सत्यमेव जयते
GOVERNMENT OF INDIA
MINISTRY OF POWER

Azadi Ka Amrit Mahotsav

SUSTAINABLE AGRARIAN MISSION ON USE OF AGRI-RESIDUE IN THERMAL POWER PLANTS
सतत कृषि आधारित विद्युत संयंत्रों में बायोमास के उपयोग पर मिशन
समर्थ
SAMARTH

Everything about SAMARTH Mission & Ministry of Power's Policy on Biomass Co-firing in Thermal Power Plants

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Frequently Asked Questions (FAQ) regarding SAMARTH mission and Ministry of Power's policy on Biomass Co-firing in Thermal Power Plants

Q: What is SAMARTH mission?

A: SAMARTH (Sustainable Agrarian Mission on use of Agri-Residue in Thermal Power Plants) also known as National Mission on use of Biomass in TPPs has been set-up by Ministry of Power (MOP) on dated 12.07.2021 to address the issue of air pollution due to farm stubble burning and to reduce carbon footprints of thermal power generation.

Q: What is Biomass Policy?

A: In order to reduce the carbon foot-print and to reduce the burning of agro-residue by the farmers, Ministry of Power has issued Revised Biomass Co-Firing Policy on 08.10.2021. As per the policy, Thermal Power Plants in the country have been mandated to use of 5 to 7% biomass pellets, made primarily of agro-residue, along with coal.

Q: What are the advantages of Biomass co-firing?

A: Advantages of Biomass co-firing are as follows:

1. Power Generation: Co-firing enables the use of surplus biomass, which was earlier burnt in the fields, for generation of electricity for millions of homes.
2. Reduction Stubble Burning: Farmers would no longer need to burn the agro-residue as it can now be used for pellet manufacturing affording them additional income and several other benefits.
3. GHG reduction: Biomass co-firing is a suitable method to reduce GHG emission, because the process reduces net CO_2, PM, SO_2 and often NO_X emissions, compared to coal combustion.
4. Carbon neutral – Net Zero emissions: Enhancing climate and reducing Carbon Footprint
5. Existing Infrastructure utilization: With biomass co-firing we can use the infrastructure of existing thermal power plants in the country without the need to build dedicated biomass fired power plants.
6. Reduction in Coal Dependency: It reduces the over reliance on coal for Power generation.
7. Employment generation: Development of Biomass sector will lead to employment generation for all sectors including MSME, Agriculture, Power sector, etc.

FARMERS

Q: What is agro-residue?

A: Agro-residue is the post-harvest leftover portion, such as stubble/ straw/ stalk/ husk etc., of an agricultural crop.

Q: What type of crops are included in biomass/ agro-residues?

A: Agro-residue i.e. the leftover portion of the agriculture produce such as stubble/straw/stalk/husk which are surplus and not being used as animal fodder can be used for co-firing in TPPs. This includes agro-residue obtained from crops like Paddy, Soya, Arhar, Gwar, Cotton, Gram, Jawar, Bajra, Moong, Mustard, Sesame, Til, Maize, Sunflower, Jute, Coffee, etc. as well as Groundnut Shell, Coconut Shell, Castor Seed Shell etc.

In addition, pellets made from the following agro product/crop/waste can also be used for cofiring in TPPs:

a. Bamboo and its by-products (e.g. Bamboo Chips, Cuttings, Bamboo Dust etc.).
b. Horticulture waste such as dry leaves and trimmings obtained from maintenance & pruning of trees and plants.
c. Other biomass such as Pine Cone/ Needle, Elephant Grass, Sarkanda etc.

How Biomass cofiring is beneficial to the farmers?

Development of Biomass Cofiring Ecosystem shall have direct and indirect benefits for farmers as follows:

- Additional income source for farmers through selling of Agro-residue.
- Employment generation for many small farmers employed for initial processing of agro-residue.
- Improves soil health by saving from negative effects of stubble burning.
- Helps the farmers to clear the land for next crop at no cost.

Q: How is the burning of Agro-residue in Power Plant different from the burning of Agro-residue in Farm Fields?

A: Agro-residue burning in open farm fields releases particulate matter, leading to degradation in air quality and loss of nutrients & organic matter from soil. In contrast, the combustion of Agro-residue pellets in Thermal Power Plants takes place in controlled environment leaving lesser emissions. Further, by using biomass in place of coal, we save a corresponding amount of coal and CO_2 emissions.

Q: How can I sell my agro-residue for biomass co-firing?

A: For Pellet/Briquette Manufacturing Agro-residue can be sold through Biomass Aggregators/Digital e-market platforms or directly to Pellet Manufacturers.

Q: Who will collect the biomass from the fields and in what form it will be sold?

A: Depending on the locality, various practices are prevailing for the Biomass Collection/Transportation/Procurement. As per the volume of Raw Biomass, the collection processes such as Slashing, Raking, and Baling can be manual/mechanized. Normally, Biomass Aggregators are collecting the Raw Biomass from the fields and supplying to Pellet Manufacturer in Baled form. At many instances, this is being done by Farmers or Pellet Manufacturers also.

Q: How do I know if my agro-residue is suitable for Biomass Pellets?

A: The suitability of agro-residue for biomass pellets depends on various factors, such as the moisture content, ash content, and chemical composition.

As per Model Contract issued by MoP, Biomass includes agro-residue obtained from crops like Paddy, Soya, Arhar, Gwar, Cotton, Gram, Jawar, Bajra, Moong, Mustard, Sesame, Til, Maize, Sunflower, Jute, Coffee, etc. as well as Groundnut Shell, Coconut Shell, Castor Seed Shell etc.

In addition, pellets made from the following agro product/crop/waste can also be used for cofiring in TPPs:

a. Bamboo and its by-products (e.g. Bamboo Chips, Cuttings, Bamboo Dust etc.).
b. Horticulture waste such as dry leaves and trimmings obtained from maintenance & pruning of trees and plants.
c. Other biomass such as Pine Cone/ Needle, Elephant Grass, Sarkanda etc.
d. It is useful to keep the moisture content of biomass as low as possible as presence of excess moisture is likely to reduce the energy content of the raw material.

Q: How much can I sell my agro-residue for?

A: The price of agro-residue for Biomass pellets depends on various factors, such as the quality, quantity, uses, availability and demand.

Q: How much agro-residue is generated from 1 acre of land?

A: Agro-residue obtained from fields varies for crop to crop. However, approximately, 1.5 to 3.0 MT of agro-residue is generated from 1 acre of Land.

Q: Is there a market for agro-residue as a Biomass Pellets feedstock?

A: Biomass is a renewable and sustainable source of energy. There is be a growing market for agro-residue as Govt. has mandatedtheuse of 5% biomass pellets made primarily of agro-residue in all Thermal Power Plantsalong with coal.

Q: How can I ensure the sustainability of fodder, if all my agro-residue is sold for Biomass Pellets?

A:

As per the ASCII report, India's agriculture residue produce is approximately 750 MMT per annum out of which around 230 MMT is surplus agro-residue. This surplus is calculated after accounting for all traditional uses like fodder, thatching, compost etc.

Hence, you may ensure the sustainability of the fodder by keeping aside the amount required for fodder and selling only the excess agro-residue.

Q: What is the concept of a Farmer Producer Organization (FPO) and its benefits?

A: FPO is a type of Producers Organisation where the members of the organisation are the farmers. These are also known as farmers' producer companies (FPC). In an FPO, several farmers make small investment in order create a company/ organisation. The objective behind Farmer Producer Organizations is to promote better income for the farmers through a self-owned organization enhancing farmers' competitiveness and increase their advantage in emerging market opportunities.Such FPOs can also be set up inbiomass collection/ pellet manufacturing business. Further, financial assistance is also provided by the government for setting upof an FPO.

Q: How can I learn more about selling my agro-residue for Biomass Pellets?

A: You can consult local Biomass Aggregators or a Biomass pellets manufacturer for guidance and information. You can attend conferences/seminars/workshops on Biomass pellets organised by different stakeholders and by SAMARTHMission. Details of some of the current pellet manufacturers in the country are available here (Link).

Q: How is the central Government supporting Farmers in this initiative?

A: Custom Hiring Centers (CHCs) have also been established where farmers can rent required machinery at minimal costs. You may download the FARMS app by MoA for the details of your nearest CHC. Government also runs several schemes to facilitate purchase of machinery for biomass collection. You may also contact nearest KVK/ District Agriculture department to know more.

PELLET MANUFACTURERS

Q: What are Biomass Pellets?

A: Biomass pellets are small, compressed organic materials made from various sources of biomass, such as paddy husk, cotton stalks, mustard stalks, maize straw, bamboo, elephant grass and other agricultural residues. The pellets are used as a green fuel, as they are an environmentally friendly and sustainable alternative to traditional fossil fuels.

Q: How are Biomass Pellets made?

A: Biomass pellets are made by compressing biomass feedstock through a pellet mill, which applies pressure and heat to form uniform-sized pellets. The process involves drying the feedstock to reduce its moisture content, grinding it into a fine particle, and compressing it through a die.

Q: How to do aggregation of Agro-residue for Biomass pellet manufacturing?

A: Different types of agro-residues are available in a farm, which needs to be collected by employing machines like slasher, raker and baler, and then supplied to pellet manufacturing units.

Q: What is the best biomass feedstock for making pellets?

A: Selection of feedstock for making biomass pellets depends on various factors, such as availability, quantity, quality, processing cost, energy content, technical suitability etc. Some of the common biomass feedstocks used to make pellets are paddy husk, maize stalks, mustard husk, wheat straw, elephant grass, and bamboo.

Q: What are the benefits of using biomass as Biomass Pellets?

A: Using biomass as a Biomass pellets is an environmentally friendly alternative to fossil fuels. Biomass is a renewable energy source that reduces greenhouse gas emissions and generates an additional income source for farmers. Biomass pellets also have a high energy density and are easy to transport and store.

Q: What is the cost of Agro-residue collected from Farms?

A: The price of agro-residue for Biomass pellets depends on various factors, such as the quality, quantity, uses, availability and demand.

Q: What are the machineries needed for setting-up a pellet manufacturing plant?

A: Major Machineries involved in the Pellet Manufacturing Process are as follows:

i. Chipper Grinder for primary sizing
ii. Dryer for controlling moisture content
iii. Hammer mill for fine sizing
iv. Pellet mill for pelletization

Apart from the above, equipment for other operations like handling of raw materials may also be needed. Further, a Torrefier would be required in addition to above machinery for manufacturing Torrefied biomass pellets.

Q: What is favourable location for Biomass Pellet Plant installation?

A: Selection of location for establishing Pellet Plants depends on various factors such as raw biomass availability in the catchment area, its quality/ energy content technical feasibility, proximity with end customers i.e. Thermal Power Plants etc. Preferably, it shall be established in the Farm localities where enough Agro-residue is conveniently available round the year.

Q: Who are the popular Biomass pellet machine manufacturers in India?

A: We don't recommend any particular machine manufacturer. Though, you can find a list of available Pellet machine manufacturer with contact details for information here (Link).

Q: What is the expected investment for Biomass pellet Plant installation?

A: The Cost of Project varies on case to case basis depending on various factors. Typically, the Cost of Equipment needed for Non-Torrefied Biomass pellets manufacturing lies in the vicinity of Rs 50 Lakhs per Ton /Hour (Source Year 2022-23).

Q: What is process of Biomass Pelletization?

A: Biomass (agro/ crop residue) collected from fields is cleaned of soil, mud, etc. and shredded to get adequate size material. In case of high moisture content, the shredded material is dried to the extent of acceptable moisture level. The dried biomass is passed through a screening process to remove bigger size biomass material to be conveyed back to pre-shredding process. The screening system may have magnets to remove metal particles.

The screened dried biomass is collected in the hopper placed above hammer mill through bucket elevator. The biomass from the hammer mill/ grinder is pneumatically transferred to a cyclone filter to remove dust particles. The dust free biomass is conveyed to the screw feeder to transfer the feed into Ring die pellet mill where feed mass is distributed over the inner surface of a rotating, perforated die ahead of

each roll, which compress the feed mass and compress it into the die holes to form pellets.
The densified hot biomass pellets, having temperature in the range 80-100 °C, is transferred to cooler via drag chain conveyor and is cooled by blower or sucking the cold air from the atmosphere. The cooled pellets are then transferred to vibrating Screen for removing the fines/ crumbled pellets to be sent back to the hopper above the pellet mill. The proper sized screened pellets are collected into storage hopper/ silo through bucket elevator for subsequent transportation to the power plant(s).

Q: What is the Calorific value of Biomass Pellets?

A: The Calorific value of biomass pellets can vary between 3000 to 4000 kcal per kg, in general.

Q: Is there any test procedure/ standards for testing of Biomass Pellets in India?

A: Yes, Indian Standards for testing of biomass pellets/ briquettes is available and can be obtained from BIS website by searching for keyword 'Solid biofuels' at the Link: www.services.bis.gov.in/php/BIS_2.0/bis-connect/knowyourstandards/Indian_standards/isdetails/

Q: Can Biomass Pellet be stored?

A: Biomass pellets have a good shelf life and can be stored for up to a year or more without deteriorating, provided they are stored in a dry, cool, and well-ventilated area. Proper storage conditions are essential to prevent moisture absorption and maintain the quality of the pellets.

Q: Are there any challenges in manufacturing Biomass Pellets?

A: Some of the challenges in manufacturing biomass pellets include the variability of feedstock, the cost of raw materials, and the need for maintenance of machinery and equipment. However, these challenges can be overcome through proper planning, management, and buying right set of equipment along with optimization of the overall pelletizing process.

Q: How are biomass pellets transported and stored?

A: Biomass pellets are transported and stored in bulk containers, bags, or silos. Proper ventilation and moisture control are necessary to prevent degradation of the pellets.

Q: What are the Torrefied Biomass pellets?

A: Torrefaction is a thermolysis process that subjects the feedstock to thermal treatment at temperature of 200–300 °C in the absence of oxygen and converts it into a coal like material. Torrefaction of biomass improves its physical properties like grind-ability, particle shape, size, and distribution, pellet-ability, and physical properties like moisture, carbon and hydrogen contents, and calorific value. This makes biomass suitable for higher Cofiring ratios in Thermal Power Plants.

Q: Where can I sell Biomass Pellets?

A: There is a good demand of Biomass Pellet in the market. Biomass Pellets can be sold to various GENCOs as per their standard procedures usually through participating in Tenders. Provision for Procurement/ Sell of Biomass is also available on GeM Portal.

Q: Is there any Guarantee for offtake of Biomass pellets on installation of Pellet manufacturing plant?

A: Presently, no such offtake guarantee is available under the Biomass Policy guidelines. However, to support Start-ups as per Model Contract issued by MoP, the Supplier shall start delivery of material within 270 days from the issue of the Purchase Order.

Q: What are the ideal Technical Specifications for biomass pellets?

A: As per the Model Contract issued by MoP, Technical Specifications for Biomass pellets is as follows.

S.No	Technical Data	Unit	Specification for Torrefied / Non- Torrefied Pellets
1.	Base Material	n.a.	Agro Residue/Crop Residue (wood based pellets will not be acceptable)
2.	Diameter	mm	Not more than 25mm. No other dimension should exceed 25 mm.
3.	Bulk Density $	mm	Not less than 600
4.	Fines % (Length<3mm) (ARB*)	Wt%	Fines<=5%
5.	Moisture (ARB*)	Wt%	Not more than 14%
6.	Groass Calorific Value (ARB*)	Kcal/kg	Non-Torrefied :2800 - 4000 Torrefied : 3400-5000
7.	Hard Groove Grindability Index (HGI) $	n.a	Not less than 50

* ARB —As Received Basis ** GCV ranges are indicative. $ applicable for Torrefied pellets only

Q: What is the GST for Biomass Pellets?

A: Biomass pellets are currently taxed in 5% GST bracket.

Q: What is the pricing for biomass pellets?

A: The price of Biomass pellets depends on various factors, such as the Calorific Value, quality, quantity, uses, availability and demand.

Q: Can Biomass Briquettes be used for Biomass co-firing in Thermal Power Plants?

A: It is recommended to use Biomass pellets for Biomass co-firing. Though, the procurement of Biomass Pellets/ Briquettes depends on the GENCOs as per their technical suitability.

Q: What are the Financial Schemes available for supporting Biomass Pellet Plant installation?

A: Various Financial assistance schemes have been made available by GoI for the installation of Biomass Pellet Manufacturing plant. They can be accessed on mission website here (Link).

THERMAL POWER PLANTS

Q: What is Biomass co-firing?

A: Cofiring is a low-cost option for converting biomass efficiently and cleanly to electricity by adding biomass as a partial substitute fuel in high-efficiency coal fired boilers.

Q: Why should thermal power plants use biomass pellets for co-firing?

A: To reduce the carbon footprint and the burning of agro-residue by the farmers, Ministry of Power has issued revised Policy on 08.10.2021 for the use of agro-residue biomass in Thermal Power Plants which mandates to use 5% biomass pellets made primarily of agro-residue along with coal. Also, using biomass pellets for co-firing decreases the dependency on coal. Additionally, biomass pellets are a renewable and sustainable energy source.

Q: What is the time period that Biomass co-firing needs to be done by Thermal Power plants?

A: The policy mandates coal based Thermal Power plants to co-fire biomass for 25 years or till the useful life of the plant, whichever is earlier.

Q: Does the power generated from co-firing biomass pellets considered as Renewable energy?

A: Ministry of New and Renewable Energy (MNRE), GOI vide order dated 26.09.2019 states that the power generated from co-firing of biomass in thermal power plants is renewable energy, & eligible for meeting Other Renewable Purchase Obligation (RPO). The methodology shall also be applicable to the captive power plant using co-firing of biomass.

Q: How does co-firing with biomass pellets affect the efficiency of the power plant?

A: Co-firing with biomass pellets can slightly decrease the overall efficiency of the power plant due to the difference in characteristics of biomass compared to coal. However, presently the co-firing ratios mandated are very low which has negligible impact on the efficiency of the Power plant.

Q: Can biomass pellets be used in conventional boilers?

A: Biomass pellets are compatible with most conventional boilers. However, operational modifications may be necessary to ensure optimal performance. The detailed Standard Operating Procedure (SOP) for biomass co-firing in pulverized coal fired plants and CFBC plants is available at the links, Link 1 and Link 2 respectively.

Q: How much biomass can be co-fired in a thermal power plant?

A: The amount of biomass that can be co-fired in a thermal power plant depends on factors such as the type of biomass fuel and the design of boiler and boiler auxiliaries. Generally, a biomass cofiring rate of up to 10% has been achieved in India.

Q: What types of biomass pellets can be used for co-firing?

A: Agro-based Biomass pellets that meet the required Technical specifications as mentioned in Model Contract (Point 1.2 Table 1 Link) can be used for co-firing. The commonly available types of Biomass pellets are Torrefied and Non-Torrefied Pellets.

Q: What are the environmental benefits of co-firing with biomass pellets?

A: Co-firing with biomass pellets reduces the emission of greenhouse gases such as CO_2, NO_X, and SO_2 and contributes to a cleaner environment. Biomass pellets are also a sustainable energy source, contributing to the reduction of fossil fuel dependence.

Q: What are the benefits of using biomass pellets as an alternative fuel source in Thermal Power Plants?

A: Biomass pellets are a renewable, clean, and efficient alternative to traditional fossil fuels. Using biomass pellets as a Biomass pellets reduces greenhouse gas emissions, promotes sustainability, and supports rural development by creating new job opportunities in the biomass industry.

Q: What are the challenges associated with co-firing with biomass pellets?

A: There are no major technical challenges associated with co-firing 5 -7% of Biomass pellets. Some of the issues that need to be checked is pellet quality and availability, storage & un-loading facilities for Biomass pellets at Plant site.

Q: Can any other form of Biomass apart from Biomass Pellets be co-fired in Thermal Power plants?

A: The technical specifications of Biomass pellets as mentioned in the Model Contract are within the permissible range of fuel quality. Co-firing of any other forms of Biomass may lead to adverse effects like erosion, ash clinkering, partial combustion, etc.and needs to be substantiated.

Q: How can Biomass co-firing be termed as Carbon neutral energy?

A: The next cycle of a crop's production absorbs as much Carbon dioxide as is emitted into the atmosphere from its agro-residue (Biomass) based pellet combustion in TPP and thus making the overall cycle Carbon Neutral.

Additionally, the combustion of Biomass pellets takes place in a controlled environment resulting in reduced impact on environment in comparison to open burning.

Furthermore, Biomass co-firing results in reduction of Coal Consumption. The estimated CO_2 emission reduction at 5% Biomass co-firing is approx. 38 MMT annually.

Q: Is enough Raw Biomass is available in India to cater the mandated 5-7% Biomass co-firing?

A: The total Biomass generated in the country is around 750 Million MT annually, out of which surplus Biomass after accounting for all types of conventional uses (including Fodder, manure etc.) is 230 Million MT. Out of this, only approx. 70 Million MT of raw biomass is required to achieve the 7% co-firing target in TPPs in India. Hence, sufficient amount of raw biomass is available in the country to achieve co-firing targets.

Q: Where can I find the SOP for Biomass co-firing in Thermal Power plant?

A: It is available on SAMARTH website for PF and FBC Boilers. (Link)

Q: How to procure the Biomass Pellets?

A: It can be procured by the GENCOs as per their Standard procedure. Typically, Procurement methods includes:

- Long/Short term tenders
- GeM portal

Q: Does CO_2 savings from Biomass co-firing eligible for carbon trading in India?

A: The Carbon trading market is currently under development in India.

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