REQUEST FOR EXPRESSION OF INTEREST

FOR

SELECTION OF BENEFICIARY-DESIGNATED CONSUMERS

FOR

DEMONSTRATION

OF ENERGY EFFICIENCY PROJECT (DEEP)

BUREAU OF ENERGY EFFICIENCY

Government of India, Ministry of Power

August 2022

ENERGY EFFICIENCY SERVICES LIMITED

A JV of PSUs under the Ministry of Power

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1. Project brief

The Bureau of Energy Efficiency (BEE) is keen to implement innovative energy efficiency technologies and deploy large-scale implementation of energy efficiency measures in the PAT industries i.e., the designated consumers **(DCs)**. Energy Efficiency Services Limited (EESL) has a vast experience in the implementation of large-scale energy-efficient projects through innovative financial models and demand aggregation. In this context, BEE has entrusted EESL with providing support to PAT industries for the demonstration of innovative energy-efficient technologies & creating an ecosystem to enable market transformation for such innovative technologies. BEE and EESL with their collaborative approach and expertise has prepared this program to implement innovative technologies and deploy a bespoke package of energy efficiency technologies in PAT industries.

The overall objective of this program is to demonstrate emerging/innovative energy-efficient technologies in the identified PAT sectors and to create a self-sustaining mechanism for their upscaling. Key activities of the project are as below

- Identification of Innovative technologies
- Selection of beneficiaries through REoIs (Request for expression of interest)
- Baseline study & DPR preparation
- Procurement, Installation & commissioning of technology
- Measurement & Verification (M&V)
- Training and capacity building

Emerging technologies, which are innovative in nature and have the potential to replicate in the notified PAT industries, which have not been commercialized to a large scale and have the potential for energy efficiency improvement or generation will be targeted under the scheme. JTWC has already identified four technologies for the demonstration of the project. The following are the next set of technologies approved.

1. High-Grade waste heat recovery system
    a. Scrap preheating
    b. Regenerative burners
    c. Recuperator

2. Cooling Solutions from Low Waste Heat Recovery (VAM) system
3. Industrial Automation
    a. Online Coal GCV Analyser
    b. Automatic Blowdown Control System
    c. Intelligent Flow Controller
4. IE4 Motors with VFD
5. Inlet air cooling system

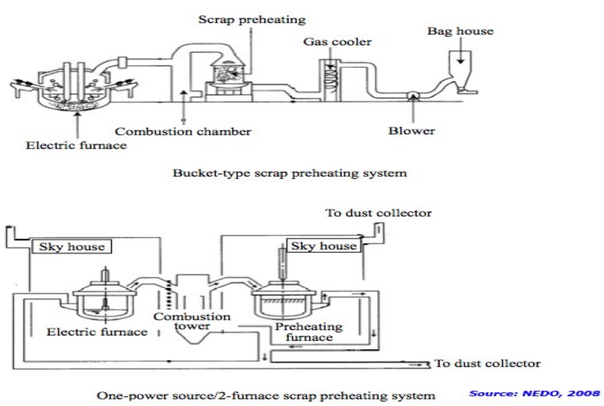
Through this request for expression of interest, we are getting the willingness of beneficiary units and collecting the data to assess the suitability of the technology for a demo project. Beneficiary units will be selected through this EoI on the basis of the highest contribution in the terms of technology cost from the DCs as per DC selection criteria given in Section 3. Technology briefs for demo projects are given below.
Finance for the project shall be done through the grant support (partially) by Bureau of Energy Efficiency (BEE) and an upfront contribution from DC. DCs has to contribute a minimum of 30% of the total technology cost. The DC, who will contribute more will be preferred for selection. Grant support by BEE shall not be recovered from DCs. A marking matrix will be prepared based on the upfront contribution of the DC towards the demonstration project as per clause 3.

2. Technology Information

Technical details of approved innovative energy-efficient technologies are given below:

2.1 High-grade Waste heat recovery

2.1.1 Scrap pre-heating

APPLICABILITY IN SECTORS	• Aluminium • Iron & Steel
SUITABILITY	Electric Arc Furnaces in Iron & Steel organizations & Exhaust waste gases from Aluminium melting furnaces can be used for preheating.
BRIEF DESCRIPTION	Scrap preheating is a technology that can reduce the power consumption of an electric arc furnace (EAF) by using the waste heat of the furnace to preheat the scrap charge. Scrap preheating is performed either in the scrap charging baskets, in a charging shaft (shaft furnace) added to the EAF, or in a specially designed scrap conveying system allowing continuous charging during the melting process. Shaft furnace and tunnel furnace systems are modern and efficient preheating. Considering application in the Iron & Steel industry, the use of an EAF, already uses approximately 30 to 40 % less energy than the primary route (blast furnace, DRI kilns). Partial scrap preheating generally saves about 60 kWh/ton, while total scrap preheating saves up to 100 kWh/t of liquid steel (IPPC, 2001). Since lower electricity use leads to lower CO2 emissions the technology supports environmental protection.  Bucket-type scrap preheating system One-power source/2-furnace scrap preheating system *Source: NEDO, 2008* Considering application in the Aluminium industry, there is a significant amount of waste heat in the exhaust of an aluminium crucible that can be used for preheating the scrap to 480 to 530 ºC and simultaneously preheats the combustion air to 425-480 ºC taking into account system heat losses and air leakage. Following table shows the heat content w.r.t scrap temperature:

<table>
<tr><td></td><td>Table XX: Scrap temperature vs heat content[1]
<table>
<tr><th>Scrap temperature (°C)</th><th>Heat content (kWh/t)</th></tr>
<tr><td>150</td><td>22</td></tr>
<tr><td>260</td><td>40</td></tr>
<tr><td>370</td><td>57</td></tr>
<tr><td>540</td><td>81</td></tr>
</table></td></tr>
<tr><td>BENEFITS</td><td>● Removal of moisture from scrap
● Reduced refractory damage
● Improved thermal efficiency
● Energy and CO2 savings</td></tr>
</table>

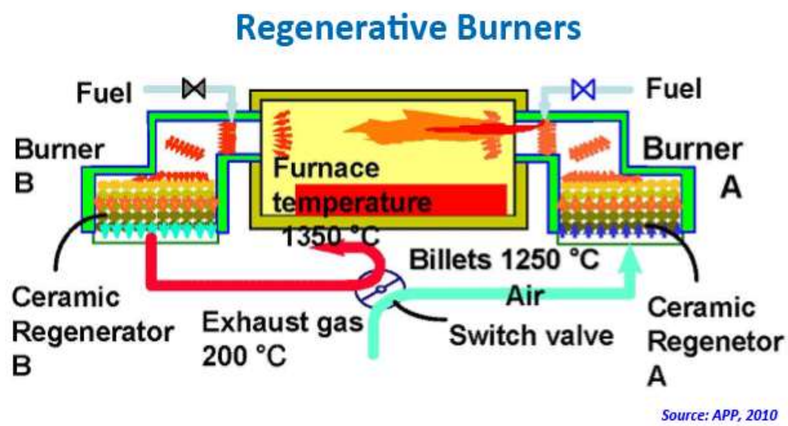
2.1.2 Regenerative burners

APPLICABILITY IN SECTORS	● Iron & Steel ● Aluminium
SUITABILITY	● Heat recovery of furnace exhaust gases and usage in preheating of combustion air
BRIEF DESCRIPTION	The process of regeneration[2] uses a pair of burners that cycle to alternately heat the combustion air or recover and store the heat from the furnace exhaust gasses. When one regenerative burner is firing, the other is exhausting the furnace gasses. **Exhaust gasses pass through the regenerative burner body and into a media case which contains refractory material. The refractory media is heated by the exhaust gasses, thus recovering, and storing energy from the flue products. When the media bed is fully heated, the regenerative burner currently firing is turned off and begins to exhaust the flue products.** These regenerative burners fire alternately to recover the sensible heat from waste gas[3] for the preheating of combustion air. The systems are capable of obtaining high-temperature preheated air exceeding 1,000°C in a short timeframe, by repeated heat accumulation and combustion. They recover between 85 -90 % of the heat from the furnace waste gases; therefore, the incoming combustion air can be preheated to very high temperatures of up to 10° -150 °C below the furnace operating temperature. Application temperatures range from 800oC up to 1500 °C. Fuel consumption can be reduced by up to 40 %.

[1] https://p2infohouse.org/ref/10/09048.pdf

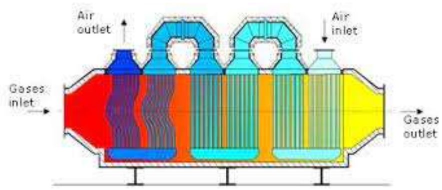
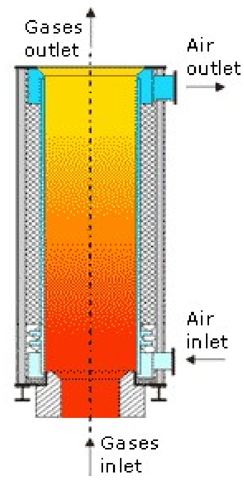
[2] https://www.bloomeng.com/burner_types/regenerative-burners

[3] https://www.eng.nipponsteel.com/english/whatwedo/steelplants/rolling/regenerative_burner_type_reheating_furnace/

	
BENEFITS	● Increased combustion efficiency ● Low NOx emissions ● More than 15% energy reduction is possible. ● Reduction in maintenance costs

2.1.3 Recuperators

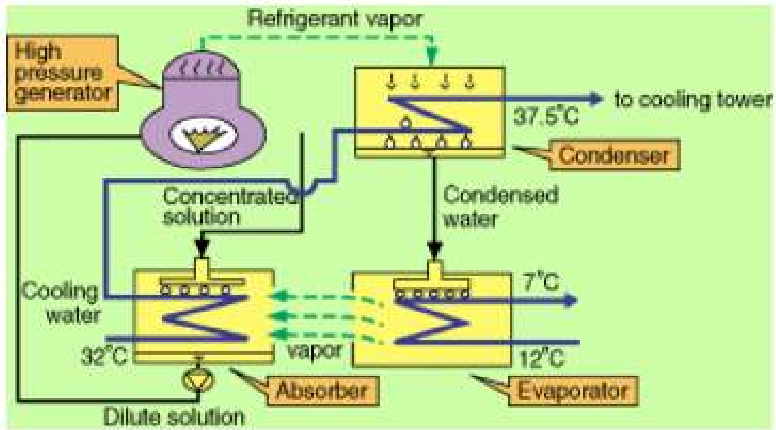
APPLICABILITY IN SECTORS	● Aluminium ● Iron & Steel ● Cement
SUITABILITY	● Steel reheat furnaces & heat treatment furnaces ● Steel anneal and pickle lines ● Steel galvanising lines ● Direct reduced iron furnaces ● Aluminium melting furnaces ● Aluminium heat treatment furnaces ● Ceramic and refractory kilns ● Waste Incinerators ● Any other application where exhaust gasses can be reused
BRIEF DESCRIPTION	In a recuperator, heat exchange takes place between the flue gasses and the air through metallic or ceramic walls. Ducts or tubes carry the air for combustion to be preheated, the other side contains the waste heat stream. Recuperators are classified based on the principle of heat transfer by radiation, convection, or combinations. Recuperators are constructed out of either metallic or ceramic materials. Metallic recuperators are used in applications with temperatures below 1050 deg C, while heat recovery at higher temperatures is better suited to ceramic tube recuperators which can operate with hot side temperatures as high as 1500 deg C and cold side temperatures of around 950 deg C. For maximum effectiveness of heat transfer, hybrid recuperators are used. These are combinations of radiation and convective designs, with a high-temperature radiation section followed by a convective section.

	 Convective Recuperator  Radiation Recuperator
BENEFITS	● Higher Flame Temperature ● Better Combustion Efficiency ● Reduced fuel cost by using preheated air in burners ● Higher Furnace Output ● Lesser emissions

3. Cooling solutions from Low Grade Waste heat recovery (VAM)

APPLICABILITY IN SECTORS	● Cement ● Chlor-Alkali ● Fertilizers ● Iron & Steel ● Pulp & Paper ● Textile ● Thermal Power Plants ● Refineries ● Petrochemicals
SUITABILITY	● For cooling processes
BRIEF DESCRIPTION	A vapour absorption chiller (VAM[4]) is a machine to produce chilled water using heat sources such as steam, hot water, and gas. A fluid pair of lithium bromide and water are used in commercial VAM. The refrigerant used is actually water, as that is the working medium that experiences a phase change and causes the cooling effect. The second fluid that drives the process is salt, generally lithium bromide. Heat is used to separate the two fluids, when they are mixed in a near vacuum environment. For low-

[4] https://pdhonline.com/courses/m130/m130content.pdf

	temperature applications, ammonia-based absorption machines are used that utilize ammonia as a refrigerant and water as an absorbent. These machines use only a small fraction of electricity as compared to the conventional vapour compression chillers. Vapour absorption systems work with non-CFC environmentally friendly refrigerants such as water or ammonia.  Various parts and working of VAM
BENEFITS	● Can be nearly (not entirely) powered by Waste Heat ● No/less electricity consumption ● No Noise/vibration due to the absence of compressors ● Natural refrigerants which have zero ODP and GWP

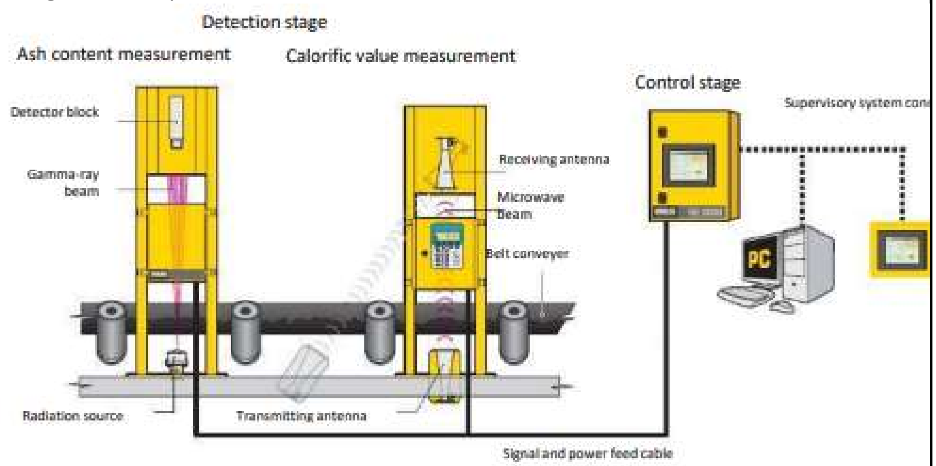
4. Industrial automation

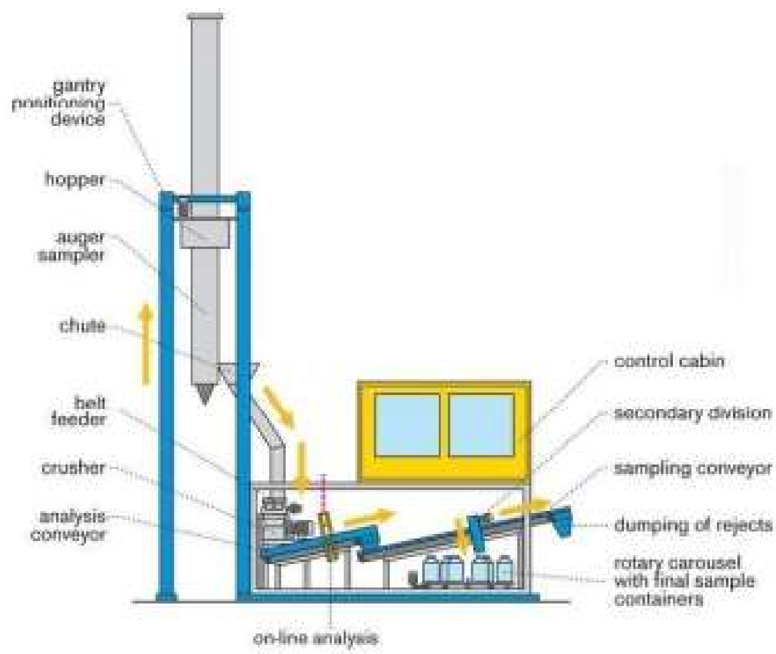
4.1 Online Coal GCV analysers

APPLICABILITY IN SECTORS	● Thermal Power ● Iron and Steel ● Pulp and Paper ● Cement
SUITABILITY	Traditionally, Coal GCV measurement is done using Laboratory tests.
BRIEF DESCRIPTION	Traditionally, Coal GCV measurement is done using a Laboratory test. Laboratory analysis only provides either a "snapshot" or an "average" of coal quality, it does not show the actual variations and by the time the laboratory results are available, thousands of tons of material have already been conveyed. The online Coal GCV Analyser provides real-time data that can then immediately drive decisions at the power plant. This analysis method uses a radioisotope that has a low energy level, can be used for a long time without requiring replacement, has low radiation and is safe and reliable. This analyser finds extensive use in Coal Mining, Coal Washeries, Coal Blending Plants, Coal-fired Power Plants, Coking Plants, steel plants, etc. It is especially

suitable for online coal ash analysis on the entire belt conveyor during the coal transportation process.

Installation of the machine has given the advantage of feeding close-to-design GCV coal in the Boiler for optimizing combustion. Unscheduled loss of generation on account of coal quality can be avoided. Additionally, it also provides online information on the Slagging index of the coal, so that Boiler slagging & hence long outages can be prevented.





BENEFITS	● Helps in real-time analysis of coal GCV ● Helps in feeding close-to-design GCV coal to boiler ● Helps in optimised combustion of coal ● Reduction in loss of generation due to poor coal quality

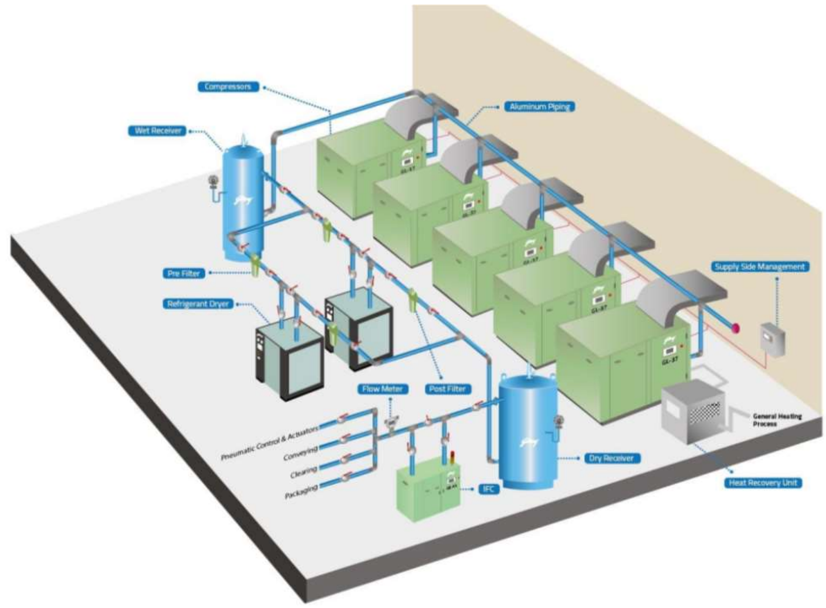
4.2 Automatic blowdown control system

APPLICABILITY IN SECTORS	● This can be used across sectors where boilers with manual blowdown is used (Thermal power plant, Pulp and Paper, Textile)
SUITABILITY	Manual blowdown system
BRIEF DESCRIPTION	Boilers generate steam used for heating or manufacturing processes. When steam leaves the boiler, impurities (TDS – total dissolved solids) are left behind to accumulate in the boiler. Accumulation of TDS beyond their solubility limit results in the formation of scale. Blowdown is the process of removing water with high concentrations of TDS and replacing it with fresh makeup water with lower levels of TDS, thereby lowering the overall TDS in the boiler. Two types of blowdown: Bottom blowdown – which removes sediment/sludge from the bottom of the boiler; Surface skimmer blowdown – which removes high--TDS water near the surface (6" below the water line). Automated controllers only regulate surface blowdown. 1. TDS can be directly measured by lab tests (costly, time-consuming) or can be approximated by conductivity measurements (inexpensive, quick, reasonably accurate). 2. Two types of surface blowdown: manual and automated **Manual Blowdown** 1. Involves manually opening a blowdown valve at various times throughout the day; used in conjunction with a hand--held conductivity meter to keep some degree of control over TDS levels. 2. Results in high and low conductivity spikes due to boiler load variances. 3. Conductivity levels above the target maximum lead to the formation of scale. Conductivity levels below the target maximum result in excess water and chemical usage. 4. At best, manual systems err on the safe side and keep TDS too low. **Automated Blowdown** 1. Uses an automated controller and valves to continuously or intermittently sample the boiler water and then blow down as needed. 2. Types of Automated Blowdown a. Continuous Sampling – Used when steam blowdown requirements exceed 2000 kg/hr. A sample of water is continuously sent across the conductivity probe to drain. When conductivity levels exceed the target maximum, a larger blowdown valve opens and sends more water to drain until the set point is satisfied. b. Timed Sampling (most common) – Used when steam blowdown requirements are less than 2000 kg/hr. A sample of water is intermittently sent across the probe for a predetermined amount of time (interval and duration are adjustable), and the blowdown valve is held open until the conductivity set point is satisfied.

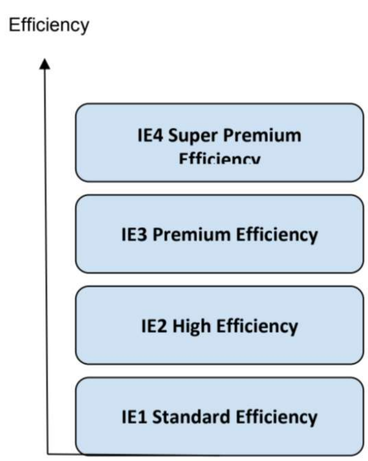
	Boilers without a blowdown heat recovery system and with high blowdown rates offer the greatest energy-savings potential. The optimum blowdown rate is determined by a number of factors, including boiler type, operating pressure, water treatment, and makeup-water quality. Savings also depend upon the quantity of condensate returned to the boiler.
BENEFITS	● With automatic blowdown, one can avoid high and low conductivity spikes due to boiler load variance. ● Can avoid keeping the TDS too low than what is required ● Reduced operating costs (less feed water consumption, chemical treatment and higher heating efficiency) ● Reduced maintenance and repair costs (minimised carryover and deposits) ● Cleaner and more efficient steam ● Minimise energy loss from boiler blowdown

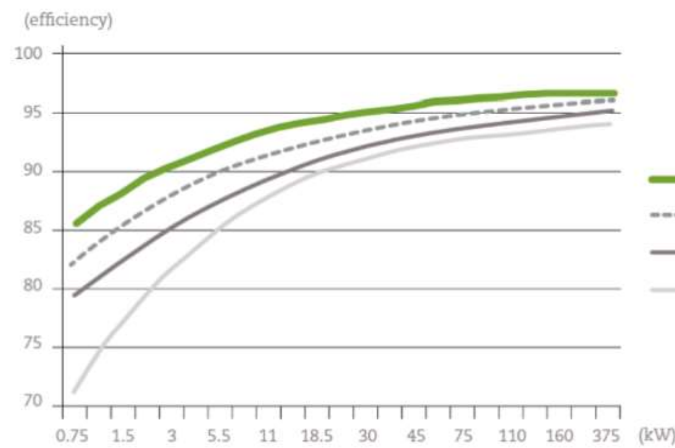
4.3 Intelligent Flow Controller (IFC) for Compressed Air Network

APPLICABILITY IN SECTORS	● Cement ● Textile ● Chemical ● Pulp and Paper This can be used across sectors where compressed air system is used
SUITABILITY	It can be used where the compressed air demand is met from manual control system
BRIEF DESCRIPTION	The fluctuating air pressure is the major problem faced by industries caused due to intermittent use of several pneumatic types of equipment. It begins with the sudden air demand pulling down the pressure at the point of use. The air compressors get to know about it when this air demand travels to the upstream generation side through the distribution network. The control mechanism of the air compressor then starts delivering compressed air in the form of load/unload or VSD. Practically it takes a while for the entire air system to fill up to the required pressure. Thus the compressor operators maintain a higher level of pressure in the air system to minimise the lag in the response time between demand and supply to sustain a sudden demand. Thus more compressors are needed to meet this artificial demand causing waste of compressed air and leading to an energy inefficient system translating into high-energy bills.

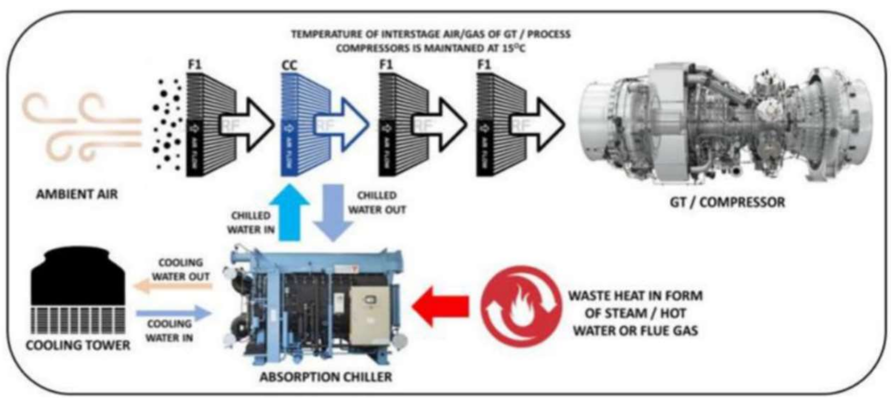
	 **Figure: IFC model** Intelligent Flow Controller (IFC) controls the airflow and pressure being delivered to the plant. It operates at the intermediate point of the compressed air system, i.e. on downstream of Dryers/Receivers and upstream of the main piping distribution system. IFC creates useful storage, which isolates compressors from the demand side peak and trough to provide a stable air supply at optimum pressure. It monitors the demand side rate of change of pressure and releases only the required amount of storage air to satisfy the peak demand instead of starting additional compressors. Thus reduction in the mass of air and a reduction in the load period of compressors leads to energy savings.
BENEFITS	● Energy saving from 7% to 20% ● Simple payback period within 1 to 2 years ● Creates useful storage in the compressed air system ● Increases the response time of the system to meet instantaneous demand ● Constant air pressure to pneumatic tools; Reduction in artificial demand ● Reduction in compressed air leaks ● Reduction in compressor's operation & maintenance cost.

5. IE4 motors with VFD application

APPLICABILITY IN SECTORS	● All sectors of PAT
SUITABILITY	● Pumps, Fans, blowers, compressors etc., are driven by less efficient (IE1 &IE2) motors
BRIEF DESCRIPTION	The international IEC standard for electric motors (IEC 60034-30-1) classification scheme identifies four levels of motor efficiency; ● IE1 - Standard efficiency ● IE2 - High efficiency ● IE3 - Premium efficiency ● IE4 - Super premium efficiency Indian industries historically have used IE1 motors or non-standardised motors since last many years, and also follows the practice of rewinding of motors many times after failure, but these practices not only increase energy consumption but also increases specific energy consumption. Energy-efficient motors use less electricity, run cooler and provide more mechanical output by consuming less electrical input energy. In the efficiency category of electric motors, IE1 is considered a standard motor. Motors are rated IE1 to IE4 in increasing efficiency as shown in Figure 1.  Figure 1: Motor Efficiency Classification **Figure 1: Motor Efficiency Classification** In India, IE2 has been set as the Minimum energy performance standard for motors. Innovation and technology advancements have helped to reduce motor losses and improve motor efficiency. Figure 2 represents an energy efficiency comparison of IE1, IE2, IE3 and IE4 motors (4 poles 50 HZ) at various motor ratings (KW).

	 **Figure 2: Efficiency curves for IE4, IE3, IE2 and IE1 4 pole 50Hz electric motors** Energy efficient motor pays for itself because, over the life of the motor, the major cost is the running cost of the motor, having a contribution of 97% in the lifetime cost of the motor. Purchase cost contributes to 2% and repair and maintenance cost to 1%. Though the motor can be repaired 2-3 times over its lifetime, if it is done unprofessionally, it results in losses and a reduction in energy efficiency. With a service life of 10-15 years, the payback time for an IE4 motor compared to an IE3 is in many cases less than 2-3 years depending on motor size and operating hours. e.g. a 55kW, 4 poles motor operating 4000 hours a year will have a payback time of 2.5 years. The super-premium efficiency (IE4) motors come in the size range of 0.37 kW to 375 kW. The load factor of the IE4 motor should be greater than 65% so that the advantage of energy savings can be achieved. The benefits of using IE4 motors are maximum in continuous-duty applications such as compressors, pumps, fans, blowers, etc. IE4 motors are also equipped for frequency converter (VFD) duty. By using IE4 motors together with a premium VFD there can be several benefits including better process control, energy savings and a reduced starting current. It can further reduce stress on mechanical equipment and the electrical supply network. The internal efficiency loss caused by heat generation and friction can be as high as 20% in small motors and 4-5% in motors upward of 160 kW. IE4 motors operate with significantly less heating and, as a result, with much lower losses. Lower working temperatures mean less thermal stress on the motor, the motor bearings and the terminals. Motor service life is significantly extended as a result.
BENEFITS	● High efficiency & Less maintenance ● Lower operating temperatures ● Less thermal stress on the motor, the motor bearings and terminals. ● Enhanced motor life & Low operating cost

6. Inlet air cooling system

APPLICABILITY IN SECTORS	● In all sectors where Gas Turbines and bigger capacity air compressors are installed
SUITABILITY	● For inlet air cooling
BRIEF DESCRIPTION	Gas turbines and bigger size process air compressors take in filtered ambient air and compress it in the compressor stage. The performance of a gas turbine, its efficiency (heat rate) and generated power output strongly depend on the climate conditions, which may decrease the output power ratings by around 20-25%. In a Gas turbine, after mixing with the fuel in the combustion chamber, compressed air is ignited, leading to a high temperature and high-pressure flow of exhaust gases entering the turbine. As the gas turbine is a constant-volume machine, air volume introduced in the combustion chamber after the compression stage is fixed for a given shaft speed (rpm). Thus the air mass flow is directly related to the density of air, and the introduced volume. $m = \rho V$ Where m is the mass, ρ is the density and V is the volume of the gas. As volume V is fixed, only density ρ of the air can be modified to vary air mass. The density of the air depends on the relative humidity, altitude and temperature. To operate the turbine at ISO conditions and recover performance, inlet air cooling systems are the best.  **Figure XX: Inlet air cooling**
BENEFITS	● Heat rate can be improved by 6-8% as per the performance curve of the turbine ● With inlet air cooling the air temperature can be maintained at 15 Deg C and as a result ● the throughput of the turbine/compressor can achieve ISO condition ● Reduction in repair and maintenance cost

7. Designated Consumer Selection Criteria

S. No.	Criteria	Sub Criteria	Qualifying Criteria	Weightage for selection
1.	Percentage Upfront contribution by DC	% of the estimated project cost	Min. 50%	50%
2.	Overall contribution	Total contribution (INR)	INR	50%
If the sum of score of 1 and 2 is same, following marking will be adopted for the selection of beneficiary units.				
2	Specific energy saving	Cost basis (toe/Lakh Rs.)	Energy saved per INR lakh of investment	50%
3	Specific emission saving	Cost basis (tCO2/Lakh Rs.)	GHG mitigated per INR lakh of investment	50%

***Estimated project cost includes the cost of equipment and associated accessories, freight, insurance, unloading, installation and commissioning, etc.**

- A maximum number of technologies that shall be demonstrated in a single DC/group of DC be limited to maximum 2 technologies and project investment cost not more than INR 200 Lakhs in one single DC/group of DC.

- **The beneficiary industry will be selected through competitive bidding for whoever gets the highest marks in the evaluation of Expression of Interest.**

8. Objective of the REoI

Objective of REOI is to adopt a transparent mechanism for the selection of beneficiary units for demonstration. As government organizations, BEE and EESL follow norms of transparency in all their engagements.

For the finalization of REoIs EESL will adopt a cafeteria approach to assess the willingness of DCs toward the implementation of these energy-saving technologies. REoIs will also include the information to assess the capacity, saving potential, investment and payback period, organization/sectoral representation etc.
Annexures are attached for technical information to evaluate the above parameters.

9. Evaluation of the REoI

Units will be selected in a transparent manner by a committee comprising members from BEE & EESL. Evaluation of REoIs will be carried out in 2 stages as detailed below.

Stage-1
Information will be collected from the designated consumers through an online webpage. PMU will compile and analyze the information to evaluate the techno-commercial feasibility of the demonstration. The findings of the feasibility report will be shared with DCs to receive 2nd stage offers.

Stage-2

Cost Contribution has to be declared by each DCs based on the techno-commercial feasibility report shared. DC will be mapped in the DC selection matrix and ranking will be assessed. The selection matrix will be put up to the JTWC for approval.

If multiple units have the same ranking for the beneficiary selection for a particular technology, priority may be accorded as mentioned above in section 3.

10. Commercial Terms

9.1 Contribution of the technology cost sharing

The contribution of the technology cost sharing by DCs (To be filled during the second stage REoI after sharing the techno commercial feasibility report) in

a. INR______(in figures)
b. INR______________________________(in words)
c. In percentage(_______%) of estimated technology cost

9.2 Payment milestones towards upfront contribution

Payment milestones for cost-shared by DCs as agreed in clause 6.1

a. DC has to submit an Advance Bank Guarantee (ABG) equivalent to 10% of estimated technology cost at the time of signing of the agreement. ABG should be valid for the duration till 100% receipt of DC's cost contribution.
b. 50% of DC's contribution within 10 days from the date of the delivery of equipment at site
c. Balance 50% of DC's contribution within 10 days from the date of successful commissioning of equipment
d. ABG will be returned on receipt of 100% amount of DC's cost contribution
e. All statutory taxes/duties including GST or any indirect taxes or any duties / levies / CESS (including but not limited to labor CESS, construction CESS, and workmen compensation CESS) as applicable shall be reimbursed by DC to EESL on an actual basis.
f. In case of delay in payment to EESL, a "Delayed Payment Surcharge" shall be applicable on the outstanding amount due to EESL for the period beyond the "Due Date" to the actual date of credit of such dues into the EESL bank account. The Delayed Payment Surcharge shall be applicable at the rate of 2% over and above the annual SBI MCLR rate on the outstanding amount due to EESL on a day-to-day basis (and compounded monthly) for the duration starting from the Due Date to the actual date of receipt of payment against EESL's invoices.

9.3 In Case of Non-submission of the document by DC

If the selected DC is not able to submit documents along with ABG at the time of signing of the agreement, an offer will be given to the next shortlisted DC. The contribution amount from DC shall be based on the actual discovered price of the technology through competitive bidding.

9.4 Exclusion

Minor works not related to energy saving and necessary for the implementation of the Energy Efficiency technology will be under the scope of DC (like civil works, integration with the existing system, electrical lining/cabling, earthing, etc.)

11. REoI Format

Interested DC(s) have to download the excel file from the EESL website (Corporate Driven – Energy Efficiency Services Limited (eeslindia.org) and fill out the Microsoft form for the interesting technologies available at the following link.

Energy Efficiency Services Limited (eeslindia.org)

Energy Efficiency Services Limited (eeslindia.org)
On website :- Energy Efficiency Services Limited (eeslindia.org)

12. Designated Consumer Selection Criteria

S. No.	Criteria	Sub Criteria	Qualifying Criteria	Weightage for selection
1.	Percentage Upfront contribution by DC	% of the estimated project cost*	Min. 30% of project cost	50%
2.	Overall contribution	Total contribution (INR)	INR	50%
If the sum of score of 1 and 2 is same, following marking will be adopted for the selection of beneficiary units.				
3	Specific energy saving	Cost basis (toe/Lakh Rs.)	Energy saved per INR lakh of investment	50%
4	Specific emission saving	Cost basis (tCO_2/Lakh Rs.)	GHG mitigated per INR lakh of investment	50%

**Estimated project cost includes the cost of equipment and associated accessories, freight, and insurance, unloading, installation and commissioning, etc*.

- A maximum number of technologies that shall be demonstrated in a single DC/group of DC be limited to maximum 2 technologies and project investment cost not more than INR 200 Lakhs in one single DC/group of DC under DEEP scheme.
- **The beneficiary industry will be selected through competitive bidding for whoever gets the highest marks in the evaluation of Expression of Interest.**

13. Important dates

Sr. No.	Activity	Duration
A	Downloading of EOI formats will be available	20th Jan 2023
B	Submission of EOI	Till 31st Jan 2023
C	2nd stage REOI Release for cost contribution (Through emails to the short listed DCs)	To be informed via mail to applicant DC (for any queries & concerns,please mail at deep@eesl.co.in)
D	Window for submission of 2nd stage REOI	To be informed
E	Approval from JTWC committee	To be informed
F	Signing of agreement with selected DCs	To be informed

14. Technical Parameters

Sr. No.	Parameters	UoM	Input
	Client Information		
1	Name of the Company		
2	Company Group		
3	Company Website		
4	Sector of Industry		
5	PAT Registration Number		
6	Address		
7	City		
8	State		
9	PIN		
10	Name of the Contact Person		
11	Designation		
12	Contact No. (Mobile)		
13	Contact No. (Office)		

14	Email Address		
15	Plant operation cycle		
16	The average cost of electric Power	Rs./unit	
17	Plant Power Demand Maximum / Average	MW	
18	Site ambient air temperature	°C	
19	Site Relative humidity (Rh)	%	
20	Site altitude	MSL	

14.1 High-Grade Waste Heat Recovery System - Scrap pre heating

S. No	Parameters	UoM	Furnace-1
1	Gas flow at furnace outlet		
1.a	Max. gas flow at furnace outlet	Nm3/h	
1.b	Avg. gas flow at furnace outlet	Nm3/h	
1.c	Min. gas flow at furnace outlet	Nm3/h	
2	Gas temp. at furnace outlet		
2.a	Max. gas temp. at furnace outlet	°C	
2.b	Avg. gas temp. at furnace outlet	°C	
2.c	Min. gas temp. at furnace outlet	°C	
1	Electric Arc Furnace and transformer details (specifications)		
2	% Carbon in liquid metal	%	
3	Tapping (liquid metal temp.)	°C	
4	Tapping (Batch) weight of EAF	Ton	
5	Hot Heel (molten steel plus slag) of EAF	Ton	
6	Fuel used in furnace		
7	The sulfur dew point of fuel	°C	
8	Ambient temperature	°C	
9	Weight of scrap (for preheating)	Kg/h	
10	Type and size of scrap material		
11	Density of scrap material	ton / cum	
12	Specific heat of scrap material	kCal/(kg-°C)	
13	The temperature of scrap before preheating	°C	
14	Quantity of fuel used	l/h (or) kg/h (or) kWh	
15	NCV of fuel	kCal/kg	
16	Fuel Cost	Rs. /kg	
17	Daily operating hours	h/d	
18	Annual operating days	d/y	
19	Additional comment If any		
20	Willing to contribute to Project Cost (min 30%)	Yes/No	

14.2 High-Grade Waste Heat Recovery System _ Regenerative Burners

GENERAL QUESTIONS

S. No	Parameters	UoM	Input
1	Brief description of the technological process where the recuperator will be used.		
2	Place of installation of the recuperator (description, layout with dimensions, photos).		
3	Sizes of flanges or other connecting elements of inlet and outlet tubes.		

4	Are there any restrictions on dimensions? (width, depth, height).	M	
5	Recuperator operating mode	h/d	
6	Recuperator operating mode	d/y	
7	Desired direction of movement of the medium (counter, cross, parallel).		
8	Is there an existing heat exchanger or was there a heat exchanger installed previously? If yes, what are its present characteristics (dimensions, weight, advantages/disadvantages, technical characteristics).		
9	Where the heating medium will be taken from		
10	The purpose of the heated medium? Where will it be used?		
11	Required quantity of recuperators?		

OPERATIONAL PARAMETERS

S. No	Name	UoM	Heating medium (heat transferred from)	Heated medium (heat transferred to)	Heating medium (heat transferred from)	Heated medium (heat transferred to)
11	Medium (air, gas, others)					
12	Inlet Temperature	°C				
13	Outlet Temperature	°C				
14	Mass flow rate	kg/hr				
15	Inlet pressure	kg/cm2				
16	Pressure drop	kg/cm2				
17	Presence of SO2 & %	YES/NO/No data				
18	Presence of SO3 & %	YES/NO/No data				
18	Dustiness of inlet flow	g/nm^3 (yes, no, no data)				
19	Additional comment, If any					
20	Willing to contribute to Project Cost (min 30%)					

14.3 Cooling solutions from Low Grade Waste heat recovery (Vapor absorption chiller/ VAM)

S. No	Parameters	UoM	heat source-1
1	Source and type of waste heat available		
2	Waste heat available (flow rate)		
2.a	Maximum	Kg/h	
2.b	Average	Kg/h	
2.c	Minimum	Kg/h	
3	**temperature of waste heat available**		
3.a	Maximum	°C	
3.b	Average	°C	

S. No	Parameters	UoM	heat source-1
3.c	Minimum	°C	
4	Pressure of Waste heat	kg/cm²	
5	Ambient temperature	°C	
6	Sulfur dew point temperature of the fuel	°C	
7	Type of fuel used in the device from which waste heat is being generated		
8	Quantity of fuel used (flow rate)	Kg/hr	
9	Required Chilled water temperature at the inlet of VAM	°C	
10	Required Chilled water temperature at the outlet of VAM	°C	
11	Required Chilled water flow	m3/h	
12	Existing source of chilling	VAM/Electrical chiller	
13	Existing chilling capacity	TR	
14	Daily operating hours	h/d	
15	Annual operating days	d/y	
16	Specific Power consumption of existing chilling system (Including auxiliary)	Kw/TR	
17	Power cost	INR/KWH	
18	Capacity of existing Cooling tower	TR	
19	existing flow of cooling tower pumps	M3/HR	
20	No. of cooling tower pumps	nos	
21	Temperature profile of cooling tower approach	°C	
22	Temperature profile of cooling tower range	°C	
23	Condenser cooling type	Air / Water	
24	Additional comment If any		
24	Willing to contribute to Project Cost (min 30%)	Yes/No	

14.4 Industrial Automation: Online Coal GCV Analyser

S.No.	TECHNICAL PARAMETERS	UoM	Input
1	**Belt conveyor parameter:**		
	Belt material		
	Belt width	mm	
	Belt Speed (Constant or Variable)		
	Max Belt speed	m/s	
	Min Belt speed	m/s	
	Avg Belt speed	m/s	
	Thickness	mm	
	Belt height from the ground	inches	
2	**Belt conveyor other conditions:**		
	Sway (Degree of Running)	YES/NO	
	Vibration	YES/NO	
3	**Belt conveyor type** (Ordinary leather belt / Steel wired belt / Chlorinated belts/ Others)		
4	**If it is steel wired belt conveyor:**		
	Thickness of steel wire belt inner steel wire	mm	
	Built-in space separation distance	mm	
5	**Measured coal type:**	*Mention Grade and moisture/ash content of coal	

S.No.	TECHNICAL PARAMETERS	UoM	Input
6	**Measured coal bed:**		
	Max thickness	mm	
	Min thickness	mm	
7	**Measured coal bed change condition:**	HIGH	
		LOW	
		ADDITONAL DETAILS	
8	**The condition of coal when measured normally (Note: Data to be collected for different types of coal used separately, atleast 5 types of most commonly used coal)**		
	Ash range	%	
	Moisture content range	%	
	Calorific value	kCal/kg	
	General particle size range	µm	
	Presence of stones etc	-	
	Uniformity in coal size	-	
9	**External conditions:**		
	Temperature range	°C	
	Humidity range	%	
	Whether it has rats (to provide braided cables etc.)	-	
	Whether it is prone to lightning strikes	-	
10	**Distance of control room from sensor:**	m	
11	**Coal Size: -**		
	Maximum	**mm**	
	Average	**mm**	
	Minimum	**mm**	
12	**Pictures for the belt, controlling room and surrounding areas etc:**		
13	**If any other input:**		

14.5 Industrial Automation: Automatic Blowdown-Control System

S.No.	TECHNICAL PARAMETERS	UoM	Input
	Design Parameters		
1	*Boiler operating pressure	kg/cm2	
2	Boiler capacity	TPH	
3	Boiler Efficiency	%	
4	Calorific Value of the Fuel	kcal/kg	
5	Cost of Fuel	INR/kg	
6	*Steam generation rate	kg/h	
7	*Feed water TDS	ppm	
8	*Feed water conductivity	µS/cm	
9	*Permissible boiler water TDS	ppm	
10	*Boiler water conductivity	µS/cm	
11	*Provision available for fitting conduction probe	-	
12	*If yes, Dimension of provision		
13	*Blowdown control valve solenoid supply voltage	V	

S.No.	TECHNICAL PARAMETERS	UoM	Input
14	Existing blow down rate	kg/hr	
15	Annual working days	d	
16	Daily working hours	h	

14.6 Industrial Automation: IFC for Compressed Air Network

S.No.	TECHNICAL PARAMETERS	UoM	Compressor 1	Compressor 2	Compressor 3
	Compressor Data:				
1	Make				
2	Model				
3	Compressor Type				
4	Lub/Non-Lub				
5	Control type				
6	Control settings	Bar			
7	Capacity	CFM			
8	Motor	kW			
9	Rated Efficiency	%			
10	Voltage	V			
11	Starter type				
13	Power consumption at Loaded Condition	kW			
14	Power consumption at Unloaded Condition	kW			
15	Is your compressed air system Centralised or Decentralised				
	Operational data				
1	Working compressors				
2	Capacity	CFM			
3	Hours				
4	Product manufactured				
5	Use of compressed Air				
6	System Unload Pr. :	Bar			
7	load Pr. :	Bar			
8	Accept Pr. :	Bar			
9	Working Hours / Day:	Hrs			
10	Days/Yr	days			
11	Electricity tariff rate:	Rs/kWh			
12	Daily Energy Consumption:	kWh/Day			
13	Main Header Size :	Inch/mm			
14	Comp Room Receiver:	m3			
15	Dryer Present:	Yes / No			
16	Header Length in compressor room	Mtrs			
17	Receiver Sizing in Plant:	m3			
18	Dew Point	°C			
19	Dryer Dp:	bar			
	Dryer				
1	Make				
2	Model				
3	type				
4	Capacity	CFM			
	Pre filters 1				
1	Make				

S.No.	TECHNICAL PARAMETERS	UoM	Compressor 1	Compressor 2	Compressor 3
2	Model				
3	Type				
	Volumetric Flow Rate	m3/hr			
	Pre filters 2 (if applicable)				
1	Make				
2	Model				
3	Type				
	Volumetric Flow Rate	m3/hr			
	Pre filters 3 (if applicable)				
1	Make				
2	Model				
3	Type				
	Volumetric Flow Rate	m3/hr			
	Please add any other pre-filter data if applicable.				
	Post filter 1				
1	Make				
2	Model				
3	Type				
4	Volumetric Flow Rate	m3/hr			
	Post filter 2				
1	Make				
2	Model				
3	Type				
4	Volumetric Flow Rate	m3/hr			
	Post filter 3				
1	Make				
2	Model				
3	Type				
4	Volumetric Flow Rate	m3/hr			
	Please add any other post-filter data if applicable.				
	Challenge in Existing Compressed Air System				
	Operational data				
1	Running Hours				
2	Loaded Hours				
3	Compressor no.				
4	Please send a single line schematic diagram of your Compressed Air system along with this data sheet.				
Note	**Data to be collected for 24 Hours**				

14.7 IE4 MOTORS WITH VFD

S. No.	Preliminary motor data	Unit of Measure	Existing motor Specifications
1	Application of motor		
2	Motor power rating (0.75 to 75 KW)	KW	
3	Motor speed	rpm	
4	Frequency (50 Hz)	Hz	
5	Voltage (3 Phase LT Motors only)	V	
6	Motor mounting type		
7	Type (Non Flame proof application only)		

S. No.	Preliminary motor data	Unit of Measure	Existing motor Specifications
8	Motor efficiency	%	
9	Power factor		
10	Ambient temperature	Deg C	
11	Class of insulation		
12	Temperature rise limited	Deg C	
13	Type of cooling		
14	Duty (S1)		
15	Service factor		
16	Ingress protection		
17	Manufacturer		
18	Starting method		
19	No of poles		
20	Nos of Rewindings done		
21	Daily Operating Hours	Hrs	
22	Annual operating Days	No of Days	
23	Tariff	INR/kWHr	
Note: only Non flame proof 3 phase LT motors can be applied in range of 0.75 to 75Kw			

14.8 Inlet Air Cooling

S.No	Operating conditions / Technical Parameters	UoM	Design Parameter	Remarks
Note	Please optimise the format for GT/Compressor as applicable.			
	ISO Standard for Machine			
A	**PROSPECTIVE APPLICATIONS**			
1	GT/Compressor Design Air flow	Kg/hr	190000	
2	Design inlet air temperature to Filter House	Deg C	30	
3	Design inlet air humidity to Filter House	%	60	
4	Design outlet air temperature from Filter House	Deg C		
5	Design outlet air humidity from Filter House	%		
6	Heat Load rejection	TR	To be Calculated	
B	**HEAT SOURCE**			
	Exhuast Gas			
1	GT exhaust flue gas temperature	deg. C	200	
2	GT exhaust flue gas flow	Kg/hr	200000	
	Process Condensate / Hot Water			
1	Hot water temperature	deg. C		
2	Hot water flow rate	m3/hr		
3	Pressure of hot water	bar(g)		
4	Possible heat recovery	TR	To be Calculated	
	Steam			
1	Steam pressure	bar(g)		
2	Steam temperature	deg. C		
3	Approx steam available	kg/hr		
C	**Other operating parameters**			
1	GT Power Generation			
2	Existing pressure drop across entire filter house in **clean condition** for GT/Compressor	mm of WC		
	Final pressure drop limit for GT/Compressor	mm of WC		
	Present life of filter elements	no of months		

S.No	Operating conditions / Technical Parameters	UoM	Design Parameter	Remarks
	Present final grade of filtration			
3	Steam Condensate return temperature	Deg C		
	Condensate flow	kg/hr		
	Condensate return line header pressure	kg/cm2 (g)		
5	Cooling water supply temperature	deg. C		
6	Power supply conditions			
	Voltage with tolerance	V		
	Frequency with tolerance	Hz		
	Phase			
6	Instrument air pressure	kg/cm2 (g)		
7	Cost of energy generation			
8	Daily Operating Hours	Hrs		
9	Annual Operating Days	No of Days		
10	Tariff	INR/ kWHr		
Note	**1. Please optimise the format for GT/Compressor as applicable.** **2. Upload compressor performance curve**			