal of SOx and HCl where Powdered activated carbon (PAC) section is meant for removal of heavy metals and dioxin & furan.
e) Pulse Jet Fabric filter (bag filters) should be provided for continuous removal of particulate matter from flue gas stream containing reaction products and un-reacted sorbents. Dislodged dust shall fall into the collection hoppers and shall be conveyed through slide gates and rotary air valves to silo by a pneumatic/ mechanical conveying system.
f) Flue gas quenching system must be provided to bring down the temperature @ 200 degree centigrade within 2 seconds.

5.3 Automation & Control Mechanism:

The whole system is to be provided with automation like DCS/SCADA to monitor and maintain operational parameters like temperature, air flow, waste feeding rate, residence time, etc.

5.4 Feed Characteristics:

a) Non-recyclable solid waste (NRSW) including plastic waste / RDF along with any commercially available approved fuel may be utilized up to 100% feed rate.
b) Along with NRSW including plastic waste / RDF/ approved fuel, ETP sludge and deinking sludge generated from RCF mills may also be utilized in a suitable ratio that the overall calorific value of the composite wastes should be more than 1500 Kcal/kg.
c) The feed material should be of smaller size and homogenized. Also feed material should be free from metal, chlorinated & hazardous material.
d) The composite feed should have moisture content less than 40%.

5.5 Feeding Mechanism:

a) There should be a controlled feeding mechanism provided to avoid unstable combustion and bulk emission load.
b) Proper grinding and mixing mechanism to be provided to have smaller size and homogenous mixing of waste suitable for feeding into the boiler.
c) Efficient waste segregation system should be provided to separate out metal and other chlorinated waste / hazardous waste (other than wastes mentioned in this SOP) from the feed waste and shall not be used as a feed under any circumstances.
d) In case of moisture content higher than 40%, a suitable dewatering system such as dryer, compactor, screw press, etc. should be provided.
e) Dedicated storage area for storing the Waste to Energy Feed waste shall be provided with leachate collection system. Leachate shall be adequately collected and to be treated in the in-house ETP. It is recommended to have several tumbling and storage of at least one day before use.
f) Automated feeding system should be provided to maintain feed rate in required ratio.

5.6 Fly ash management

Particulate matter removed and collected as fly ash/ solid waste should be analyzed for its characteristics, and disposed off to TSDF site, if found hazardous or else may be disposed off following fly ash notification.

5.7 Monitoring mechanism:

a) OCEMS system should be provided for online monitoring of stack emissions for PM, SO2, NOx, HCl, HF parameters.

b) Any change in APCM and fuel combination etc. other than included in SOP shall have to first approved through institute of national repute like NEERI, IIT etc.

5.8 Legal requirements:

a) The holistic design of the waste to energy/steam boiler system including APCMs shall be evaluated & certified by Schedule-I auditor and shall be submitted with the application for Consent to Establish (CtE).

b) The performance evaluation and adequacy of the system operations is to be certified by Schedule-I Auditor and shall be submitted with the application for Consent to Operate (CCA).

c) The emission norms shall be as below for the stack connected to waste feed based industrial boiler / waste to energy plant;

Parameter	Emission standard	
Particulates	50 mg/Nm3	Standard refers to half hourly average value
SO2	200 mg/Nm3	Standard refers to half hourly average value
NOx	400 mg/Nm3	Standard refers to half hourly average value
HCl	50 mg/Nm3	Standard refers to half hourly average value
HF	4 mg/Nm3	Standard refers to half hourly average value
CO	100 mg/Nm3 50 mg/Nm3	Standard refers to half hourly average value Standard refers to daily average value
Total Organic Carbon	20 mg/Nm3	Standard refers to half hourly average value
Total dioxins and furans	0.1 ng TEQ/Nm3	Standard refers to 6-8 hours sampling. Please refer guidelines for 17 concerned congeners for toxic equivalence values to arrive at total toxic equivalence.
Cd + Th + their compounds	0.05 mg/Nm3	Standard refers to sampling time anywhere between 30 minutes and 8 hours.
Hg and its compounds	0.05 mg/Nm3	Standard refers to sampling time anywhere between 30 minutes and 8 hours.
Sb + As + Pb + Cr + Co + Cu + Mn + Ni + V + their compounds	0.5 mg/Nm3	Standard refers to sampling time anywhere between 30 minutes and 8 hours.

Note: All values corrected to 11% oxygen on a dry basis.

Ref.: (1) NEERI report on utilization of waste in industrial boiler at recycled fiber based paper mill in Gujarat (2) SWM rules 2016.

Figure 1: Indicative Flow Chart of Standard Operating Procedures for Utilization of Wastes in Industrial Boiler

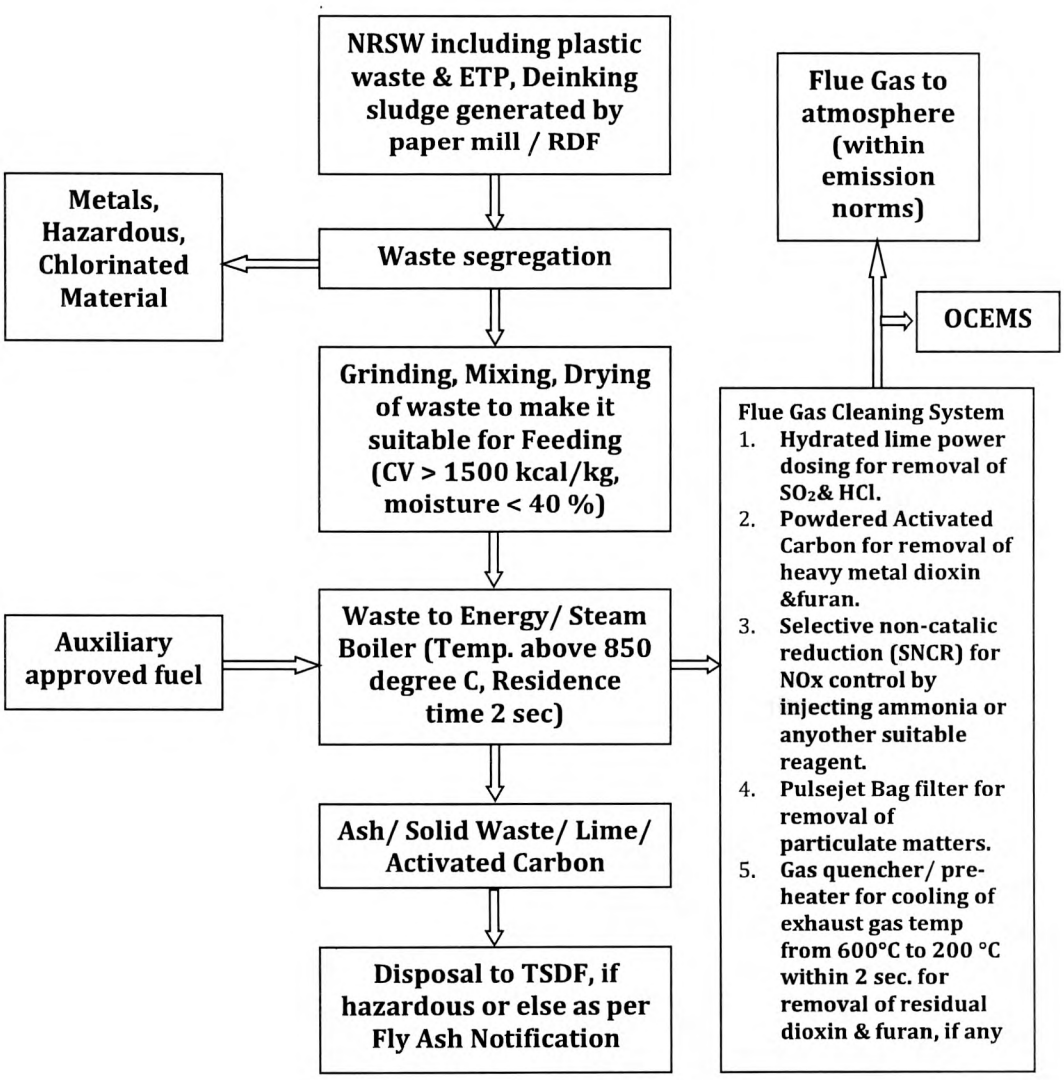
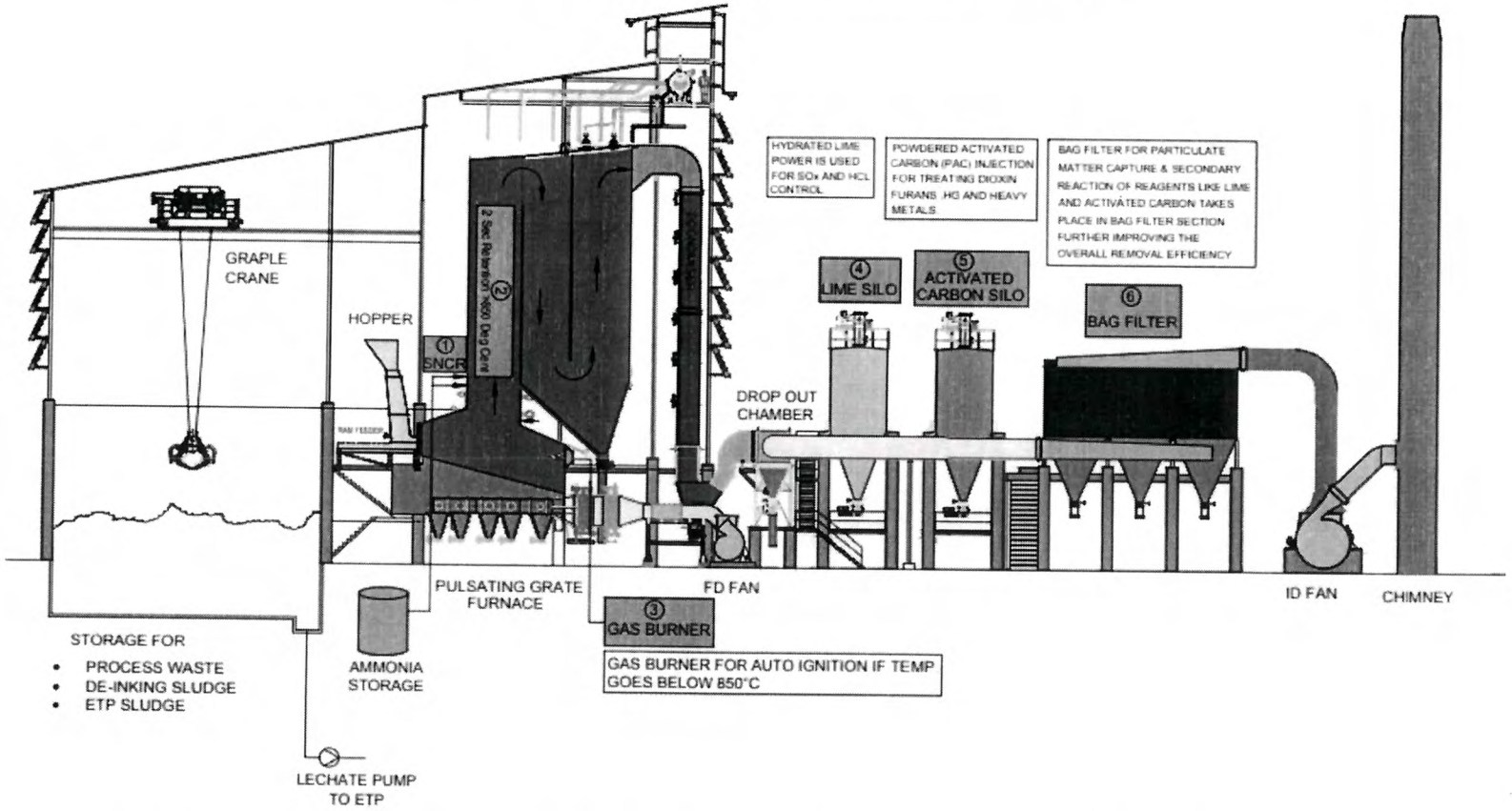


Figure 2: Typical sketch of waste based Boiler and APCM



Courtesy: NEERI report of October, 2023 on utilization of waste in industrial boiler at recycled fiber based paper mill in Gujarat