

DLF Cyber City

District CHP Project

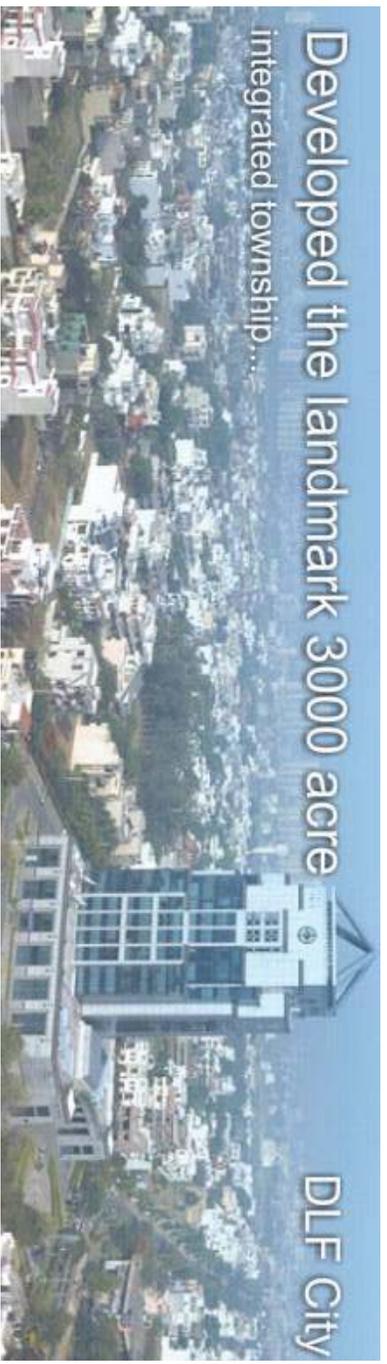
Please contact:

Robin Bisarya, CCO

MBH NRG LLC

Robin@mbhnr.com





Introduction

DLF Limited, is India's largest real estate company in terms of revenues, earnings, market capitalisation and developable area. It has a 62-year track record of sustained growth, customer satisfaction, and innovation. The company has approximately 238 msf of completed development and 423 msf of planned projects, and has pan India presence across 30 cities.

DLF's primary business is development of residential, commercial and retail properties. The company has a unique business model with earnings arising from development and rentals. Its exposure across businesses, segments and geographies, mitigates any down-cycles in the market. DLF has also forayed into infrastructure, SEZ and hotel businesses. DLF City Gurgaon is divided into five phases with total area 120 million sq.ft., DLF Cyber City is phase 3 including more than 10 buildings like DLF Building 10, Infinity Tower, DLF Cyber Green, Gateway Tower etc., and the Building 10, Building 5 and Building 14 are the biggest CHP cases in the world.

Economics

In India, the conventional generation efficiency is 32%-56%, the energy loss in transfer is 8%, and total efficiency of the system is 30%-51%. But for CHP system, 40%-50% of the waste heat from generator can be used, so total efficiency of the system can reach 70%-90%.

This district is using 59 units of generators, 33 units of BROAD non-electric chillers. The generation efficiency is 30%-35%, and BROAD Non-electric Air Con. (BZHE & BE) can recover 85%-95% waste heat, after this step-utilizing waste heat, the total efficiency of the system is increased to 85%. From here we can see BROAD Non-electric Air Con. play important part in energy-utilizing for the CHP system.

In India, the air conditioning price of office building is around 0.2-0.3 USD/ sq.ft.*month, after using BROAD non-electric air conditioning and distributed CHP system, the air conditioning cost is only 0.04 USD/ sq.ft.*month. The investments of the whole system can payback within 1 year.

Compared with electric air conditioning:

- Reduce the power demand by 100,000 kW.
- Reduce the power consumption by 65,000 kW.
- Reduce natural gas consumption by 70 million cubic meters yearly.
- Reduce CO₂ emission by 36,000 tons yearly.
- Equal to plant 1.9 million trees.

Advantages:

- High reliability/ avoid the electric power crisis caused by accident such as power grid breakdown, disaster (earthquake, snowstorm, war) etc.
- Reduce emission of the greenhouse gases (N₂O, CFC) causing global warming.
- Reduce the temperature of exhaust from generator
- Reduce the machine room area request.
- Disposed sewage can be used to co-generation and air conditioning device.

Please contact:

Robin Bisarya, CCO

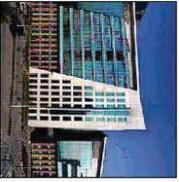
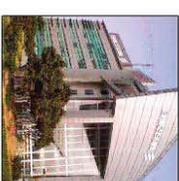
MBH NRG LLC

Robin@mbhnrng.com

DLF Cyber City District Cooling System Diagram



Note: Building Area is 30 million sq.ft.,
Air-con Area is 18 million sq.ft.

- 
1-DLF Building 10
- 
2-DLF Building 8
- 
3-DLF Infinity Tower
- 
4-Gateway Tower
- 
5-Ericsson Forum
- 
6-DLF Building 14
- 
7-DLF Building 6
- 
8-DLF Building 9A
- 
9-DLF Building 9B
- 
10-DLF Cyber Green
- 
11-DLF Building 7
- 
12-DLF Building 5

DLF Building 10

An integrated technology Park offering modern workspace to IT/ITES companies.

Description of Machines

Gas Generator:

Turbomach 5.5MW×4 units

MWM 4.2MW×5units

Absorption Chiller:

BE1000×4 units

(cooling capacity 3,150 RT for each unit)

BZHE400×5 units

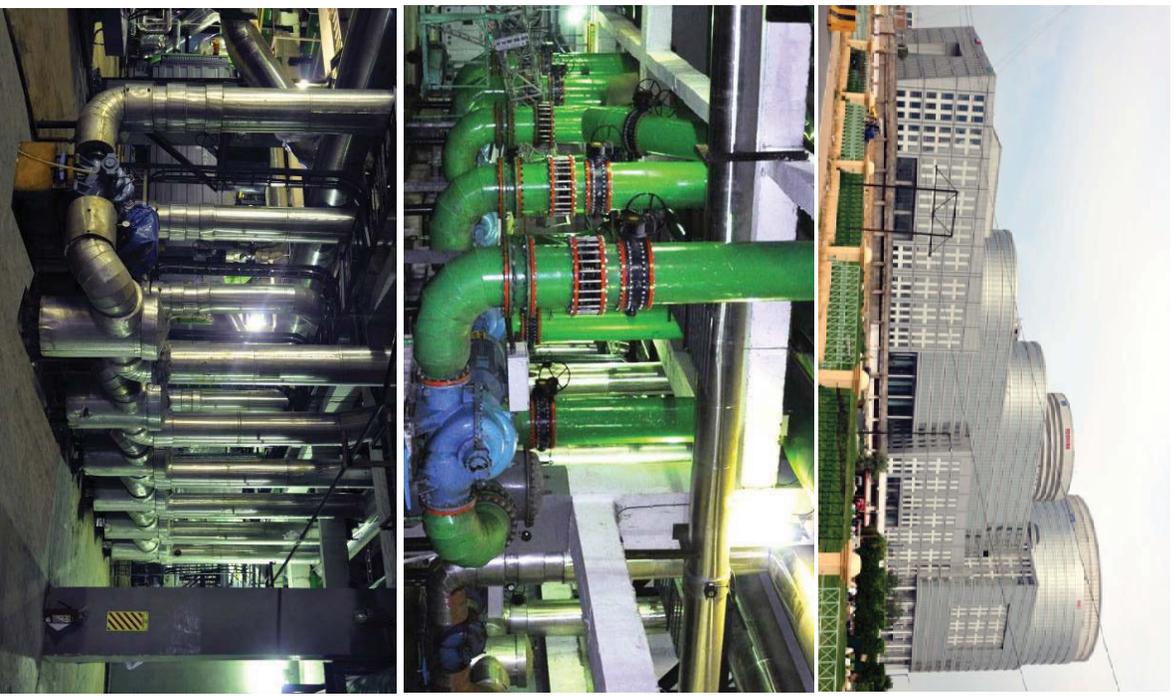
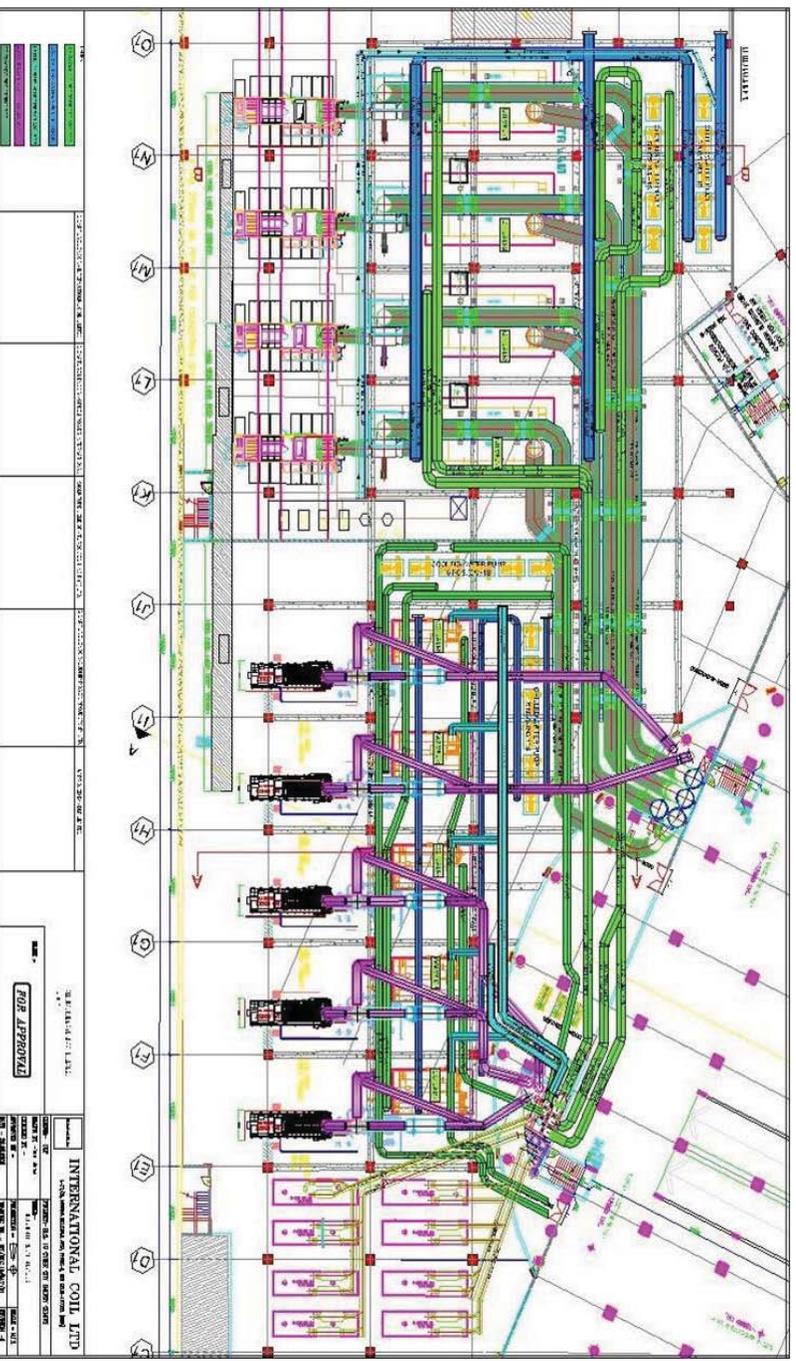
(cooling capacity 1,100 RT for each unit)

Features:

Natural gas power generation; Cooling by waste heat from power generation; Total 40 MW power & 18,100 USRT cooling to DLF Building 10, Building 8, Building 9A, 9B & DLF Cyber Greens.

DLF Building 10 Energy System Diagram

4X5.5MW GT + 4XBE1000 + 5x4.2MW GG + 5XBZHE400





BROAD Exhaust Chiller BE1000

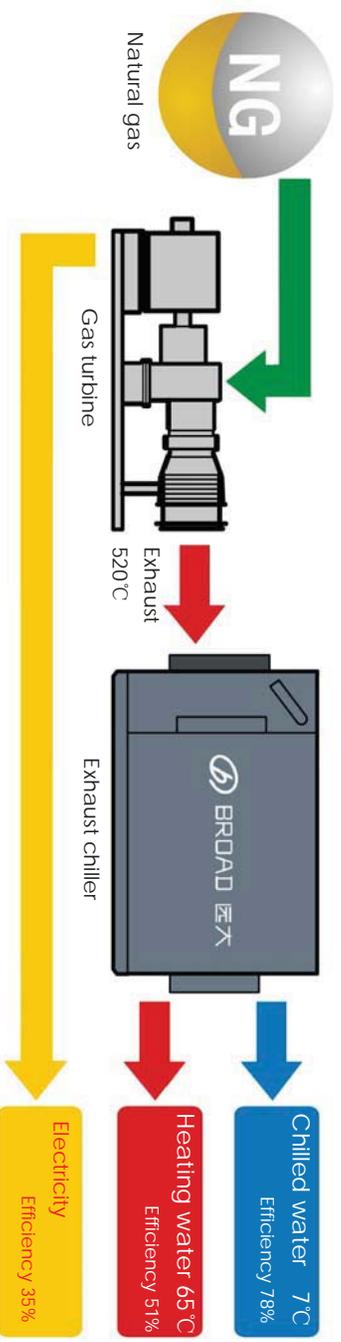
Parameters of BROAD Exhaust Chillers

Manufacturer	BROAD
Model	BE9551X520-d-1000
Quantity	4 units
Cooling Capacity per unit	3,150 RT
Total Cooling Capacity	12,600 RT
Chilled W. Outlet/Inlet Temp.	7 Deg. C / 14 Deg. C
Cooling W. Outlet/Inlet Temp.	37.5 Deg. C / 32 Deg. C
Energy	520 Deg. C Exhaust Gas
Exhaust Gas Mass Flow Rate	73,800 kg/h



Chiller Exhaust Gas Inlet

Machine Room Equipment Drawing (Exhaust Type) : 5.2MW GT + BE1000



Please contact:

Robin Bisarya, CCO

MBH NRG LLC

Robin@mbhnrng.com

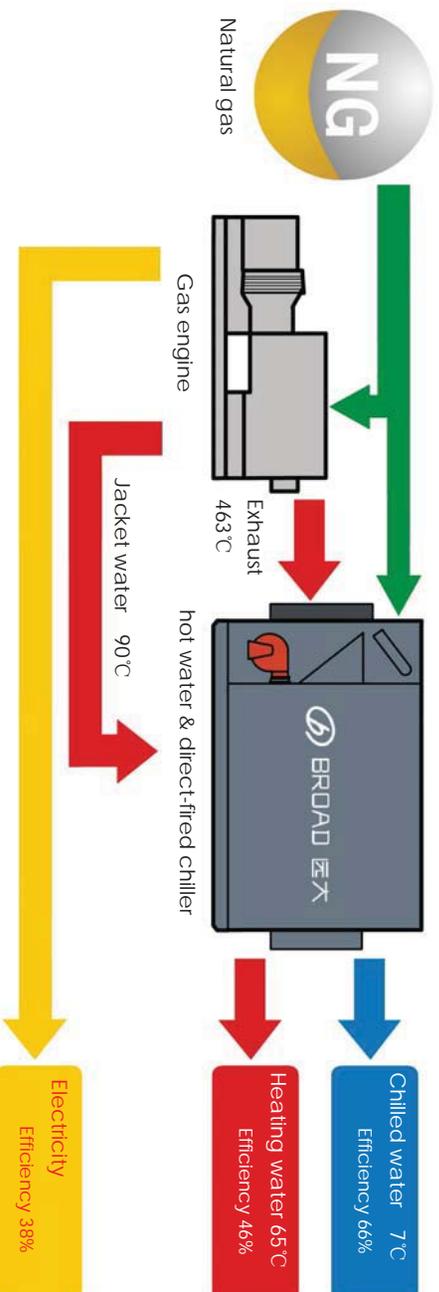


BROAD Multi-Energy Chillers BZHE400

Parameters of BROAD Multi- Energy Chillers

Manufacturer	BROAD
Model	BZHE333XBD-463-80/90-d-400
Quantity	5 units
Cooling Capacity per unit	1,100 RT
Total Cooling Capacity	5,500 RT
Chilled W. Outlet/Inlet Temp.	7 Deg. C / 14 Deg. C
Cooling W. Outlet/Inlet Temp.	37.5 Deg. C / 32 Deg. C
Energy	463 Deg. C Exhaust Gas, 80 / 90 Deg. C Jacket W. and N.G., HSD for backup burner
Exhaust Gas Mass Flow Rate	20,898 kg/h
Jacket W. Flow Rate	137 m ³ /h

Machine Room Equipment Drawing (N.G., Exhaust & Jacket W. Type) : 4.2 MW GG + BZHE400



DLF Building 5

The building offers over 2 million sq.ft (approx) of workspace spread over 3 interconnected blocks.

Description of Machines

Gas Generator:

Turbomach 5.5MW×4 units

MWM 4.2MW×5units

Absorption Chiller:

BE1000×4 units

(cooling capacity 3,150 RT for each unit)

BZHE400×5 units

(cooling capacity 1,100 RT for each unit)

Features:

Natural gas power generation; Cooling by waste heat from power generation;Total 40 MW power & 18,100 USRT cooling to DLF Building 5, Building 6,Building 7A, 7B & DLF Building 14.



Parameters of BROAD Exhaust Chillers

Manufacturer	BROAD
Model	BE9551X520-d-1000
Quantity	4 units
Cooling Capacity per unit	3,150 RT
Total Cooling Capacity	12,600 RT
Chilled W. Outlet/Inlet Temp.	7 Deg. C / 14 Deg. C
Cooling W. Outlet/Inlet Temp.	37.5 Deg. C / 32 Deg. C
Energy	520 Deg. C Exhaust Gas
Exhaust Gas Mass Flow Rate	73,800 kg/h

Parameters of BROAD Multi- Energy Chillers

Manufacturer	BROAD
Model	BZHE333XBD-463-80/90-d-400
Quantity	5 units
Cooling Capacity per unit	1,100 RT
Total Cooling Capacity	5,500 RT
Chilled W. Outlet/Inlet Temp.	7 Deg. C / 14 Deg. C
Cooling W. Outlet/Inlet Temp.	37.5 Deg. C / 32 Deg. C
Energy	463 Deg. C Exhaust Gas, 80 / 90 Deg. C Jacket W. and N.G., HSD for backup burner
Exhaust Gas Mass Flow Rate	20,898 kg/h
Jacket W. Flow Rate	137 m³/h

DLF Building 8



Building 8 is spread across an area of approx 1.4 million sq.ft. It is divided in to 3 blocks (8A, 8B & 8C), with a range of 4-9 floors

Description of Machines

Gas Generator:

Caterpillar 1.4MWx4 units

Absorption Chiller:

BZHE150x4 units
(cooling capacity 496 RT for each unit)

Features:

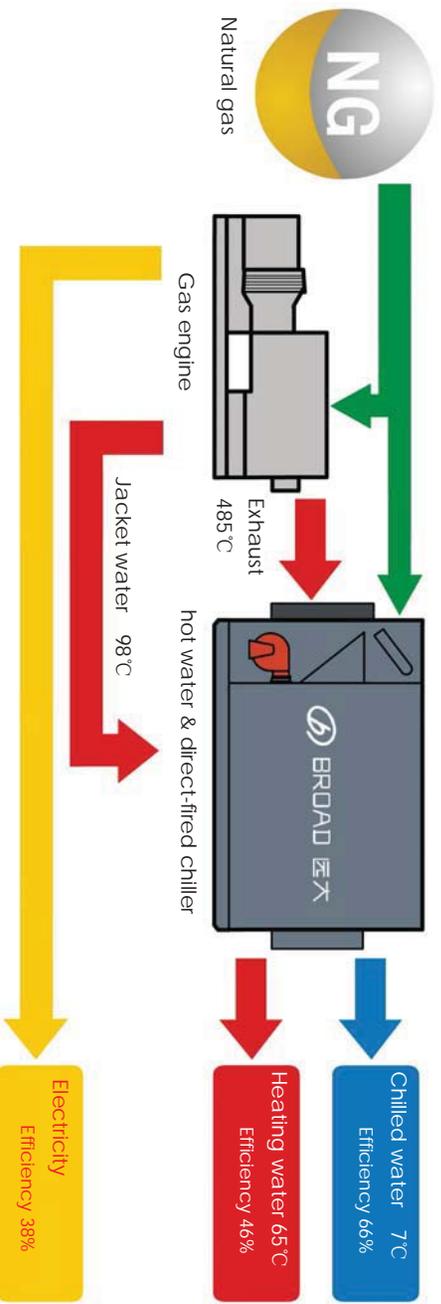
Natural gas power generation; Cooling by exhaust gas and jacket water from power generation.

Parameters of BROAD Multi- Energy Chillers

Manufacturer	BROAD
Model	BZHE150IXBD-485-92/98-k-B2
Quantity	4 unit
Cooling Capacity per unit	496 RT
Total Cooling Capacity	1,984 RT
Chilled W. Outlet/Inlet Temp.	7 Deg. C / 12 Deg. C
Cooling W. Outlet/Inlet Temp.	37.5 Deg. C / 32 Deg. C
Energy	485 Deg. C Exhaust Gas, 92 Deg. C / 98 Deg. C Jacket W. and N.G., Light Oil for backup burner
Exhaust Gas Mass Flow Rate	8,149 kg/h
Jacket W. Flow Rate	105 m ³ /h



Machine Room Equipment Drawing (N.G., Exhaust & Jacket W. Type)



DLF Infinity Tower

Three interconnected towers (A, B, C) scaling between 10-12 storeys. Spread across 1.2 million sq.ft of space.

Description of Machines

Gas Generator:

Caterpillar 1.4MWx4 units

Absorption Chiller:

BZHE150x7 units

(cooling capacity 496 RT for each unit)

Features:

Natural gas power generation; Cooling by exhaust gas and Jacket water from power generation.

Please contact:

Robin Bisarya, CCO

MBH NRG LLC

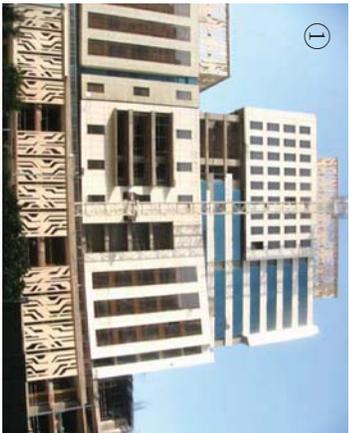
Robin@mbhnr.com

Parameters of BROAD Multi- Energy Chillers

Manufacturer	BROAD
Model	BZHE150IXBD-485-92/98-k-B2
Quantity	7 unit
Cooling Capacity per unit	496 RT
Total Cooling Capacity	3,472 RT
Chilled W. Outlet/Inlet Temp.	7 Deg. C / 12 Deg. C
Cooling W. Outlet/Inlet Temp.	37.5 Deg. C / 32 Deg. C
Energy	485 Deg. C Exhaust Gas, 92 / 98 Deg. C Jacket W. and N.G., Light Oil for backup burner
Exhaust Gas Mass Flow Rate	8,149 kg/h
Jacket W. Flow Rate	105 m ³ /h



District Pipe Line & Gas Station



①



④



⑦



②



⑤



③



⑥



⑦DLF Gateway Tower

Gateway Tower acts as the gateway to the 3000-acre landmark city of DLF. This 12-storey complex is spread across an area of 85,000 sq.ft..

①DLF Building 14
The modern work spaces of Building 14 lend a distinctive appeal to this aesthetically designed architectural wonder. Spread over 2 million sq.ft. approx.

②Ericsson Forum
Ericsson Forum represents company's Indian Corporate Office and consolidate its multiple offices in the National Capital Region (NCR). Spread over 170,000 sq.ft. approx.

③DLF Building 6
An integrated technology park offering modern workspace to the IT and ITES companies. This building is across an area of 2 million sq.ft.

④DLF Building 9A & 9B
9 A and 9 B are perfectly located in between Ericsson building and DLF Cyber Greens. The majestic towers of 1.25 mn. Sq.ft. (approx) spread over two independent buildings.

⑤DLF Cyber Green
This Landmark complex is spread across an area of 900,000 (approx.) sq.ft. The complex constitutes five blocks / towers each scaling to 10-18 storeys.

⑥DLF Building 7A, 7B
Building 7A, 7B, the built-to-suit office space developed for Standard Chartered & RBS is spread across an area of 1 million sq. ft..

Please contact:
Robin Bisarya, CCO
MBH NRG LLC
Robin@mbhnr.com

Economic Data From DLF Official Website

DLF Infinity Tower Power Consumption Comparison Chart

Conventional System (Using electrical chillers)	Co-gen with CHP (Using absorption chillers)
Electrical Energy: 12.25MW	Electrical Energy: 9.8MW
Air Conditioning: 4,000RT	Free A/C available from waste heat recovery: 3500RT
Heat energy of flue gas is released to atmosphere	Equivalent electrical energy saved: 2,450KW
/	Percentage of energy saved: 20-25%

Comparison Between Conventional System and CHP

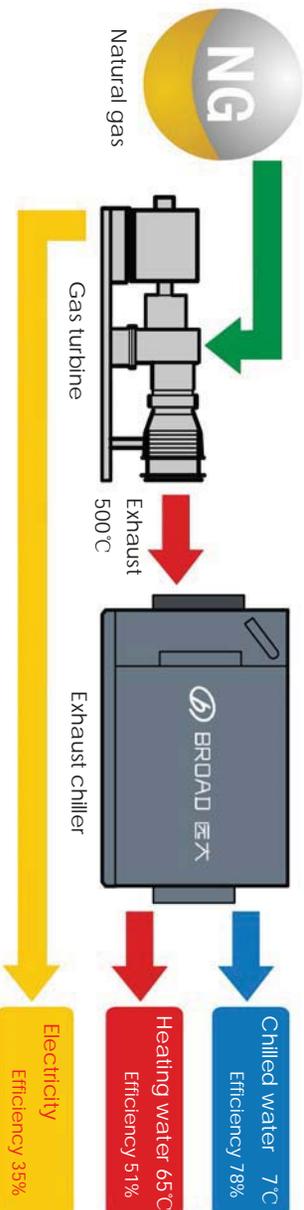
Item	Centralized Generation	Distributed Generation
Delivered Power	2,000MW	2,000MW
Capital Cost		
Generation	2.22 billion	2.34 billion
Incremental T&D	2.22 billion	0.23 billion
Total Capital Cost	4.44 billion	2.57 billion
Fuel Cost for 20 years	13.08 billion	5.49 billion
Total Cost for 20 years	17.53 billion	8.06 billion
Unit Cost for Generation	95.6/MWh	49.3/MWh

Analysis from India Centre for Fuel Studies and Research has concluded that the unit cost DE sources such as CHP over 20 years lifespan can be about half as much as Centralized option.

BROAD CHP Modes

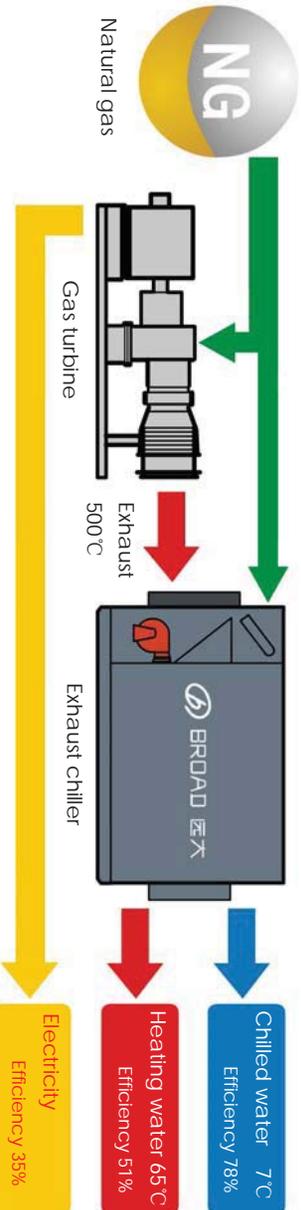
Model 1 : Exhaust type

Energy efficiency: electricity+cooling 113% electricity+heating 86%



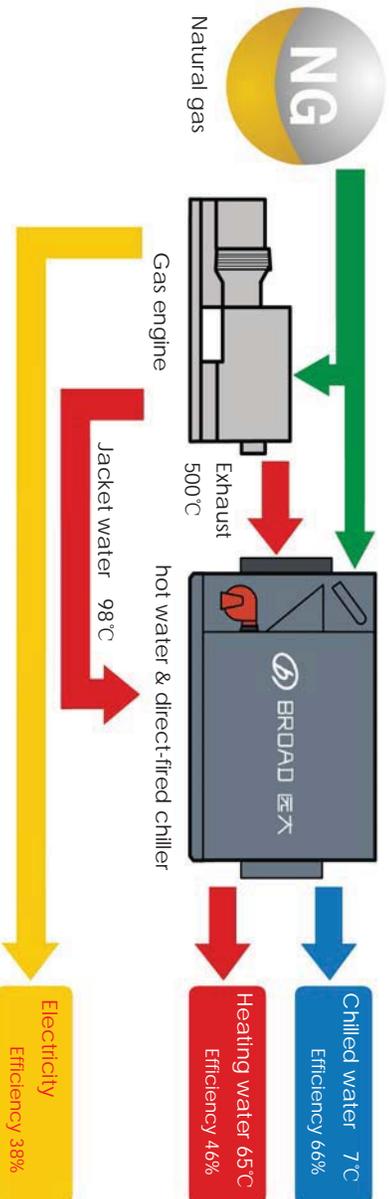
Model 2 : Exhaust & direct-fired type

Energy efficiency: electricity+cooling 113% electricity+heating 86%



Model 3 : Exhaust, hot W. & direct-fired type

Energy efficiency: electricity+cooling 104% electricity+heating 84%



Model 4 : Steam type

Energy efficiency: electricity+cooling 110% electricity+heating 85%

