

Biomass Utilization at Coal-Fired Power Plant A Choice for Environment and Economy

CEA-JCOAL Workshop FY2019
November 8, 2019

Japan Coal Energy Center (JCOAL)

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5. Summary

- ✓ GOI is considering the utilization of biomass to coal-fired power station as a practical measure of GHG mitigation
- ✓ Air pollution in NCR Delhi by open-burning of agricultural waste become a pressing issue in winter season.
- ✓ The following discussion has made as bilateral collaboration topics in the meeting of the Joint Working Group on Electricity and Renewable Energy under the India-Japan Energy Dialogue held on Jan. 24, 2018.
 - a. Co-firing of biomass with higher blending ratios.
 - b. Conversion of pulverized fuel fired plants to 100% biomass firing or 100% biomass based fuels in Japan.
 - c. Generating energy from Municipal waste.
- ✓ Technical presentation and discussion have aggressively done during CEA-JCOAL workshop on Nov. 16, 2018.



Photos from news web, etc.

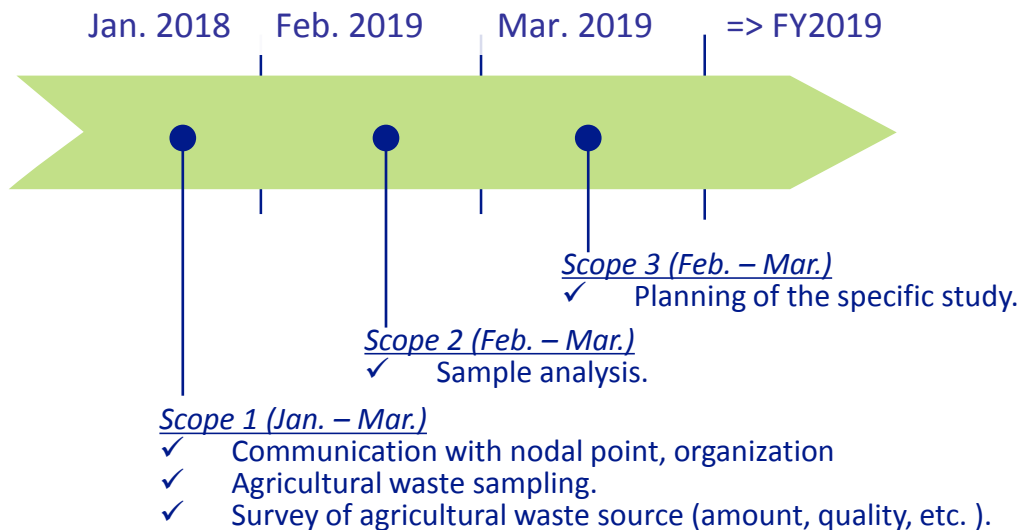
2. Preliminary Study

2-1. Study outline

(1) Scope of work

- ✓ Punjab, Haryana and Uttar Pradesh were selected for the study on biomass resource survey.
- ✓ Rice husk sample was obtained and proximate, ultimate, ash component, TG analysis were conducted.

(2) Study Schedule



(3) Target States

- ✓ Punjab, Haryana and Uttar Pradesh were selected for the study on biomass resource survey.
- ✓ Since the fuel cost of these States is much higher because of the long distance of coal transportation from the coal mines, Alternative fuel possibility is considerable.

2-2. Agricultural waste potential: statistical data, nomination of the site

(4) Biomass potential

- ✓ According to the CERC guideline, Heat rate of biomass generation is not higher than 4,200 kcal/kWh. Assuming that GCV of biomass is 3,100 kcal/kg, specific fuel consumption is estimated 1.35kg/kWh.
- ✓ Punjab State is found to be most suitable for the agricultural waste supply of 4 crore tonne annual, or 3,373MW as shown in the following table.

State	Agricultural waste volume (t/y)	Generation potential (MW)
Punjab	39,895,965	3,373
Haryana	30,968,046	1,746
Uttar Pradesh	35,405,185	2,957

- ✓ Punjab State Power Corporation Limited (PSPCL) showed their interest through CEA for further study at GNDTP (100MW×2, 120MW×2).

2. Preliminary Study

2-3. Analysis of rice husk sample

(5) Analysis of rice husk sample

- ✓ Rice husk was obtained from the rice husk accumulation site in Haryana and Punjab state.
- ✓ Proximate analysis, ultimate analysis, Ash component, TGA were conducted.

Proximate analysis (wt%)

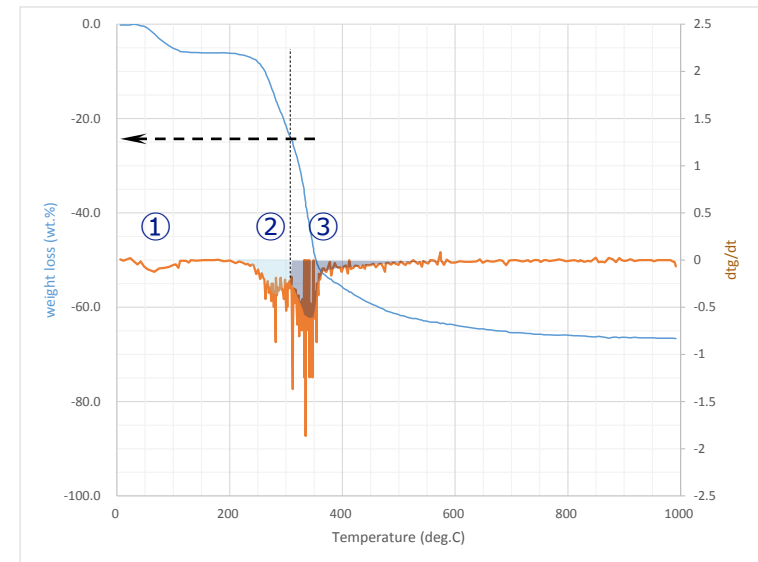
V.M.	F.C.	Ash	Moisture
59.9	22.6	11.2	6.3

Ultimate Analysis (wt%)

Carbon C	Hydrogen H	Oxygen O(diff.)	Nitrogen N
47.2	6.1	46.7	—

Ash component Analysis (atm%)

Si	K	S	Ca	other
77.1	14.4	3.8	3.6	1.0



- ✓ Rice husk contains 11 wt.% of ash with the main element of Si. In the organic portion, no S and N contained.
- ✓ This is an advantage for flue gas impact to air quality.
- ✓ < 100 degC: ① moisture evaporation
- ✓ 250-300 degC: ② desorption of water from cellulose structure
- ✓ > 300 degC: ③ thermal decomposition of cellulose

3-1. 1st site survey by JCOAL team

- ✓ JCOAL will conduct a first site survey at GNDTP, Punjab State Power Corporation Limited (PSPCL) to collect the information by site visit and/or interviewing the nodal officers/engineers.
- ✓ JCOAL will consider the expert team for the 2nd site survey of the detailed study for the adaptability of coal/biomass co-firing technologies.

Nov. 2019	Dec. 2019	Jan. 2020	Feb. 2020	Mar. 2020
	1st			
		2nd		
				Debriefing

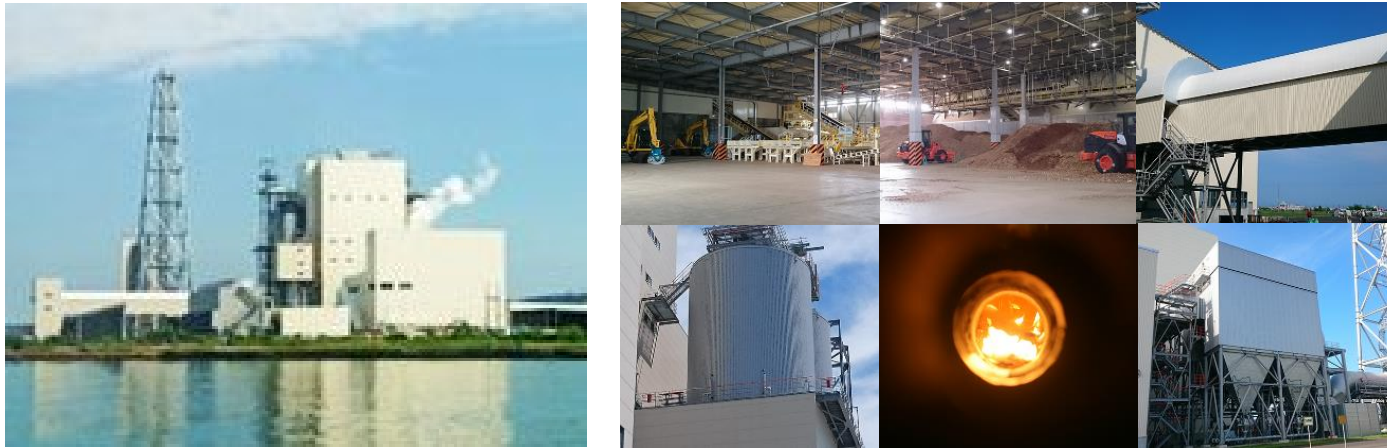
3-2. 2nd site survey by JCOAL and the expert team

- ✓ JCOAL and the expert team will be dispatched to the site to identify the critical point for introducing coal/biomass co-firing to the TPS.
- ✓ Technology to be adopted will be clarified and recommended by considering the environment and economy.

4 Japanese experience: coal/biomass co-firing technologies

4-1. CFB Boiler

- ✓ 50MW, 84%-biomass CFB co-firing thermal plant installed by SHI is commissioned in 2018 at Mombetsu, Japan
- ✓ CFB combustion system has an advantage in flexibility of fuel.

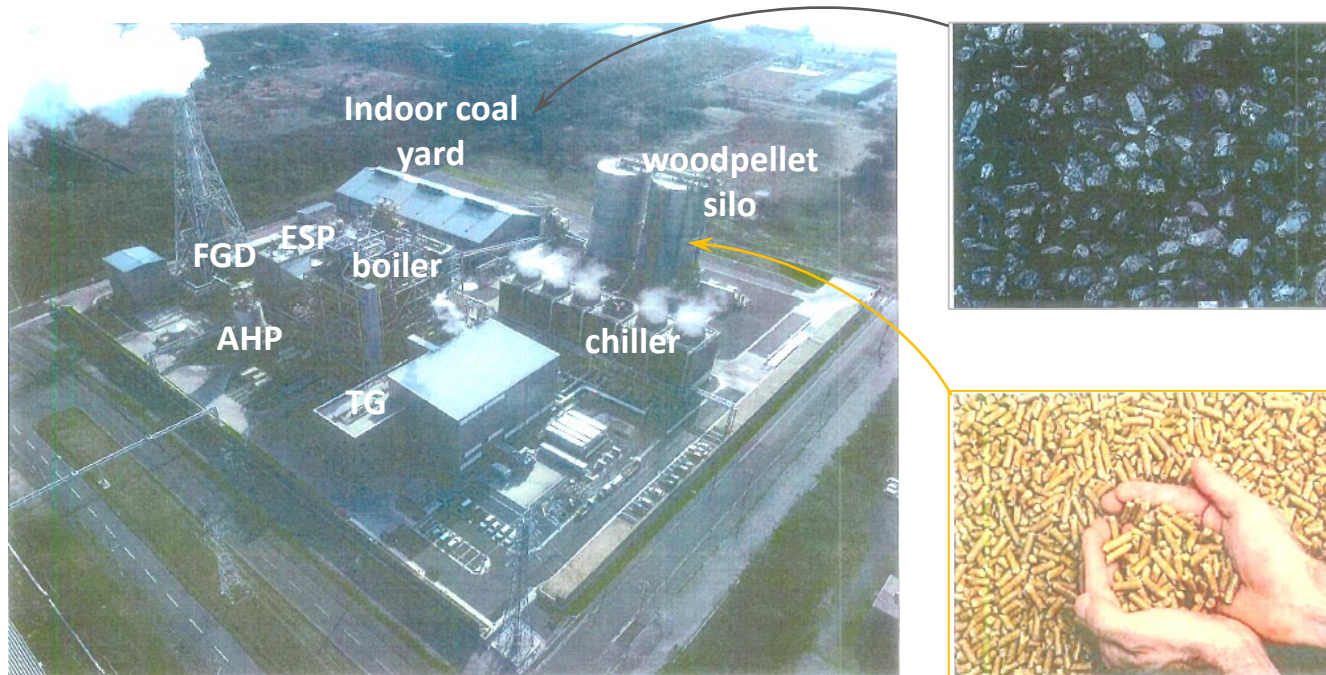


Mombetsu Biomass co-firing Plant

4 Japanese experience: coal/biomass co-firing technologies

4-2. Biomass fuel-fired technology

- ✓ 112MW Hibikinada thermal power station in Kita-Kyusyu area was commissioned in early 2019 as imported coal/wood pellet co-firing plant.
- ✓ Coal and wood pellet were separately pulverized and feed into a boiler. Its biomass blend ratio is approximately 30 cal.%.



4 Japanese experience: coal/biomass co-firing technologies

4-3. rice husk compressed fuel

- ✓ Tromso has newly developed a agricultural waste utilization technology to make solid fuel “Momigarite” which can be widely applicable.
- ✓ “Momigalite” grind mill has unique characteristics to apply rice waste utilization;
 - 1) Simple operation & maintenance, portability.
 - 2) Scale up



“Momigalite” grind mill



Rice husk



Compressed fuel
“Momigalite”

1. Biomass utilization study

- ✓ Preliminary study on agricultural waste utilization by coal fired power station was conducted to clarify the potential of coal/biomass co-firing in Punjab, Haryana and Uttar Pradesh.
- ✓ Punjab State Power Corporation Limited (PSPCL) showed their interest through CEA for further study at GNDTP (100MW×2, 120MW×2) for detailed study in FY2019.
- ✓ JCOAL plan to conduct a detailed study in this FY to identify the critical point for introducing coal/biomass co-firing to the TPS. Recommendation of technology to be adopted by considering the environment and economy.

2. Coal/biomass co-firing; Japanese experiences and technologies

- ✓ CFB Boiler co-firing
- ✓ Biomass fuel-fired technology
- ✓ Rice husk compressed fuel “Momigalite”

JCOAL look forward to working with you



Website:

<http://www.jcoal.or.jp/index-en.html>

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