Trigeneration as Solution for CHPC

Green Power International Pvt. Ltd.

Presented by:

DMH & GPIPL

Topic for discussion:

- Snapshot
  - About Green Power International Pvt Ltd.
  - Our Partners…
- Cogeneration (CHP) and Trigeneration (CHPC)
  - Concept, Application Solution.
  - CHP & CHPC System Efficiencies.
  - How Trigeneration Works.
  - Reasons Why Trigeneration Plant opted for…
  - Power generation cost with CHPC.
  - Benefits of Trigeneration.
- Overview of Installation.
  - MWM - GPIPL My Fleet data
  - References
  - Brief about DMH Installation.
  - DMH Contribution towards Environment.
- Q&A Session…

A Snapshot

Green Power International Pvt. Ltd.

Established in 2002.

Power solutions with gas gensets 12kWe - 4500 kWe.

Team of Best Professionals from the industry with 500+ Committed Manpower.

Single window turnkey EPC solution & Long-term comprehensive O&M services for gas and liquid power plants up to 100 MW capacity

.

Worldwide Presence – India, Nigeria, Thailand and Middle East

Over 900+MW installed base Worldwide.

In house capability to take up specialized turnkey EPC jobs outside our core business

Liquid Fuel Power Projects, Low rpm engines & Long-term comprehensive O&M

H2, CO2, Methanol capture and storage, Alternate fuel (Dual fuel, Hydrogen etc.) based power generation, Air conditioning, Railway electrification etc.

Gas upgradation system – Bio CBG & H2S Scrubber along with O&M services

GPIPL Partners:

Green Power International Pvt. Ltd.

ROLLS ROYCE

R SCHMITT ENERTEC

MAN

carbon clean
TECHNOLOGY TO ACHIEVE 'NET ZERO'

MWM
Energy. Efficiency. Environment.

ANGLO BELGIAN CORPORATION

ECOFINITY

kirloskar
Oil Engines

stx

A Snapshot

Green Power International Pvt. Ltd.

MWM

Energy. Efficiency. Environment.

A Snapshot

Green Power International Pvt. Ltd.

MWM
Energy. Efficiency. Environment.

ABOUT MWM

01 MWM more than 150 Years Old German Company manufacturing Gas & Diesel Gensets.

02 Product Range :400 kWe To 4500 kWe (in Single Unit)

03 Offer product for Natural Gas, Coke Oven Gas, Biogas, Sewage Gas, Coal Bed Methane, Producer gas etc.

04 Now offering gensets capable of operating on Hydrogen fuel.

05 MWM sets the standards for efficiency, support and service quality.

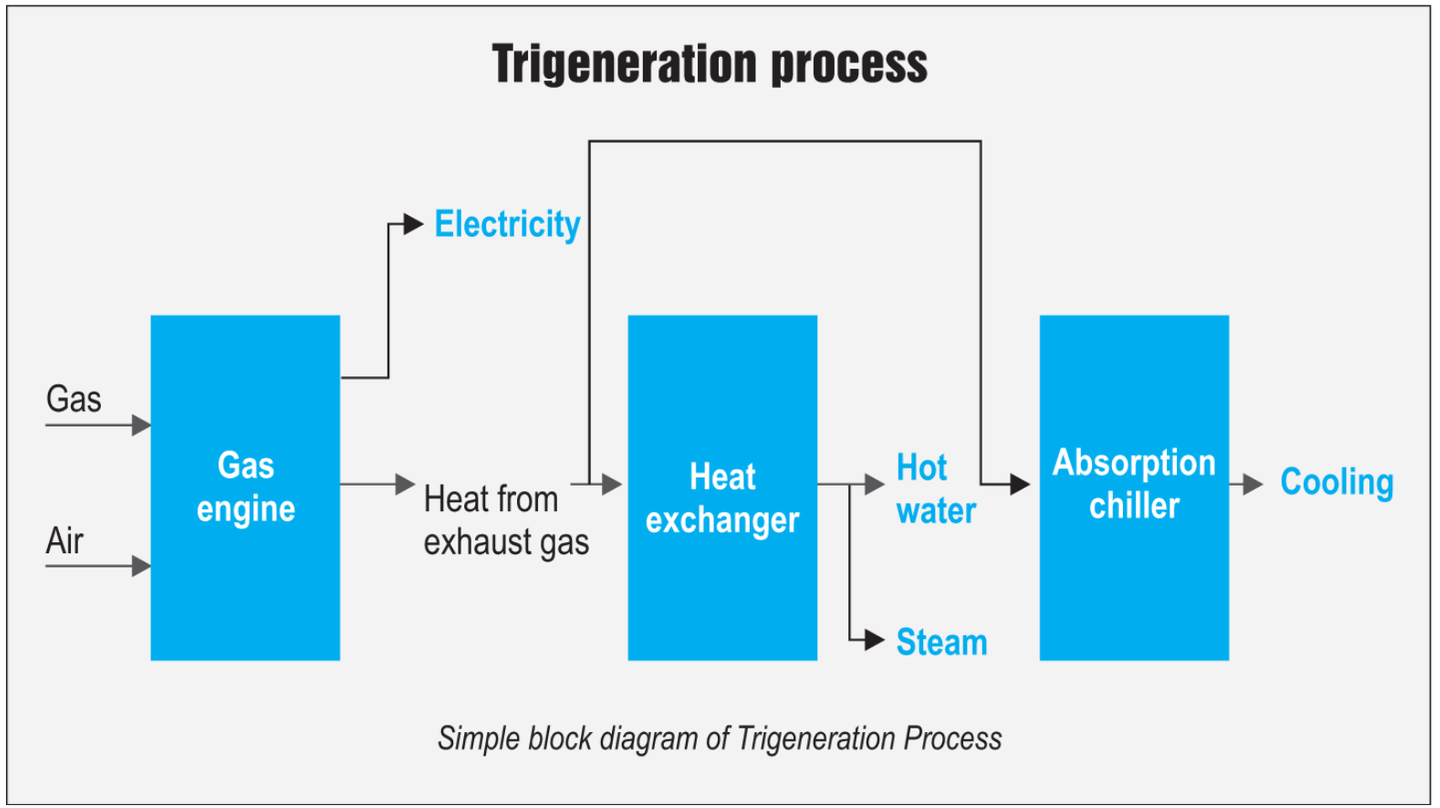
MWM recognized SOLUTIONS PROVIDER

WE are MWM's authorised distributors for INDIA and THAILAND, as well as recognized solutions provider for the African market.

Cogeneration & Trigeneration Concept:

Green Power International Pvt. Ltd.

- **Cogeneration (CHP):** Produces electricity and heat (usually for steam or hot water).
- **Trigeneration (CHPC):** Produces electricity, heat, and cooling (air conditioning or refrigeration) using an absorption chiller, ***in a single integrated system***.



Simple block diagram of Trigeneration Process

Cogeneration & Trigeneration Concept:

Green Power International Pvt. Ltd.

Overall Efficiency 89.5%

Gas Engine:

a) Exhaust Gas
b) Jacket Water
c) Exhaust Gas + Jacket Water

Gas Turbine:

a) Exhaust Only

Overall Efficiency 60%

Heat Recovery

Micro Turbines

a) Turbine Exhaust

Overall Efficiency 80%, however capacity available upto 500 KW

Steam Turbine:

a) Steam Condensate cum Extraction Recovery
b) Steam Backpressure Recovery

Overall Efficiency 50%

CHP & CHPC: Application Solution

CHP & CHPC System Efficiencies:

Green Power International Pvt. Ltd.

Electrical Efficiency: 43.5%

Thermal Efficiency: 45%
(with Heat Recovery)

Overall Efficiency
: 88.5%

Unused Heat: 11.5% approx
(Alternator Loss, Stack loss, Radiation loss, Coolant loss etc etc…)

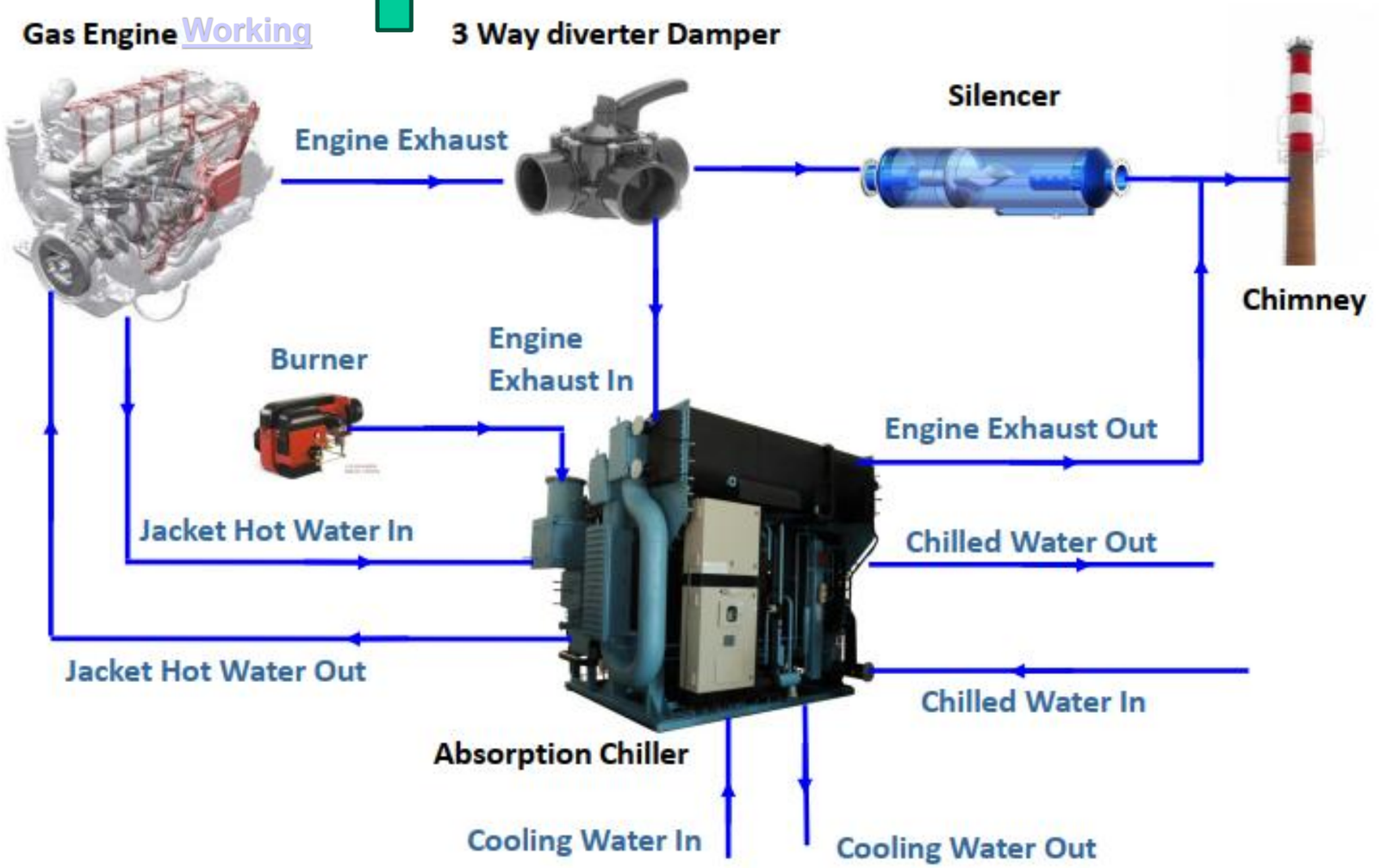
How Trigeneration Works:

Various Applications:

- ✓ Cooling
- ✓ Steam Generation
- ✓ Thermic Fluid Heating
- ✓ Hot Water & Hot Air

Green Power International Pvt. Ltd.

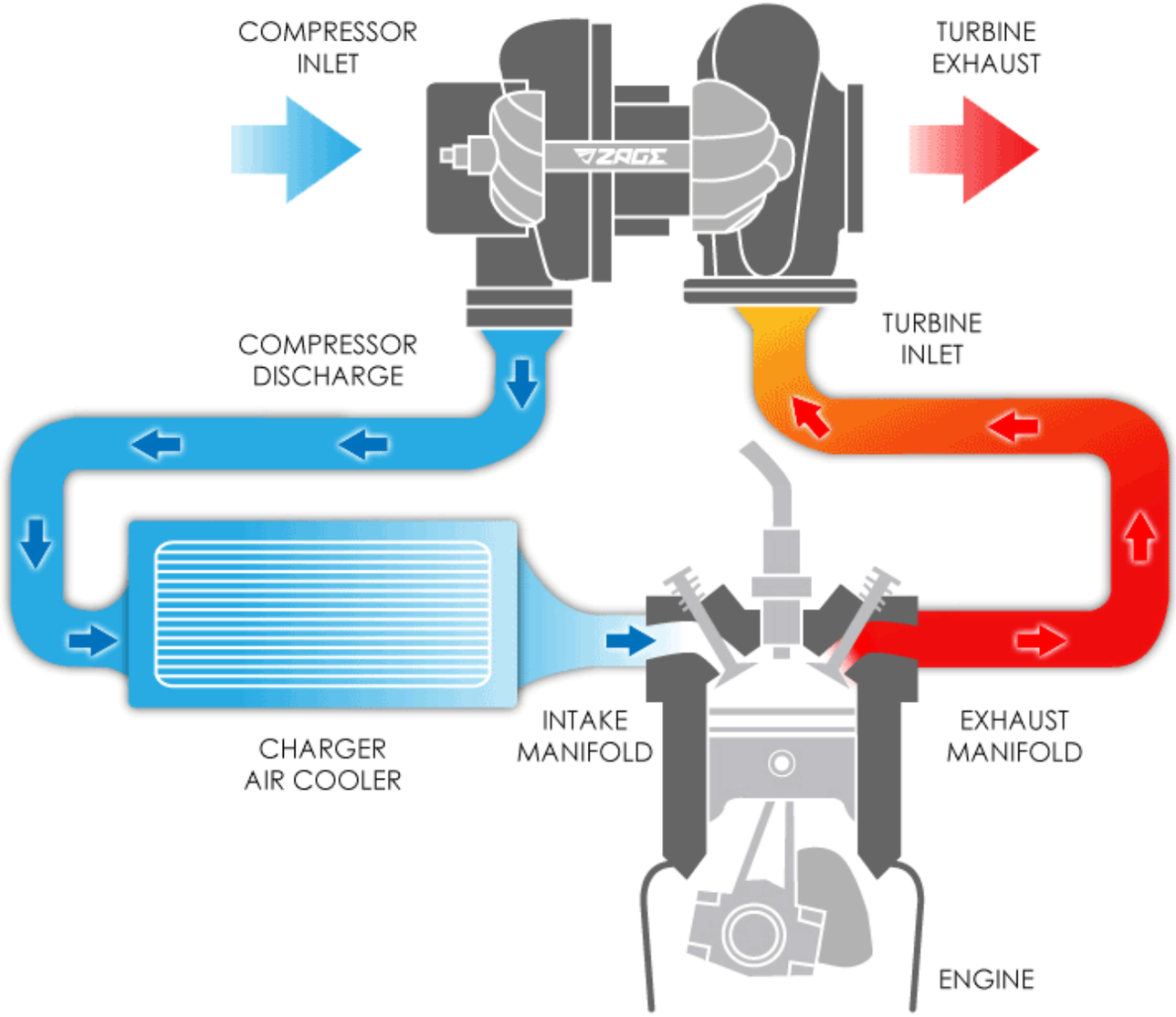
NG Supply
(1 ~ 4) Bar



P&I Diagram

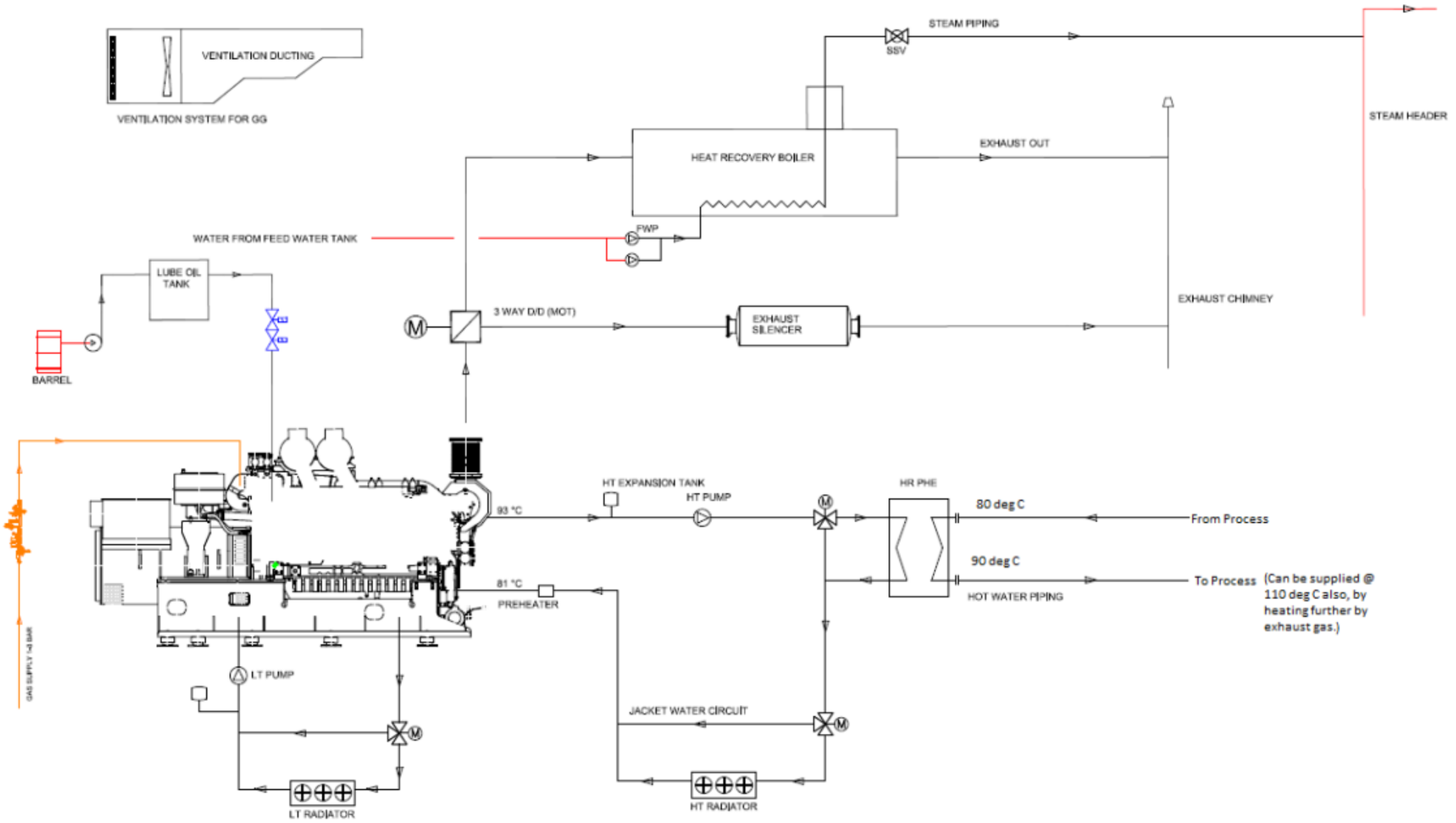
P&I Diagram:

Green Power International Pvt. Ltd.

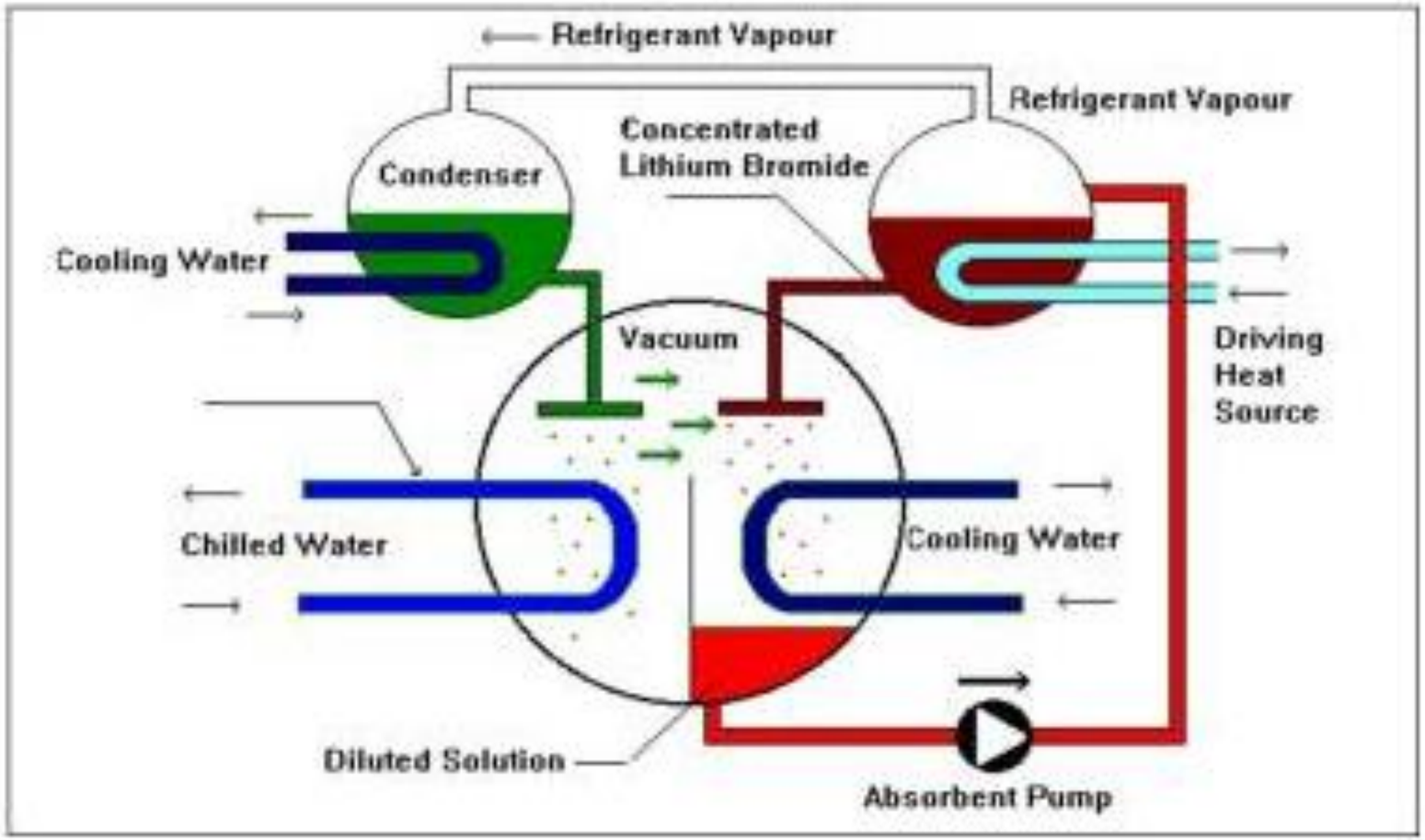


P&I Diagram:

Green Power International Pvt. Ltd.



VAM Working Principal:



Benefits:

- Low maintenance, No Moving part…
- Environment friendly Ref – Lithium Bromide - Global Warming Potential (GWP): **Zero** ; Ozone Depletion Potential (ODP): **Zero**

STEP 1:
Boiling point of the water acts as a function of pressure. At atmospheric pressure, water boils at 100 deg. C. When maintained at high vacuum, water will boil and sub-cool itself. The boiling point of the water at 6 mm-Hg (abs) is 3.7 deg.C.

STEP 2:
Lithium Bromide (LiBr) has the property to absorb water (Refrigerant) due to its chemical affinity. It is directly proportional to concentration and inversely proportional to its temperature.

STEP 3:
Diluted LiBr loses its capacity to absorb water vapour. Thus, needs to be re-concentrated using a Heat Source. Heating may be in the form of Steam / **Flue gases** / **Hot water** /fuel firing.

STEP 4:
The heating causes the solution to release the absorbed refrigerant in the form of vapour. This vapour is cooled in a separate chamber to become liquid Refrigerant.

Reasons why a Tri-Generation Plant is opted for:

Green Power International Pvt. Ltd.

			Green Field Commercial Building	
Sr. No	**Description**	**UOM**	**Case A Conventional Working**	**Case B Working with CHPC Concept**
1	Proposed Total load of building expect HVAC load	KW	2400	2400
2	Total HVAC / Chiller Load of proposed Building	TR	600	600
a	Chiller ikW/TR	Kw	0.6	N.A.
b	Chiller (power consumption)	KWh	360	30*
3	Total design load required for the building	KWh	2760	2430
4	Difference in Power Saving	KWh	330	
5	Total Working Hours per years	OH's	8760	
6	Total Power Saving per year	KW	28,90,800	
7	Power Cost for a commercial building *(Vary with State to State / City to City)****	Rs./Unit	18.00	
8	Total Saving (INR) per year	Rs. Lakhs	**520.34**	

* On full load working

Benefits of Trigeneration:

Green Power International Pvt. Ltd.

- **Very High Energy Efficiency –** Overall upto 88.5%.
- **Major Cost Savings -** Over time, trigeneration systems often have short payback periods.
- **Reduced Greenhouse Gas Emissions -** Higher efficiency means lower CO_2 emissions per unit of energy produced.
- **Improved Electrical Reliability (Sync with Grid / Island Mode):** Flexibility in Start and Stop of GEG.
- **Reduced Transmission & Distribution Losses -** Electricity generated on-site eliminates the losses that occur during long-distance transmission through the grid.
- **Flexible Use of Recovered Heat –** For VAM, Steam, HW, HA, TFH…
- **Lower Operating & Maintenance Costs -** Because trigeneration uses a single integrated system rather than three separate systems (power + boiler + chiller), the operational requirements are simplified.
- **Scalability and Adaptability –** Can be sized for Hospital, Commercial complexes… **Can run on NG + Hydrogen (25% blending too…)**
- **Supports Sustainable & Smart Building Goals:** Trigeneration aligns well with Green building certifications (LEED, IGBC, Net Zero).
- **Heat and Cooling Availability Throughout the Year -** The system can provide heating in winter and cooling in summer without major changes in infrastructure.

MWM - GPIPL:My Fleet Data

Green Power International Pvt. Ltd.

Manage

Data Governance

OH last record
Latest update < 6 months

74%
120 / 163

Show more →

Upcoming Maintenance

E60

in 2026	21
in 2027	3

E70

in 2026	10
in 2027	0

Operation Status

in operation	147
not commissioned	56
no operation	291
Unknown	16

Applications

Electricity only/Baseload	230
Others	189
CHP (mainly OPEX)	38
Long hour load management	20

Fleet Size

Installed Base in 2026	510
Total MW in 2026	798.5

Top Customer Segments

Manufacturing	247	Unknown	64	Energy Utilities	47
Commercial Businesses	42	Agricultural	37	Governmental	37
Rental	14	Healthcare (No pharma industry)	12	Public or Civil Services	8
Construction	2				

Series

TCG 2020	308
TCG 2016	51
TCG 3016	48
TBG 620	38

Show more →

Service Contracts

References

Green Power International Pvt. Ltd.

INFRASTRUCTURE & COMMERCIALS

DELHI LAND AND FINANCE LIMITED, DLF

GENSET MODEL : TCG 2032 V16
YEAR OF INSTALLATION: 2010 & 2011
INSTALLATION SITE: BLDG. 5, 10 & SILOKHERA
SIZE OF PLANT : 3916 KWE X 13 NOS.
CHP : AIR–CONDITIONING. EACH ENGINE COUPLED WITH 1100 TR OF VAM
LOCATION : GURGAON (DELHI NCR

CO – GENERATION :
AIR– CONDITIONING BY VAHP

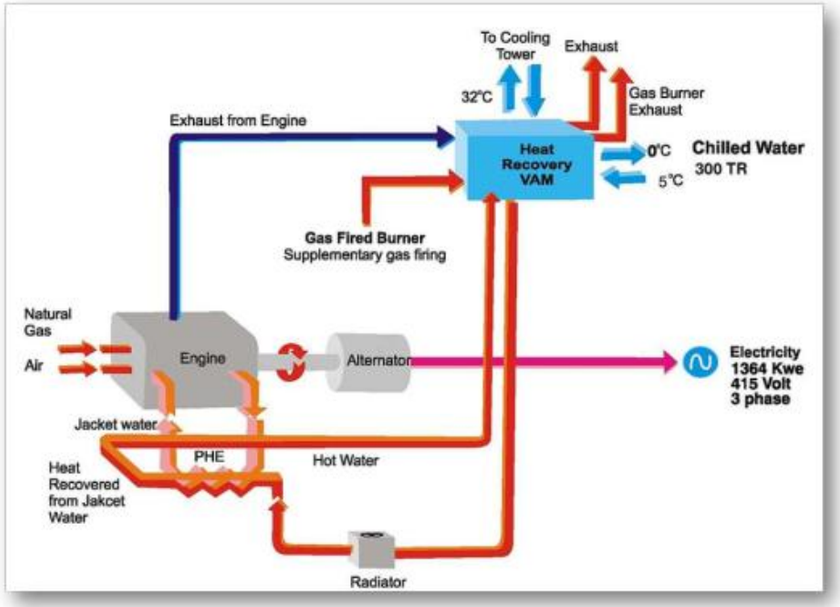
References

Green Power International Pvt. Ltd.

DAIRIES & AGRICULTURE

AMUL DAIRY

GENSET MODEL : TCG 2020 V16K
YEAR OF INSTALLATION: 2005
SIZE OF PLANT : 1364 KWE X 1 NO.
CHP : 300 TR AT 0 DEG C
LOCATION : ANAND, GUJARAT



References

Green Power International Pvt. Ltd.

CERAMICS

KAJARIA CERAMICS

GENSET MODEL : TCG 2020 V16K
YEAR OF INSTALLATION : 2005
SIZE OF PLANT : 1365 KWE X 2 NOS.
CHP : HOT AIR FOR SPRAY DRYER: 8 TONS/HR @ 500 DEG C FROM EACH SYSTEM
LOCATION : SIKANDRABAD

ORIENT CERAMICS

GENSET MODEL : TCG 2020 V16K
YEAR OF INSTALLATION : 2007
SIZE OF PLANT : 1350 KWE
CHP : DIRECT EXHAUST HEAT RECOVERY
LOCATION : SIKANDRABAD

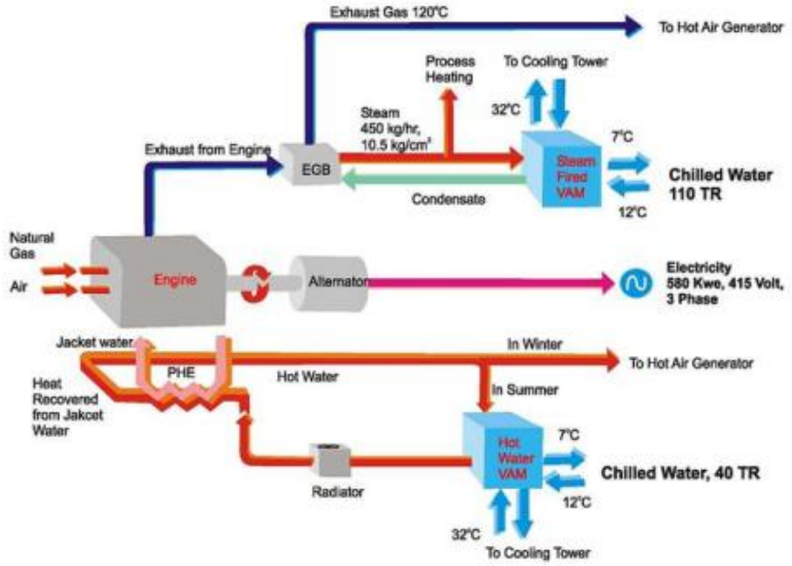
HINDUSTAN SANITARYWARE & INDUSTRIES LIMITED

GENSET MODEL : TCG 2020 V16
YEAR OF INSTALLATION : 2011
SIZE OF PLANT : 1560 KWE
LOCATION : GURGAON (DELHI NCR)

References

Green Power International Pvt. Ltd.

TEXTILES



ENCORE NATURAL POLYMERS LIMITED

GENSET MODEL : TCG 2016 V12
YEAR OF INSTALLATION: 2006
SIZE OF PLANT : 580 KWE X 1 NO.
HEAT RECOVERY :

From Exhaust: Steam 450 kgs/hr. @10.5 kg/cm^2 ; Chilled Water 110 TR @ 7 Deg C ;
Hot Air 1000 Kgs/Hr @ 80 Deg C
From Jacket : Chilled Water 40 TR @ 7 Deg C
Hot Air 300 Kgs/Hr @ 60 Deg C

LOCATION : AHMEDABAD (GUJARAT)

BIRLA CENTURY

GENSET MODEL : TCG 2020 V20
YEAR OF INSTALLATION: 2008
SIZE OF PLANT : 2010 KWE X 4 NOS.
LOCATION : JHAGADIA (GUJARAT)

Our References

Sahyadri Starch & Industries Pvt. Ltd.

Source of Biogas - Starch Waste-Water Digester

Scope - Biogas Genset & Accessories, Waste Heat Recovery Boiler, Jacket Water Heat Recovery for Hot Water on Turnkey basis

Size of Project - 1 Nos. X 1.2 MW MWM make Biogas Gensets

Total Capacity - 1.2 MW Gas Genset + 1 TPH Boiler

Simbhaoli Sugars Limited

Source of Biogas - Distillery Spent Wash Digester Based

Scope - Biogas Genset & Accessories, Waste Heat Recovery Boiler, Jacket Water Heat Recovery for Hot Water on Turnkey basis

Size Of Project - 1 No. X 1.2 Mw MWM make Biogas Gensets

Total Capacity - 1.2 MW Gas Genset + 1 TPH Boiler

Our References

Radico Khaitan (Rampur Distilleries)

Source of Biogas - Distillery Spent Wash Digester

Scope - Biogas Genset with Accessories

Size of Project - 2 Nos. X 1.2 MW MWM make Biogas Gensets

Total Capacity - 2.4 MW

Lokmangal Argo Industries Ltd.

Source of Biogas - Distillery Spent Wash Digester Based

Scope - Biogas Genset with Accessories

Size Of Project - 2 Nos. X 2 MW MWM make Biogas Gensets

Total Capacity - 4 MW

Overview of DMH Installation

Green Power International Pvt. Ltd.

GEG#01 1200 KW***	→	VAM#01 350 TR	
GEG#02 1200 KW	→	VAM#02 350 TR	
GEG#03 1200 KW	→	VAM#03 350 TR	
GEG#04 1560 KW***	→	VAM#04 350 TR	

Tri-Generation Installation at Deenanath Mangeshkar Hospital Erandwane, Pune

Deenanath Mangeshkar Hospital
Engineering Department

Thank you, Dr. Anil Kumar Jain (Chairperson PNGRB), for visiting our facility

Deenanath Mangeshkar Hospital
Engineering Department

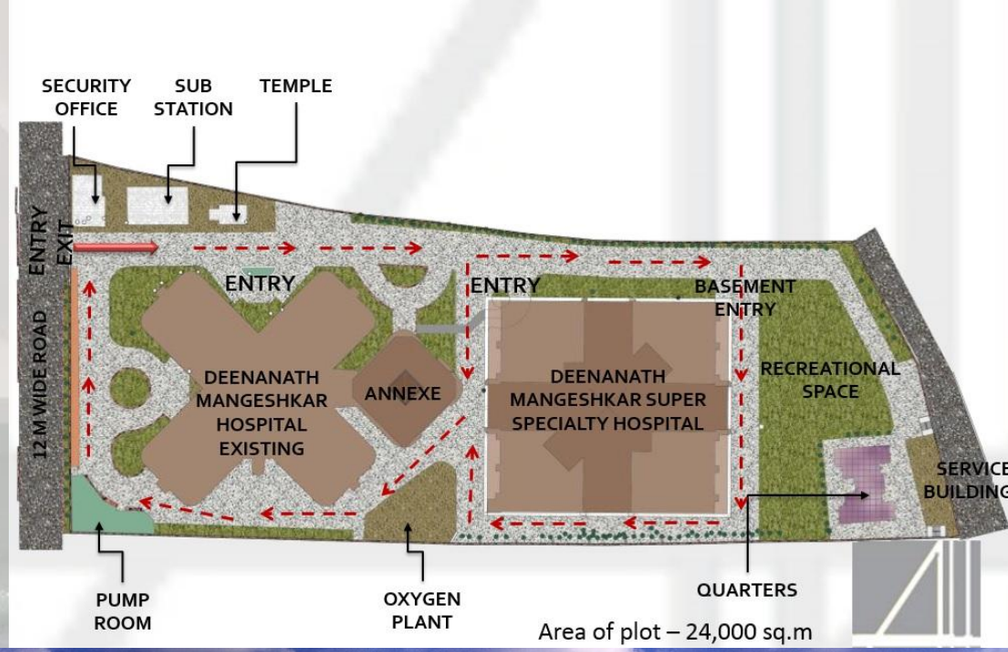
- **Deenanath Mangeshkar Hospital** is a charitable, multi-specialty hospital located in the heart of Pune, India. Founded in 2001, today it is one of the largest **hospital in Pune.**

- To provide Rational Ethical Medical Services of Highest Quality to all Patients at affordable cost.

- Lata Mangeshkar founded DMH in Pune as a heartfelt tribute to her father, Pandit Deenanath Mangeshkar, born out of her personal experience with his death due to lack of timely treatment. The hospital was established to ensure others did not suffer similar losses, focusing on affordable, non-corporate, and comprehensive care.

Deenanath Mangeshkar Hospital

- 10 Lacs sqft Building Area
- Hospital Buildings
- Hostel Building
- Power plant



[Deenanath Mangeshkar Hospital
Engineering Department]

About DMH

- SS Building consists of total 14 Floors
- SS is a surgical super speciality building

- GS building is of 8 floors.
- It’s a building for medical patients

- It’s a tertiary hospital with all facilitates.

- We also have fully equipped Ayurved and homeopathic treatment facility

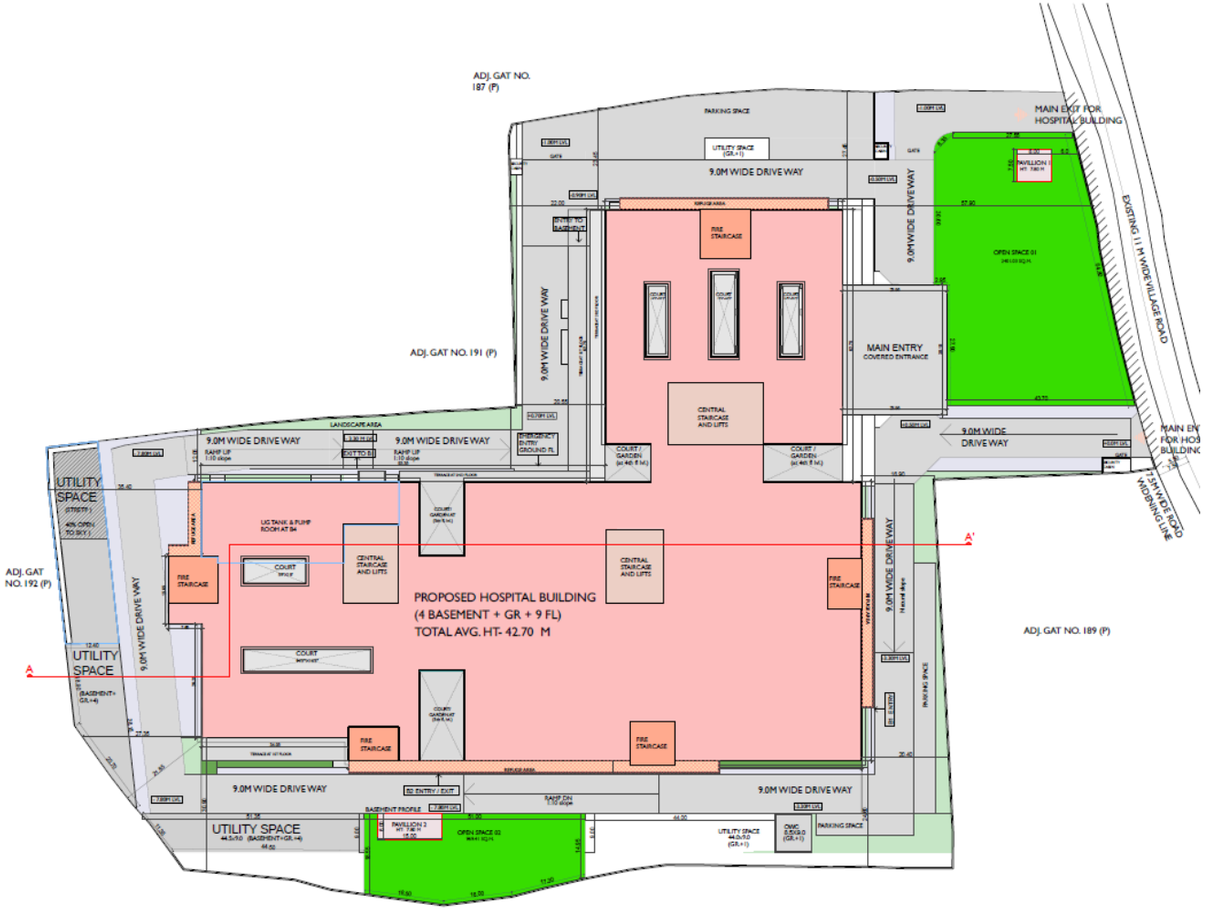
Deenanath Mangeshkar Hospital
Engineering Department

Paediatric Hospital

- 200 bed paediatric hospital

Deenanath Mangeshkar Hospital
Engineering Department

Lata Mangeshkar Institute of Medical Sciences, Nandoshi



- Super specialty Surgical hospital
- 1000 bed hospital in first phase
- Institute of institutes

Deenanath Mangeshkar Hospital
Engineering Department

Criteria for decision

- Quality of electricity
  - Critical medical equipment
  - Changes in supply parameters
- Continuous Supply
  - Problems in sudden failure
  - Sudden surge
  - Requirement of UPS
- Cost
  - Grid power increasing rates
  - Availability of 33 KVA supply
  - Area required for substation

Deenanath Mangeshkar Hospital
Engineering Department

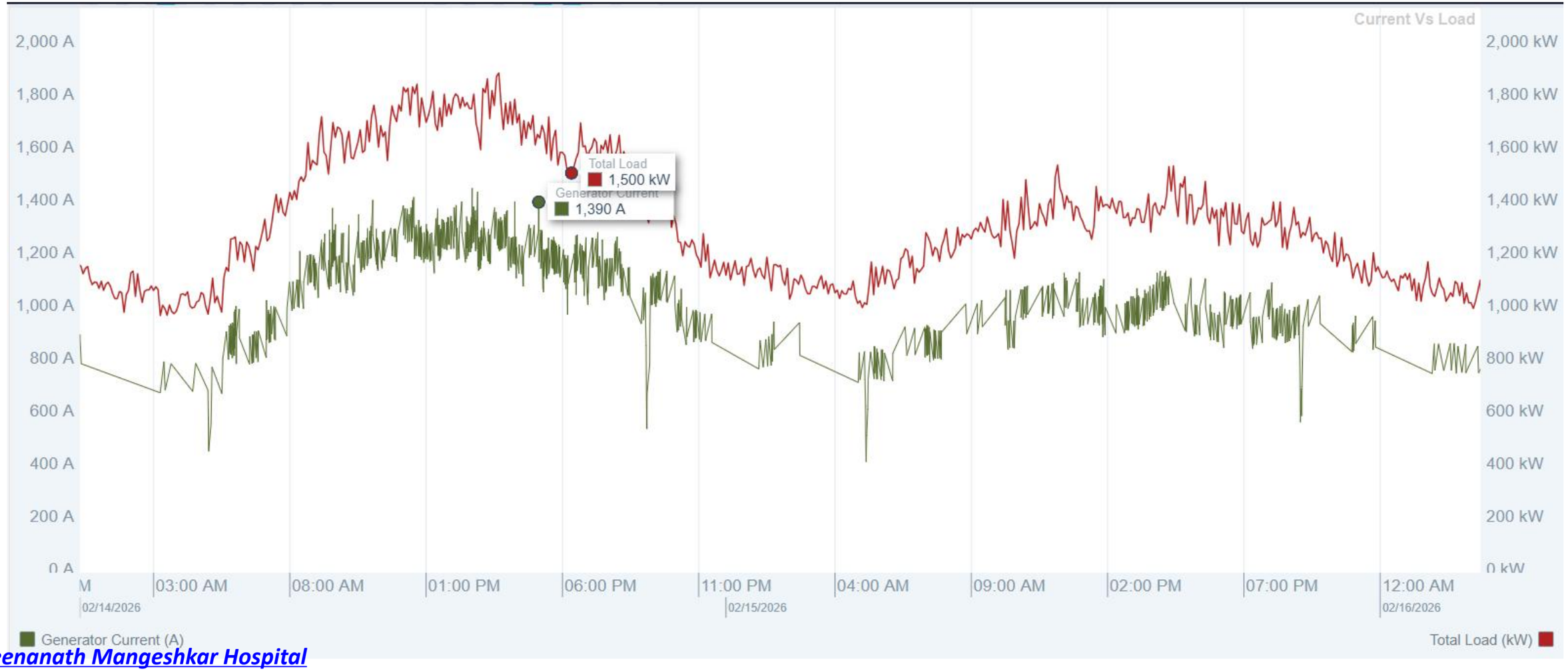
Use of alternate energy

- The cost of bringing the required electrical connection from the nearest sub station was 6.0 Crores.
- Solar power requires lot of space
- Piped Natural Gas was promised by MNGL without any extra cost.

- To generate the electricity at site using Natural Gas fired Engines with heat recovery was the most beneficial solution.

Criteria for design

1. Day and nighttime load
2. Probable failures
3. Backup plan in case of failure
4. Requirement of electricity and chiller and hot water

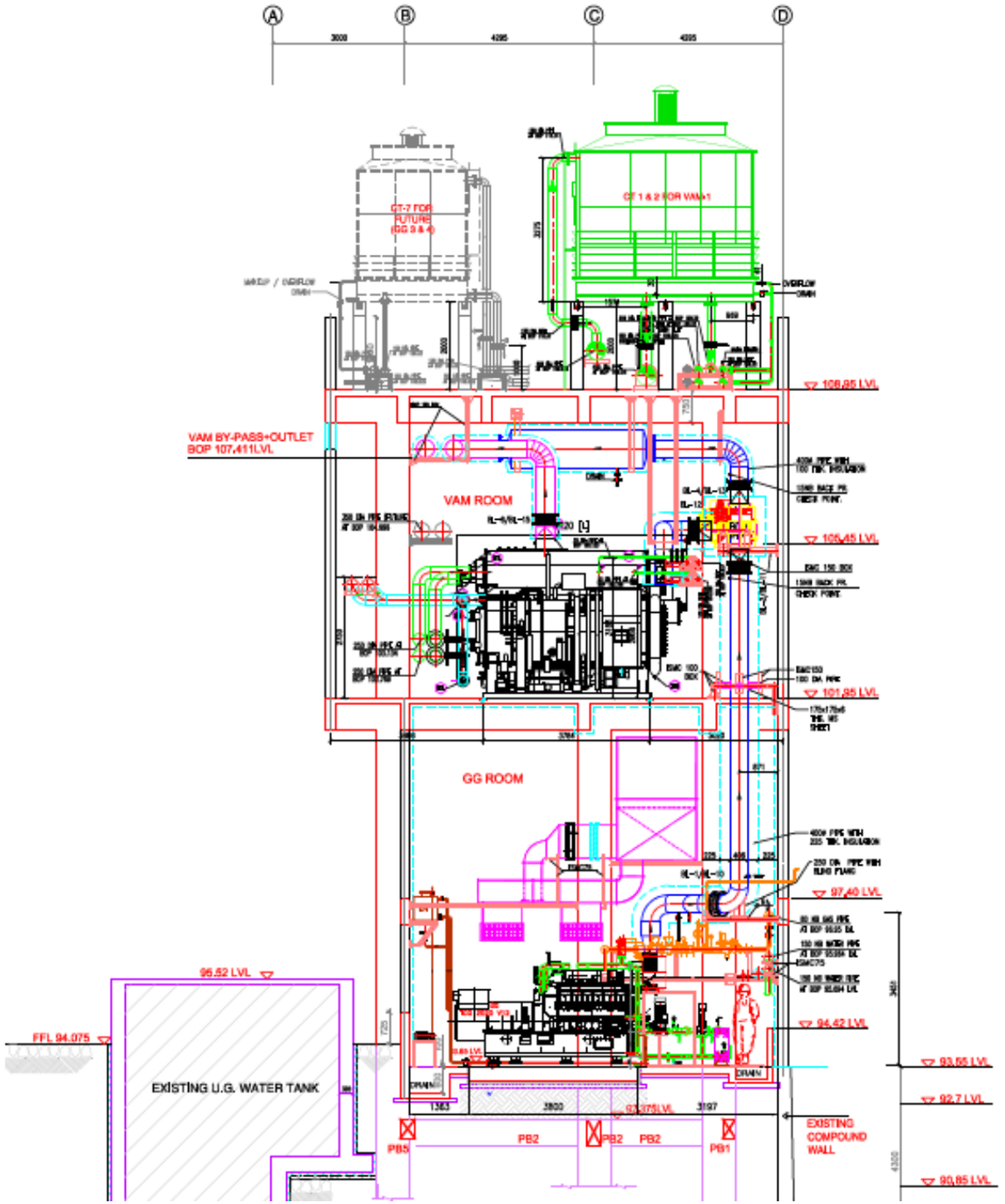


Reasons why Tri-Generation Plant was opted in DMH.

- Quality of Electricity
- No need of Transformer and VCB
- Waste heat is used for chilling and hot water generation
- Low-cost operation
- STP water is used for evaporation loss

Challenges

1. Space
2. Noise
3. Gas supply
4. Experience
5. Team



Deenanath Mangeshkar Hospital
Engineering Department

Installation

First 2 generators installed on
24 June 2014

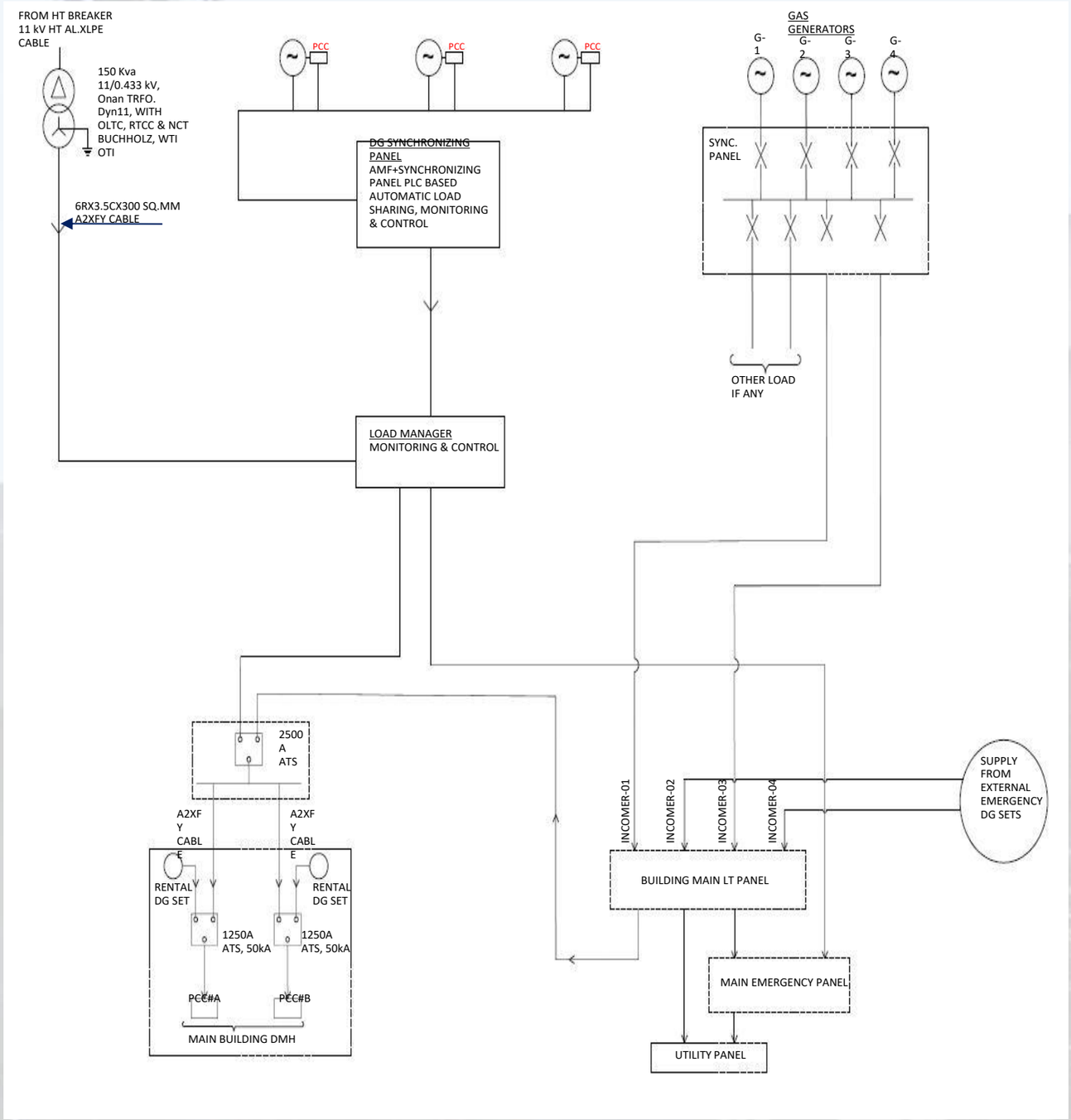
Tri - generation

5 MW Generation
1200 Tr Air Conditioning
50000 Lit. Hot Water

Deenanath Mangeshkar Hospital
Engineering Department

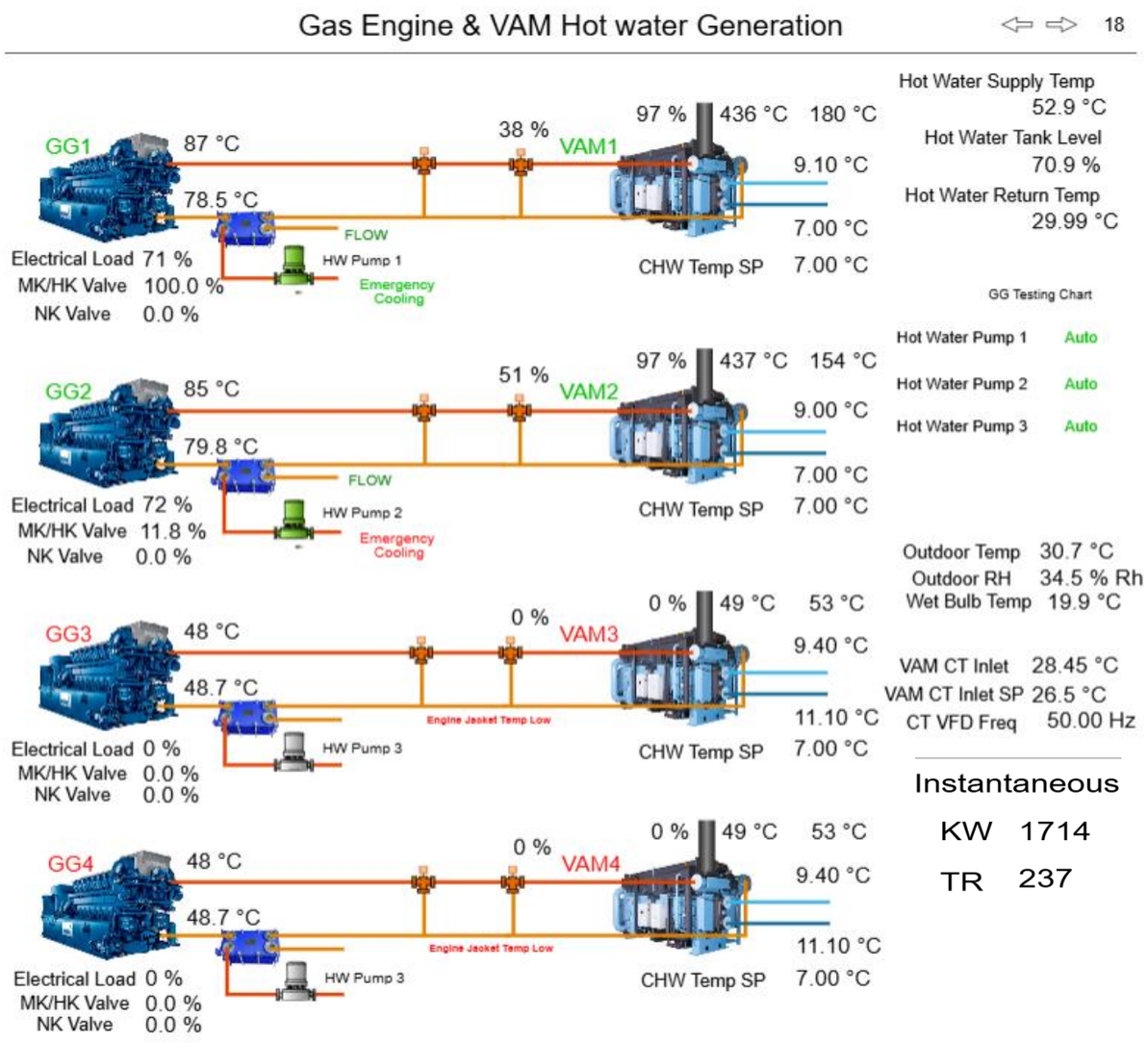
Backup Plan

- Diesel Generators are synced with Gas Generators
- External DG connection
- 1.5 MV Grid Power
- BMS for understanding problems immediately

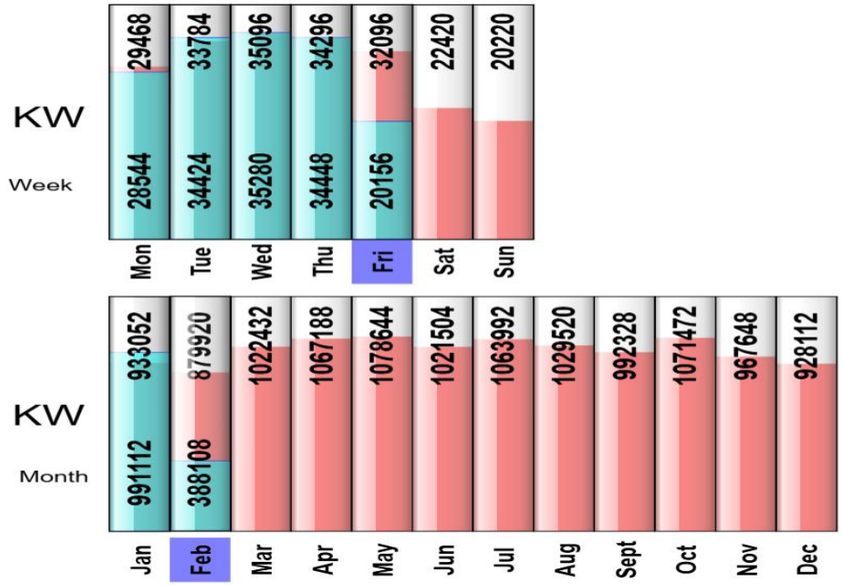


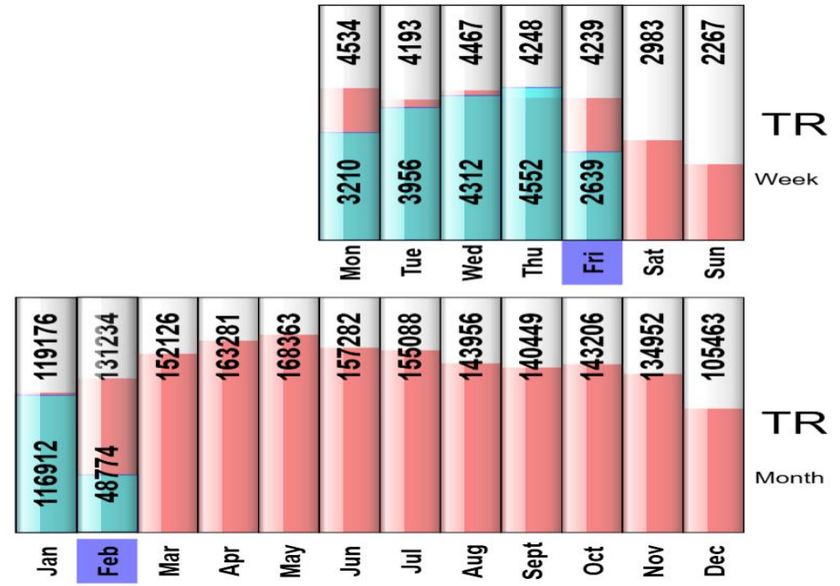
Deenanath Mangeshkar Hospital
Engineering Department

Data collection



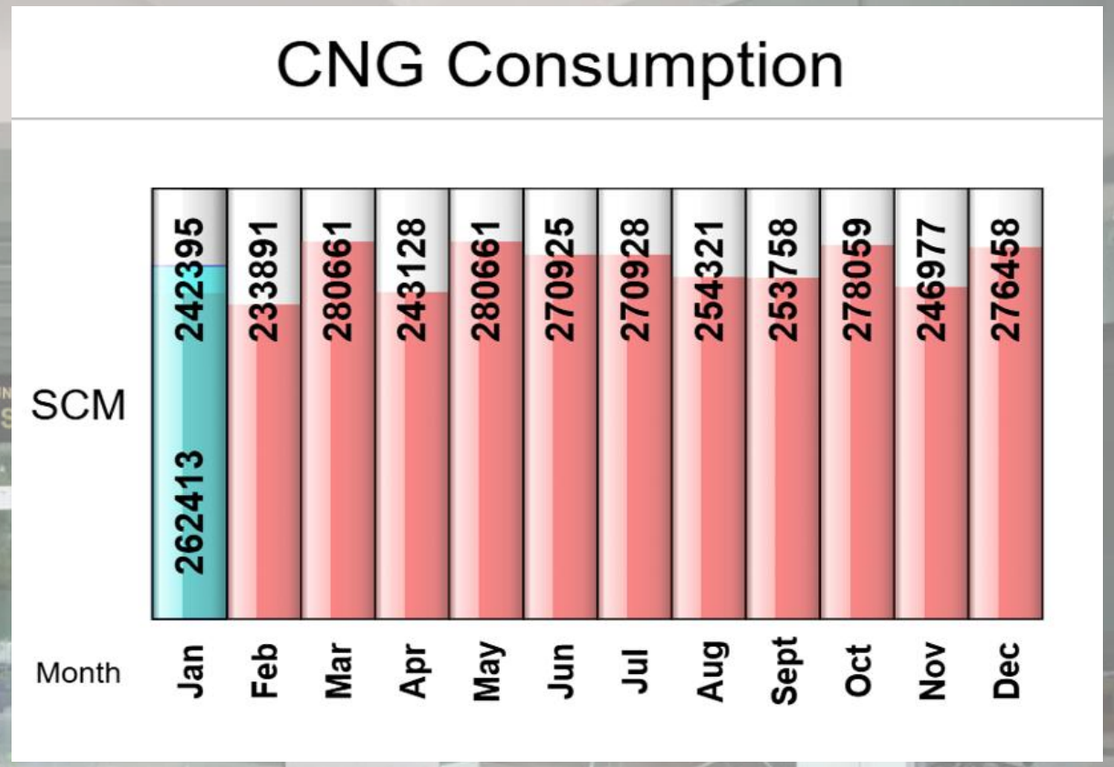
Electricity & TRH generation





Cost Calculations

- The investment done for Engines + VAM + Balance of Plant + Utility Building was Rs.12.0 Cr.
- Cost of bringing the electricity from nearest sub station was 6.0 Cr.
- Cost per unit is around Rs.12



Overview of DMH Installation

		Yearly Unit Generation			
S.N	Year	GG# 1	GG# 2	GG# 3	TOTAL GEN.
1	2015	43,00,100.00	42,46,400.00	-	85,46,500.00
2	2016	41,50,400.00	43,36,000.00	-	84,86,400.00
3	2017	39,60,830.00	42,42,090.00	5,13,860.00	87,16,780.00
4	2018	22,25,000.00	24,18,000.00	43,27,511.00	89,70,511.00
5	2019	31,65,080.00	33,29,210.00	27,23,920.00	92,18,210.00
6	2020	31,86,500.00	28,02,600.00	29,73,280.00	89,62,380.00
7	2021	29,58,860.00	31,26,420.00	37,15,710.00	98,00,990.00
8	2022	25,87,603.00	38,42,250.00	39,46,020.00	1,03,75,873.00
9	2023	46,40,520.00	30,40,350.00	35,86,370.00	1,12,67,240.00
10	2024	46,33,610.00	27,88,270.00	40,09,090.00	1,14,30,970.00
11	2025	45,20,930.00	39,52,460.00	35,83,390.00	1,20,56,780.00
	TOTAL	**4,03,29,433.00**	**3,81,24,050.00**	**2,93,79,151.00**	**10,78,32,634.00**

		GG# 1	GG# 2	GG# 3	Total
S.N	Year	Annual CO2 Saved (Tons/year)			Grand Total
1	2015	3,526.08	3,482.05	-	7,008.13
2	2016	3,403.33	3,555.52	-	6,958.85
3	2017	3,247.88	3,478.51	421.37	7,147.76
4	2018	1,824.50	1,982.76	3,548.56	7,355.82
5	2019	2,595.37	2,729.95	2,233.61	7,558.93
6	2020	2,612.93	2,298.13	2,438.09	7,349.15
7	2021	2,426.27	2,563.66	3,046.88	8,036.81
8	2022	2,121.83	3,150.65	3,235.74	8,508.22
9	2023	3,805.23	2,493.09	2,940.82	9,239.14
10	2024	3,799.56	2,286.38	3,287.45	9,373.40
11	2025	3,707.16	3,241.02	2,938.38	9,886.56
	Grand Total	**33,070.14**	**31,261.72**	**24,090.90**	**88,422.76**

Calculations of CO2 Savings Tons Per year by Installation of Trigenration System			
Parameter	**Value**	**Unit**	**Remarks / Formula**
Electricity Saved per Year	107.83	Million Units (MU)	Input (1 MU = 1,000,000 kWh)
Grid Emission Factor	0.82	kg CO2 / kWh	Typical India grid factor
Electricity Saved (kWh/10Yrs)	10,78,32,634	kWh - 10Yrs	Converted from MU
Annual CO2 Saved (kg/10Yrs)	8,84,22,760	kg - 10 Yrs	Calculated
Annual CO2 Saved (Tons/year)	**88,423**	Tons/year	Final Output

DMH: Contribution towards environment.

Overview of DMH Installation

1 Jan-2015 to 31 Dec 2025									
		Yearly Unit Generation				VAM TOTAL TR			
S.N	Year	GG# 1	GG# 2	GG# 3	TOTAL GEN.	VAM#1	VAM #2	VAM #3	Total TR
1	2015	43,00,100.00	42,46,400.00	-	85,46,500.00	1,65,000.00	1,49,000.00	-	3,14,000.00
2	2016	41,50,400.00	43,36,000.00	-	84,86,400.00	1,67,000.00	1,70,300.00	-	3,37,300.00
3	2017	39,60,830.00	42,42,090.00	5,13,860.00	87,16,780.00	1,75,200.00	1,78,500.00	80,000.00	4,33,700.00
4	2018	22,25,000.00	24,18,000.00	43,27,511.00	89,70,511.00	1,78,600.00	1,80,300.00	1,10,000.00	4,68,900.00
5	2019	31,65,080.00	33,29,210.00	27,23,920.00	92,18,210.00	1,88,950.00	1,90,600.00	1,19,490.00	4,99,040.00
6	2020	31,86,500.00	28,02,600.00	29,73,280.00	89,62,380.00	1,64,300.00	1,36,000.00	1,29,300.00	4,29,600.00
7	2021	29,58,860.00	31,26,420.00	37,15,710.00	98,00,990.00	1,77,758.00	1,30,754.00	1,35,349.00	4,43,861.00
8	2022	25,87,603.00	38,42,250.00	39,46,020.00	1,03,75,873.00	4,31,915.00	3,77,337.00	5,05,928.00	13,15,180.00
9	2023	46,40,520.00	30,40,350.00	35,86,370.00	1,12,67,240.00	7,48,506.00	4,54,793.00	5,51,476.00	17,54,775.00
10	2024	46,33,610.00	27,88,270.00	40,09,090.00	1,14,30,970.00	8,10,781.00	3,77,516.00	6,41,190.00	18,29,487.00
11	2025	45,20,930.00	39,52,460.00	35,83,390.00	1,20,56,780.00	7,26,392.00	5,37,545.00	5,40,542.00	18,04,479.00
	TOTAL	**4,03,29,433.00**	**3,81,24,050.00**	**2,93,79,151.00**	**10,78,32,634.00**	**39,34,402.00**	**28,82,645.00**	**28,13,275.00**	**96,30,322.00**

Savings with VAM
(VAM vis-à-vis Electrical Chiller)

Total Power Consumption for El. Chiller Considering iKW/TR = 0.65 (KW)	62,59,709.30
Commercial Power cost (Rs.)	18.00
Total Power Cost (Rs. '000) for 10 Years(Rs.'000)	11,26,74,767.40
Rs. Lakhs / 10 Yrs	**1,126.75**
Saved Rs. Lakhs / Year	**112.67**

Overview of DMH Installation

	GG# 1	GG# 2	GG# 3	Total	Total
	KW Generation/Annum	KW Generation/Annum	KW Generation/Annum	KW Generation/Annum	Equivalent Trees Planted
Year	Annual CO2 Saved (Tons/year)			Grand Total	Grand Total
2015	3,526.08	3,482.05	-	7,008.13	3,33,720.48
2016	3,403.33	3,555.52	-	6,958.85	3,31,373.71
2017	3,247.88	3,478.51	421.37	7,147.76	3,40,369.50
2018	1,824.50	1,982.76	3,548.56	7,355.82	3,50,277.10
2019	2,595.37	2,729.95	2,233.61	7,558.93	3,59,949.15
2020	2,612.93	2,298.13	2,438.09	7,349.15	3,49,959.60
2021	2,426.27	2,563.66	3,046.88	8,036.81	3,82,705.32
2022	2,121.83	3,150.65	3,235.74	8,508.22	4,05,153.14
2023	3,805.23	2,493.09	2,940.82	9,239.14	4,39,958.90
2024	3,799.56	2,286.38	3,287.45	9,373.40	4,46,352.16
2025	3,707.16	3,241.02	2,938.38	9,886.56	4,70,788.55
Grand Total	**33,070.14**	**31,261.72**	**24,090.90**	**88,422.76**	**42,10,607.61**

DMH: Contribution towards environment.

Calculation of Co2 absorbed and equivalent Installation of Trigeneration system			
Parameter	**Value**	**Unit**	**Remarks / Formula**
Annual CO2 Saved	88,422.76	Tons/year	Input
CO2 Absorbed per Tree per Year	0.021	Tons CO2/tree/year	≈21 kg CO2 per tree per year (editable)
Equivalent Trees Planted	42,10,607	Number of Trees	CO2 Saved / CO2 per Tree

Cost saving

❖The total generation of electricity annually & Saving in Running Cost in INR.

2015	- 85.46 Lakh Units	- 4.45 Cr. Saved.
2016	- 84.86 Lakh Units	- 1.81 Cr. Saved. (Purchased 3rd Generator and VAM)
2017	- 86.13 Lakh Units	- 5.78 Cr. Saved.
2018	- 89.70 Lakh Units	- 4.49 Cr. Saved.
2019	- 92.24 Lakh Units	- 5.89 Cr. Saved
2020	- 90.00 Lakh Units	- 8.18 Cr. Saved
2021	- 96.48 Lakh Units	- 6.55 Cr. Saved
2022	- 100.04 Lakhs Units	- 1.20 Cr. Saved
2023	- 112.68 Lakhs Units	- 6.05 Cr. Saved

❖The Total Savings of 45.40 Crores is after deduction of Maintenance and electricity duty Cost.

❖Total Investment on the project was 12 Cr. Hence the payback on the total investment was achieved in 36 Months

Appreciations

Deenanath Mangeshkar Hospital
Engineering Department

Benefits Trigeneration small sized plant

- Use of clean fuel
- Exhaust at low temperatures
- Distribution losses reduced
- Waste heat is used for HVAC and hot water

Savings with CHPC Concept:

Sr. No	Description	UOM	Value	Remark
1	CNG Price from CGD (Landed)	SCM	**52.00**	With GCV 8500 Kcal/m3
2	Amount of Power generated from each SCM	KW	4.25	Considering 43.5% Electrical Efficiency
3	Cost of Power generation from each SCM of Gas	Rs./KW	12.24	
4	Operation and Maintenance cost of Gas Genset	Rs./KW	1.30	Includes spares, consumables, manpower etc etc...
5	Duty paid to SEB for power generation	Rs./KW	**1.20**	
6	Power generation cost with O&M	Rs./KW	14.74	
7	Waste Heat Recovery cost	Rs./KW	**3.26**	
8	Total Power Generation Cost after WHR	Rs./KW	11.47	
9	State Electricity Board Charges (*Vary with State to State / City to City*)***	Rs./KW	18.00	For commercial properties
10	Savings with CHPC Concept	Rs./KW	6.53	Saving per KW with CHPC

Over & Above: HW is also generated from JW Heat which fulfills hospital HW requirement.

Deenanath Mangeshkar Hospital
Engineering Department

Thank You

Amol Sane
Engineering & Projects

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Engineering Department