

PROJECT INFORMATION FOR INDUSTRY TO SUBMIT EXPRESSION OF INTEREST FOR INSTALLATION OF BIOMASS GASIFICATION EQUIPMENT (500 KWe & 6 MWth)

The COMSATS Institute of Information Technology (CIIT), Energy Research Centre (ERC), has developed partnership with Guangzhou Institute of Energy Conversion (GIEC), Guangzhou China. Both the institutions are working on joint research projects on biomass energy since 2016. A project entitled “Biomass Gasification and Thermal Electricity Multi- System for R&D and Demonstration” has also been approved for funding by China Ministry of Science and Technology (MoST) “**under Belt and Road Mega Program to support the scientific and technological innovation in Pakistan and other countries**”.

MAIN GOALS OF PROJECT:

- Promote the Belt and Road Plan by scientific and technological innovation and demonstration of advanced technologies.
- Develop and deploy a novel poly-generation technology (electricity, heat and fuel gas) system based on biomass gasification.
- Strengthen the cooperation between China and the Belt and Road Countries, by offering jobs in China for researchers and engineers from the Belt and Road Countries.

INDEX OF GASIFICATION EQUIPMENT

- Gasifier capacity = 6 MW thermal & Gasification efficiency = 80 %.
- Electric capacity = 500 KW & Electric efficiency = 27 %
- Overall efficiency (CHP) of about 50 %

Under the project five countries engineers shall work together on design, development, installation and testing of biomass gasification system under the supervision of GIEC experts in China. The proposed system to be designed and developed shall supply power and process heat to an Industry. The equipment can be installed with Industry that can use electricity and process heat (for dual purposes). The requirements for the industry are given at **Annexure I**. The industry shall also contribute its due share in installation of equipment while some equipment and technical assistance shall be provided under the project.

Industrial units interested in the biomass gasification equipment (500 KWe & 6 MWth) may submit proposals showing interest in the system on the following format. The successful Industry shall be recommended for award of the project equipment to Chinese leading partner, GIEC.

1. Name of Industry (with complete address/contact information of Focal persons).
2. Detail of Functional Setup (Equipment in use, Products or Processes Developed, Manpower, Existing Power & Process heat utilization and costs).
3. Requirement of Power and Heat in terms of KWh electricity and MW thermal heat for the Industry.
4. Detailed plan for installation of biomass gasification system and its Justification.

5. Under-taking for making contribution in equipment and costs for installation of biomass gasification system.
6. Other information (if any).

Complete applications along with supporting documents may be submitted at below given address.

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Annexure I

REQUIREMENTS FOR THE BIOMASS GASIFICATION DEMONSTRATION PROJECT (500 KWe & 6 MWth)

(By Industry)

1、 Technical-economic evaluation

Items	unit				Remarks
Capacity	MW	1.00	2.00	2.50	1 set of gasifier
Operation time	h/a	6000.00	6000.00	6000.00	
Self-consumption of electricity	%	13.00	10.00	10.00	
Electricity production	10 ⁴ kWh/a	600.00	1200.00	1500.00	
Electricity to the grid	10 ⁴ kWh/a	522.00	1080.00	1350.00	
Electric efficiency	%	0.28	0.28	0.28	
LHV of biomass	kcal/kg	3500.00	3500.00	3500.00	Moisture < 20%
Price of biomass	CNY/t	300.00	300.00	300.00	
Biomass & Auxiliary material	10 ⁴ CNY/a	170.14	340.29	425.36	
Number of workers		15	15	15	
Labor	10 ⁴ CNY/a	75.00	75.00	75.00	5×10 ⁴ CNY/a per person
Equipment investment	10 ⁴ CNY	500.00	800.00	1000.00	
Construction and test running	10 ⁴ CNY	200.00	200.00	200.00	
Total investment	10 ⁴ CNY	700.00	1000.00	1200.00	
Depreciation	10 ⁴ CNY/a	50.00	80.00	100.00	
Total cost	10 ⁴ CNY/a	295.14	495.29	600.36	
Steam/heat supply	t/h	0.60	1.20	1.50	30 t/day
Steam/heat supply	t/y	3600.00	7200.00	9000.00	
Selling price of electricity	CNY/kWh	0.75	0.75	0.75	
Selling price of steam/heat	10 ⁴ CNY/a	150.00	150.00	150.00	

Incomes from electricity selling	10 ⁴ CNY/a	391.50	810.00	1012.50	
Benefits from electricity selling	10 ⁴ CNY/a	96.36	314.71	412.14	No steam user
Incomes from electricity selling	10 ⁴ CNY/a	54.00	108.00	135.00	Steam user existed
Total incomes	10 ⁴ CNY/a	445.50	918.00	1147.50	
Total benefits	10 ⁴ CNY/a	150.36	422.71	547.14	

*Based on the analysis above, the economic performance is better when the project scale is larger than 1500 kW.

2、 Requirements for demonstration project

- 1) **Client/user:** The project is supposed to supply electricity for an industrial park or an electricity-consuming enterprise. Priority is given to client with the demand of both electricity and steam;
- 2) **Biomass feed stock:** More than 10,000 t/year of biomass shall be available. The cost of biomass is less than 350 CNY/t;
- 3) **Market:** The local labor cost is lower than 4,000 CNY/month (50,000 CNY/y) and the selling price of electricity is higher than 0.65 CNY/kWh;
- 4) **Policy:** Support and encouragement from local government is necessary, so that approval for construction and operation of the project can be easily obtained. Priority is given to regions where there is subsidy from government.

3. Cooperation mode

1) Cooperation mode

- ✧ Biomass gasification equipment such as gasifier and gas cleaning device are provided by China free of charge. China will also provide technical information and assistance during the stage of commissioning and test running, free of charge.
- ✧ The client/user is responsible for finishing the approval procedure of construction and operation, purchasing the other equipment needed in the project (gas engine generator, HRSG, power transmission device, etc.) and the other investments (civil work, equipment installation, etc.).
- ✧ The client/user is responsible for operation of the project. The biomass gasification and power generation system shall be used to carry out experimental research that does not affect normal use of the system.

2) Requirements for cooperation

There are two kinds of clients/users for the demonstration projects. The first kind is enterprise that already has a power plant based on biomass gasification. The second kind is enterprise that is planning to build a power plant based on biomass gasification.

The basic requirements and estimated benefits of cooperation are:

	A existed power plant	A planned power plant
Capacity	$\geq 1500\text{kW}$	$\geq 1500\text{kW}$
Local biomass resource	$\geq 10000\text{ t/y}$	$\geq 10000\text{ t/y}$
Cost of biomass	$\leq 350\text{ CNY/t}$	$\leq 350\text{ CNY/t}$
Selling price of electricity	$\geq 0.7\text{ CNY/kWh}$	$\geq 0.7\text{ CNY/kWh}$
Other energy demand	Demand for steam or fuel gas	Demand for steam or fuel gas
Offered by China	Technical service and equipment which worth about 3.5 million CNY will be provided to client/user free of charge. Include: 1) Technical assistance for installation and commissioning; 2) Equipment of gasification and gas cleaing.	Technical service and equipment which worth about 3.5 million CNY will be provided to client/user free of charge. Include: 1) Technical assistance for commissioning and test running; 2) Equipment of gasification and gas cleaing.
Requirements for client/user	1) Guarantee for the selling of electricity and steam; 2). An existed gas engine generator ($>1000\text{kW}$) and power transmission system; 3). Proper plant building and space; 4).Offer 1.0 million CNY for the installation and commissioning	1) Guarantee for the selling of electricity and steam. 2) Guarantee for the purchase funds of gas engine generator ($>1000\text{ kW}$) and power transmission system (6.0 million CNY) ; 3). Proper plant building and space; 4).Offer 1.0 million CNY for the installation and commissioning.
Benefit evaluation	The operation cost will be reduced by more than 1.0 million CNY/y. And the benefits will increased by more than 1.5 million CNY/y.	The capital investment will be reduced by 3.5 million. And the benefits will increased by more than 1.5 million CNY/y.