STEAG Energy Services (India) Pvt. Ltd

Design and optimization of CCHP for microgrids and solar energy buildings

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Project Manager- R&D and Renewable Energy

steag

SHC
TASK 66
Solar Energy Buildings

Brief Contents

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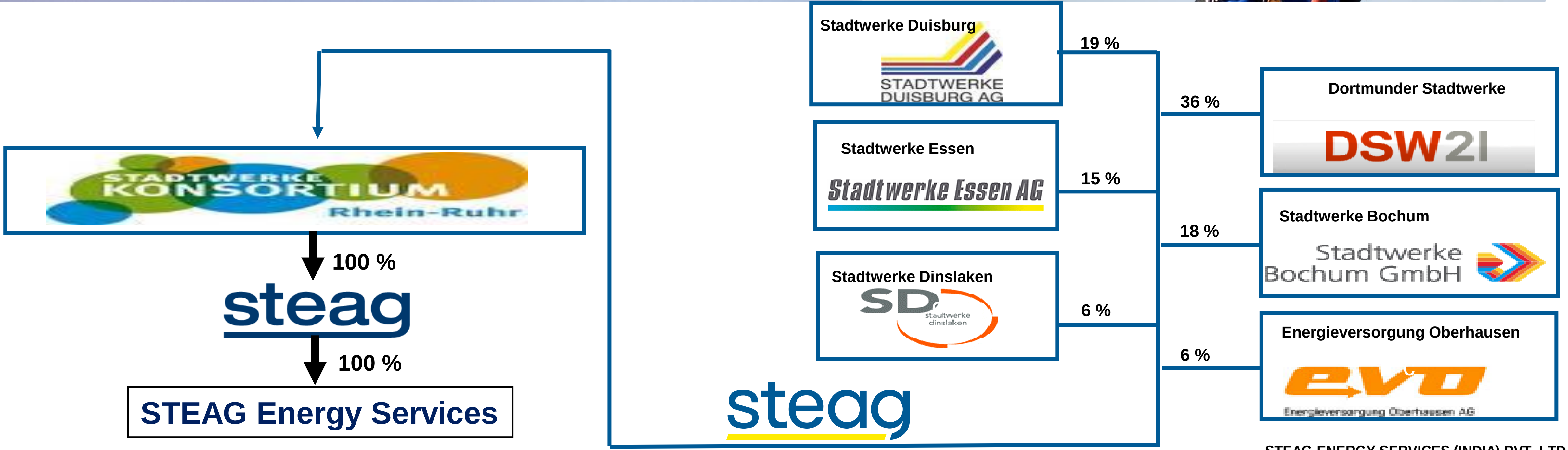
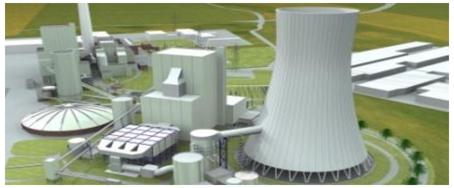
STEAG– Shareholder Structure



STEAG Portfolio overview

Existing business activities

Energy Technologies



- Design, planning and operation of power plants

Plant Services

- Operation and maintenance services for thermal power stations, especially gas fired ones

Nuclear Technologies

- Planning, construction and dismantling of nuclear facilities

System Technologies

- Development, sale and implementation of O&M management and energy management tools

Strategic projects

“Asset Light” projects

- Minority investments in combination with international O&M contracts

International wind and solar projects

- Identification and evaluation

STEAG International Presence

SUBSIDIARIES

STEAG Energy Services GmbH
Essen, Germany
Established in 1937

STEAG Energy Services Schweiz GmbH
Zurich, Switzerland
Established in 2014

STEAG Energy Services Solar S.L.U.
Seville, Spain
Established in 2012

STEAG SCR-Tech, Inc. (JV 50%)
Kings Mountain (North Carolina), USA
Established in 2016

STEAG Energy Services do Brasil Ltd.
Rio de Janeiro, Brazil
Established in 2002

STEAG EOH Energy Services (Pty) Ltd. (JV 50%)
Johannesburg, South Africa
Established in 2016

STEAG Energy Services Botswana (Pty) Ltd.
Gaborone, Botswana
Established in 2014

STEAG Ensida Energy Services Ltd.
Ankara, Turkey
Established in 1996

STEAG Energy Services (India) Pvt. Ltd.
Noida, India
Established in 2001

STEAG's proven track record for future success

1937
Foundation of **STEAG**

about 8,000 MW commissioned in the Rhine-Ruhr and Saar regions

1996
Leuna (Germany)

162 MW Refinery

Termopaipa (Colombia)

165 MW Hard coal
1999

2002
Illmenau (Germany)

5 MW Biomass (1)

2003
Köln-Godorf (Germany)

211 MW Refinery

Iskenderum (Turkey)

1,320 MW Hard coal
2003

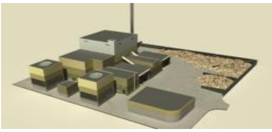
Mindanao (Philippines)

232 MW Hard coal
2006

2009
Karstädt (Germany)

1 MW Biogas (1)

2013
Ridham Dock (UK)



25 MW Biomass

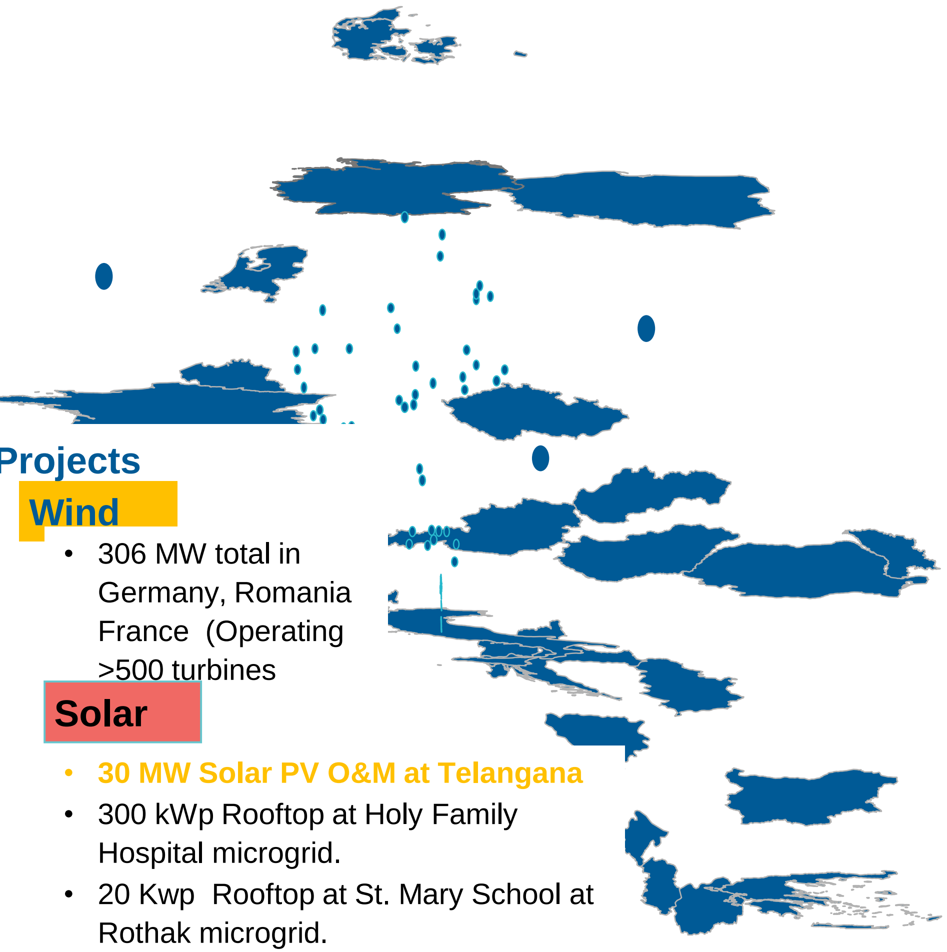
Walsum 10 (Germany)

790 MW Hard coal
2013

1937 1996 1998 2000 2002 2004 2006 2008 2009 2010 2012

STEAG holds a strong position in the renewable energy market

- **Sites of Steag New Energies GmbH**
- **Subsidiaries**



STEAG Projects

Wind

- 306 MW total in Germany, Romania France (Operating >500 turbines

Solar

- **30 MW Solar PV O&M at Telangana**
- 300 kWp Rooftop at Holy Family Hospital microgrid.
- 20 Kwp Rooftop at St. Mary School at Rothak microgrid.

		Installed capacity MW_{el}	Installed capacity MW_{th}	Plants
	**Biomass*** • since 2002 • #3 in Germany	66	154	13
	**Biogas** • since 2007 • First own biogas plant commissioned			
	**Mine gas** • since1908 • #1 in Germany	177	139	108
	**Geothermal** • since 1994 • #1 in Germany	--	71	2
	**Contracting** • since 1961 • #2 in Germany	77	905	100
	Total	**319**	**1,271**	**223**

Brief Contents

- Introduction
- CCHP for Micro-Grids and Solar Energy Buildings
- Key Parameters/Inputs
- Optimization of CCHP
- Case Studies of CCHP
- Conclusion

Typical Microgrid

Approach

Identification of Project/Case study

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Data Collection (Load, Generation, environmental parameters etc.)

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Identification and possibility of accurate measurements

↓

Optimization and effective utilization of Renewable Energy (solar energy)

Typical Microgrid

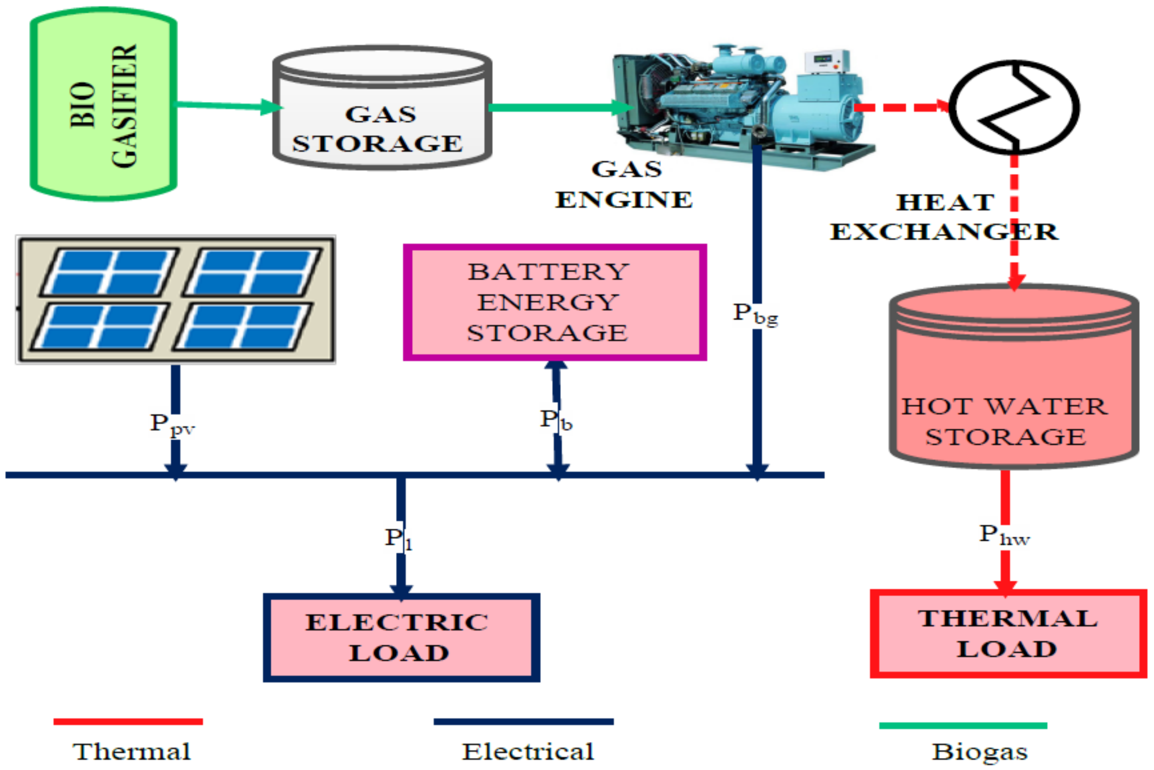
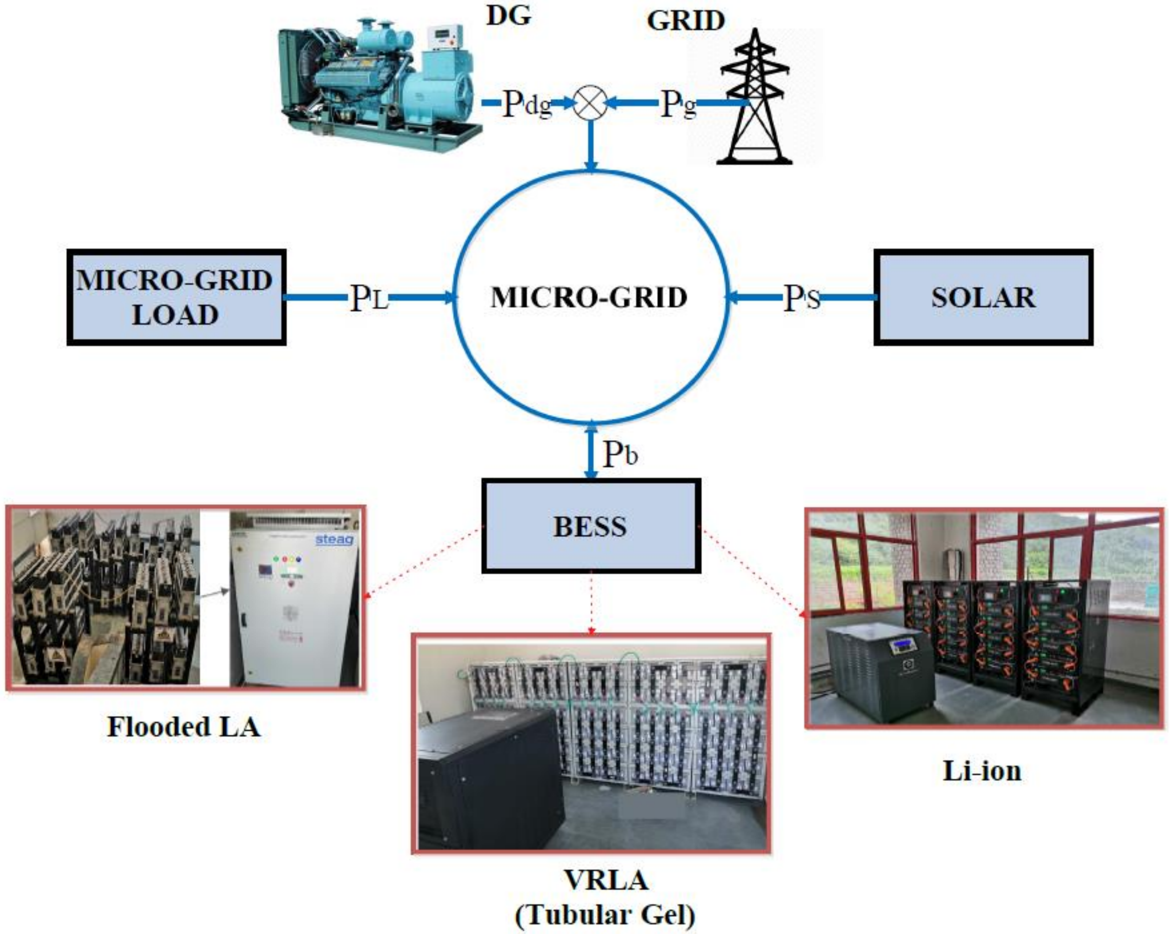


Figure: System model of the proposed rural off-grid system

Different BESS options for microgrid



Brief Contents

Key Parameters/Data

Combination of primary and secondary Data

Primary Data

- Solar Irradiation
- RE Resources
- Electric Load
- Thermal Load
  - Heating
  - Cooling

Assessment methodology

Secondary Data

- Site constraints
- Uncertainty
- Economic constraints
- Reliability

Data analysis

- Accuracy of data and measurements
- Duration of Data

Data Collection

- **Load Pattern**
  1. **Electric Load Pattern**
     - **Typical loads**
     - **Variation pattern**
     - **Impact on load –Seasonal**

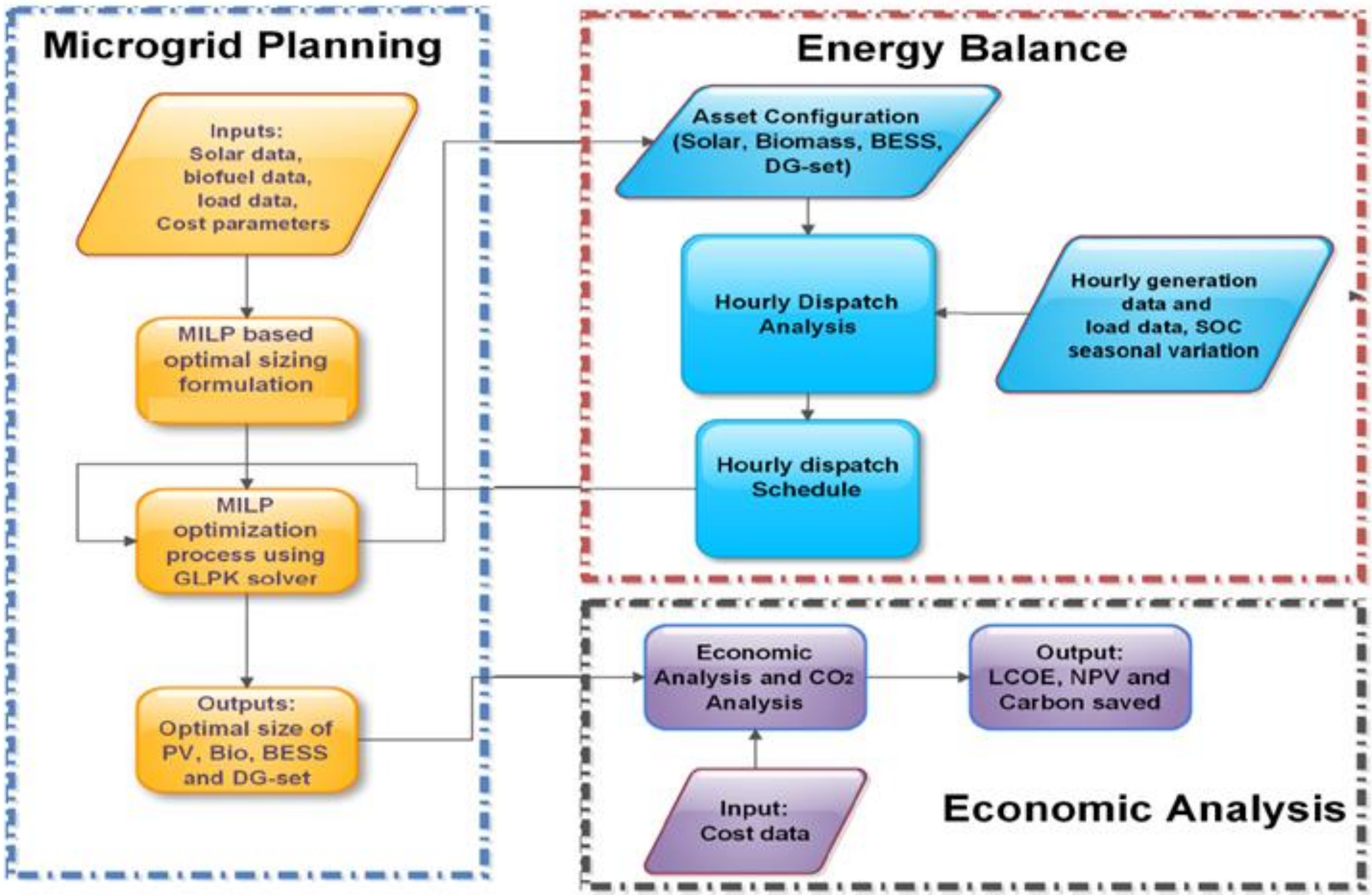
  2. **Thermal Load Pattern (Combined Cooling and Heating (CCHP))**
     - **Cooling load**
     - **Heating load including hot water load**

- **Climatic Conditions**
  - **Temperature**
  - **Humidity**

- **Solar Radiation Data**
  - **GHI**
  - **DNI (Wherever heat is considered)**

Brief Contents

Optimal Sizing



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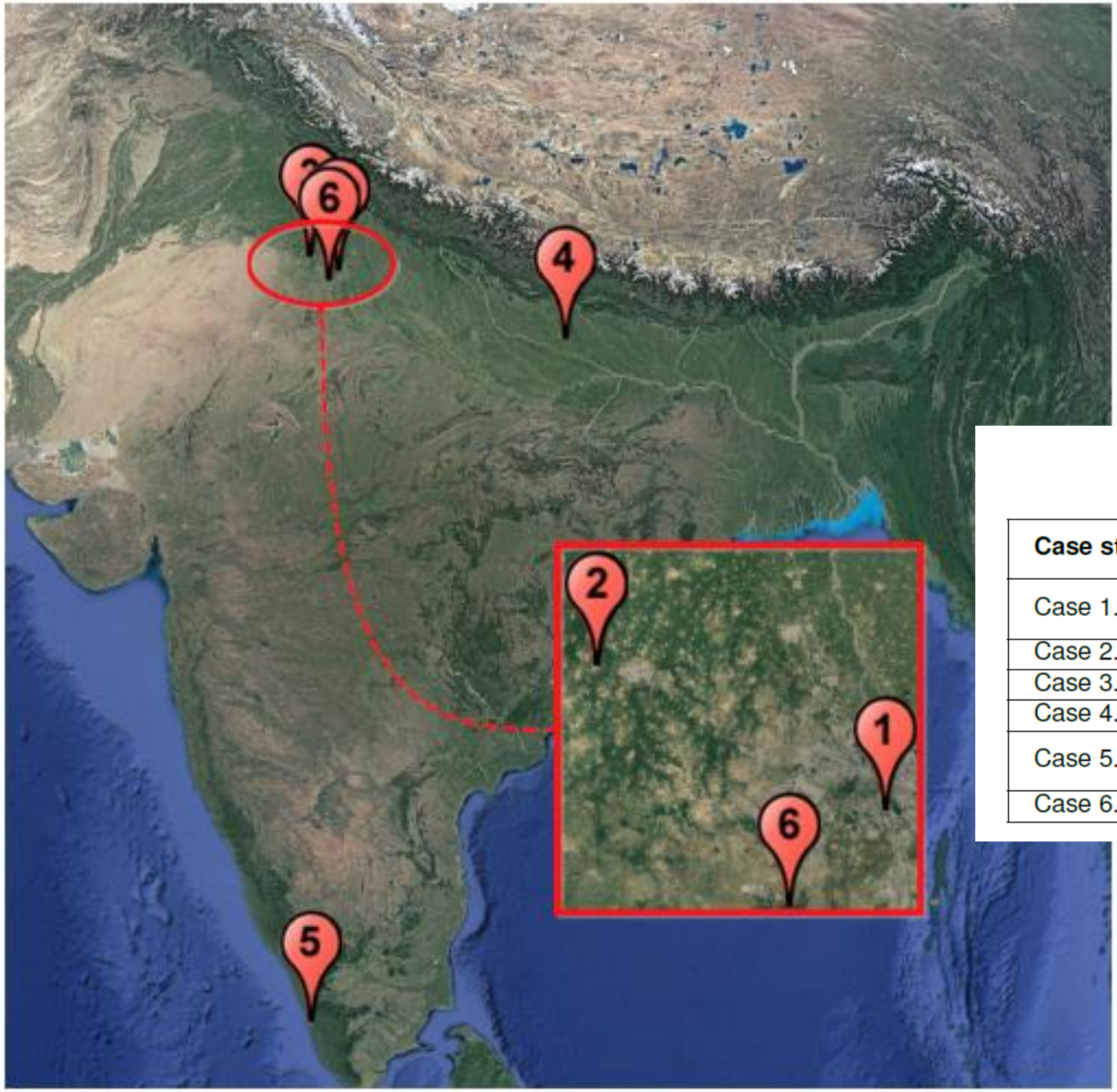
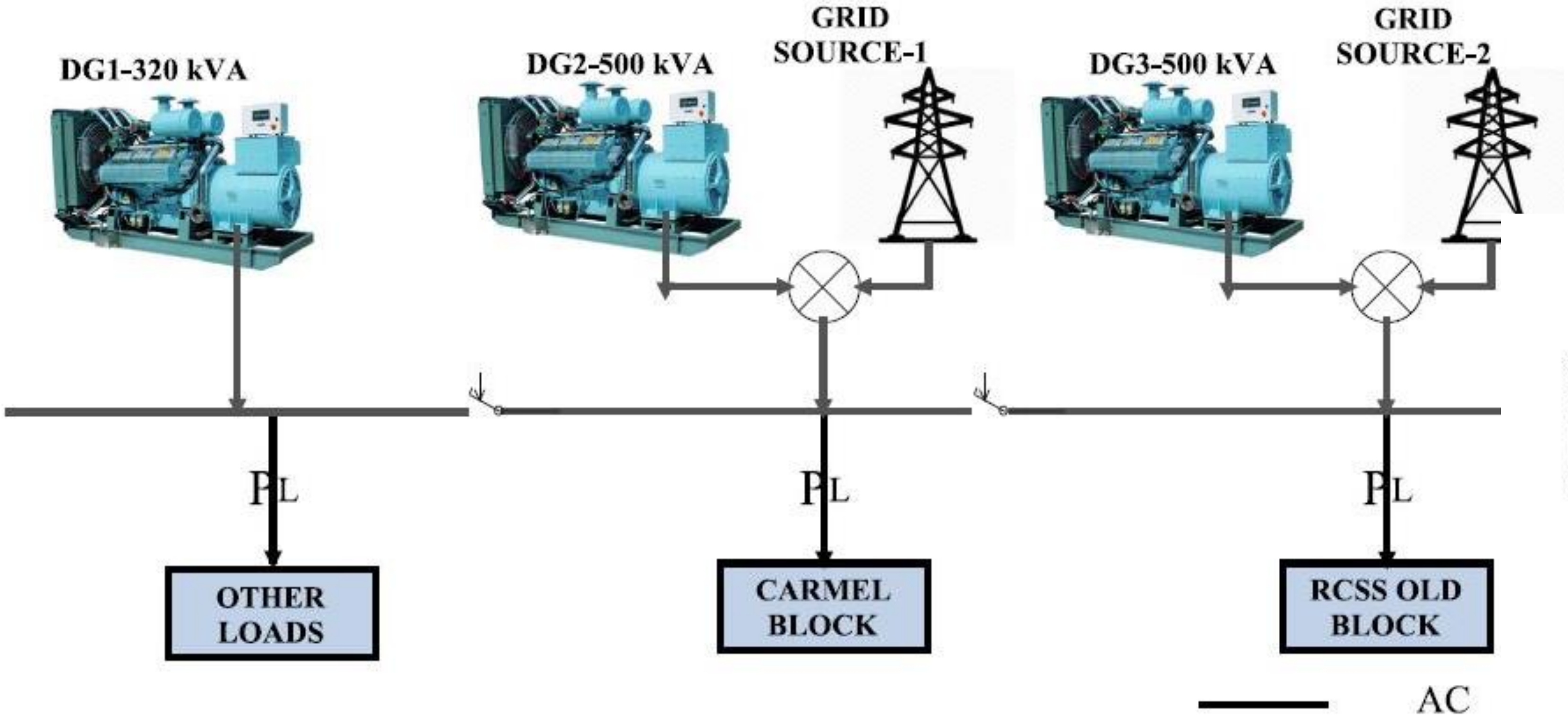


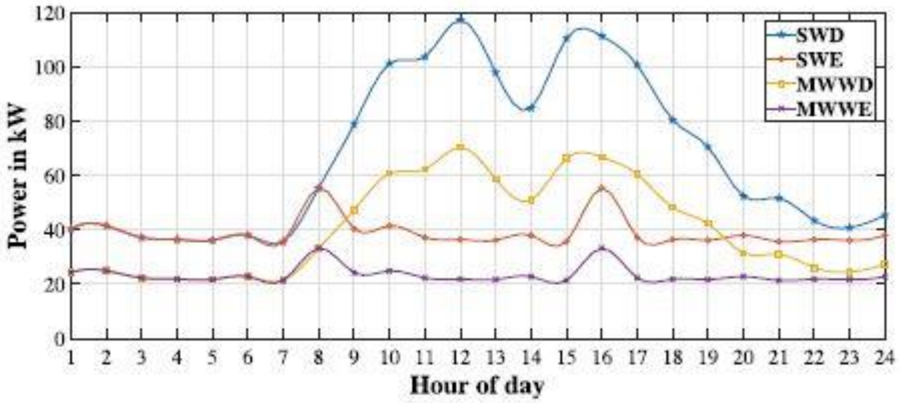
Figure: Location of Case-study

Table: Case Study details

Case study	Description	Location	Grid availability	Alternate Source
Case 1.	Holy Family Hospital (HFH)	Delhi	Good	DG-set
Case 2.	St. Mary school (SMS)	Rohtak	Very Poor	DG-set
Case 3.	St. Mary Hostel (SMH)	Rohtak	Very Poor	DG-set
Case 4.	Green Urja (GU)	Gorakhpur	Poor	DG-set
Case 5.	Rajagiri college of social science (RCSS)	Cochin	Good	DG-set
Case 6.	Steag - Ananda (SA)	Gurugram	Very Poor	DG-set

Case Study-RCSS





Case Study-RCSS

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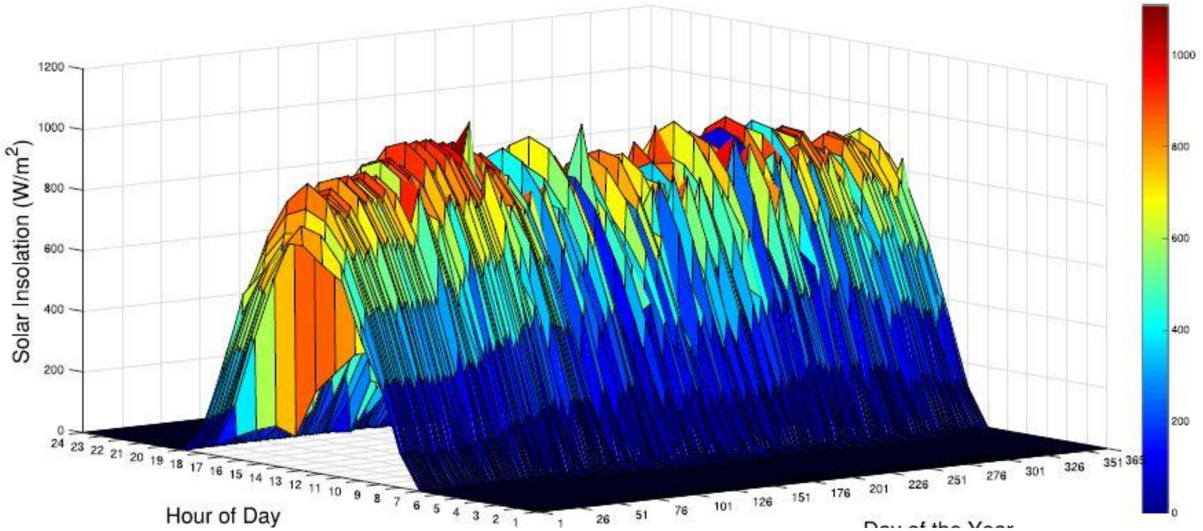
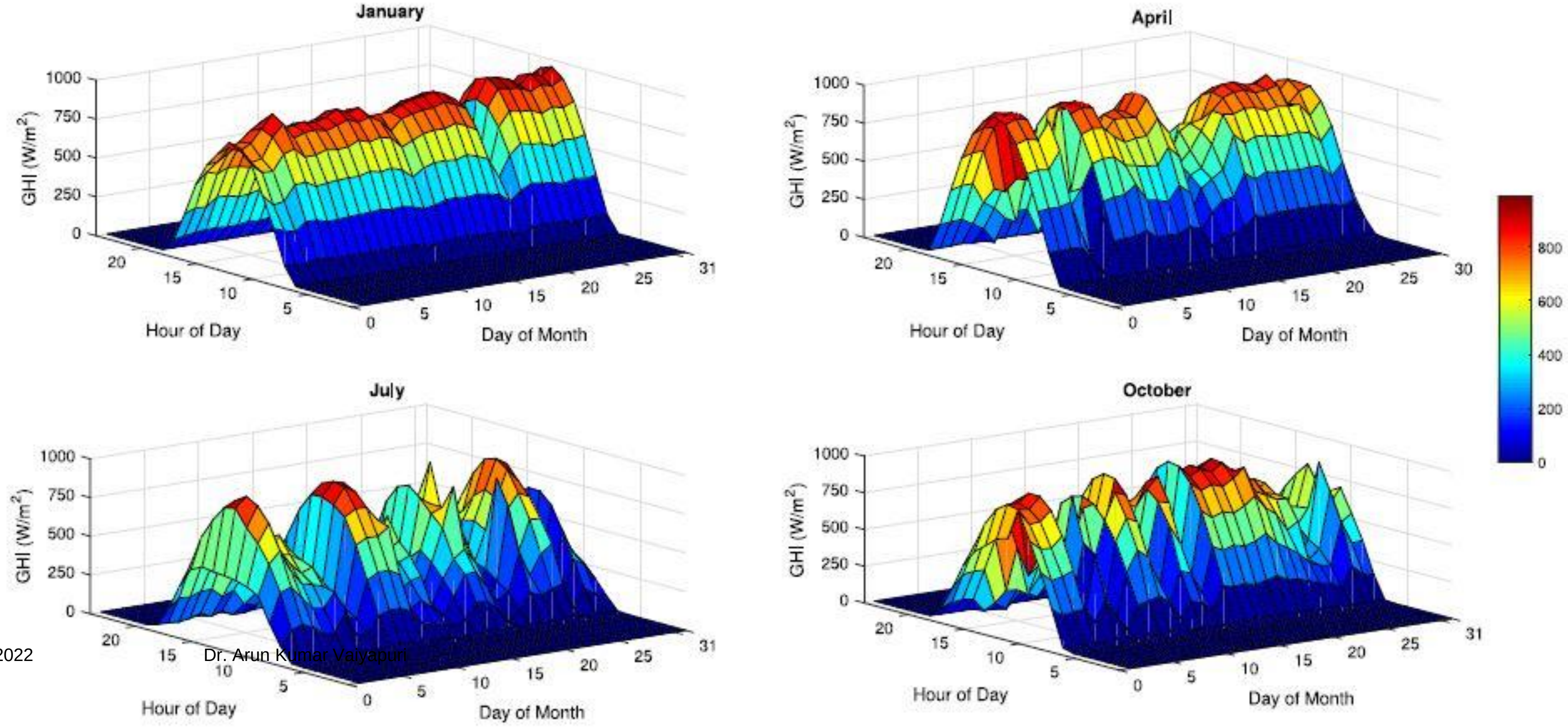
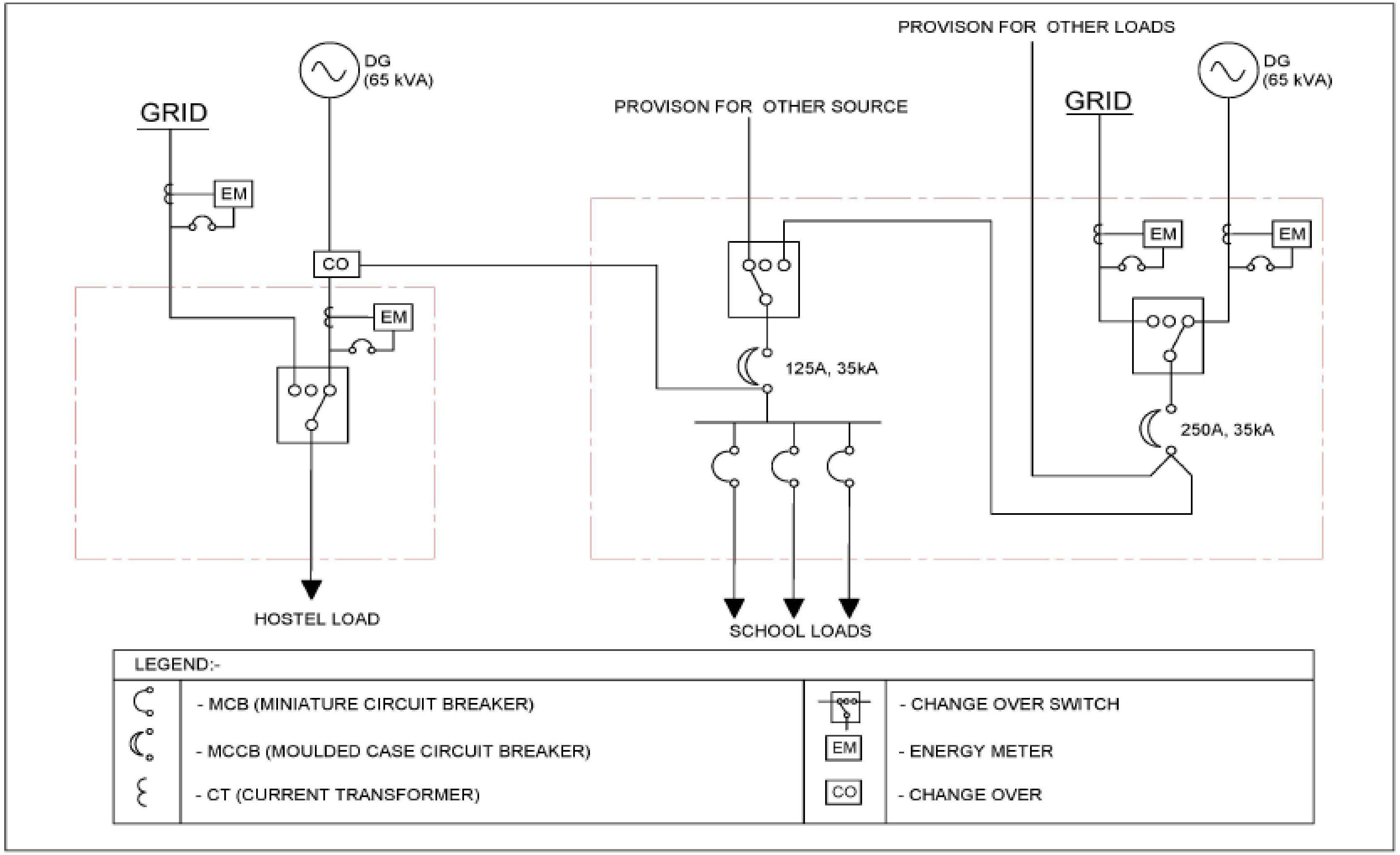




Case study-RCSS

CASE STUDY

Case Study-SMS and SMH



Case Study-SMS and SMH

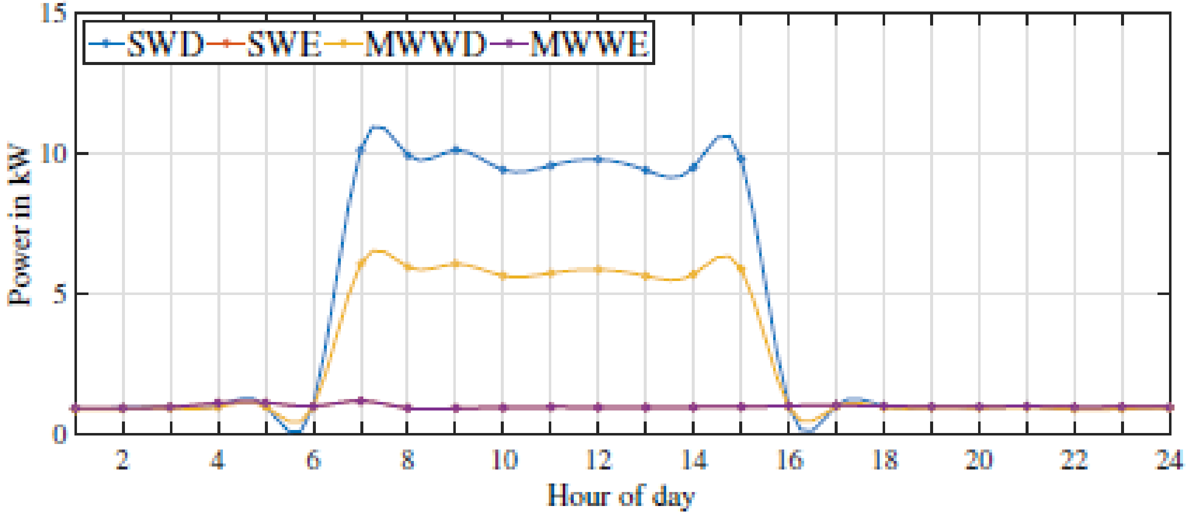


Figure: Load Pattern of School

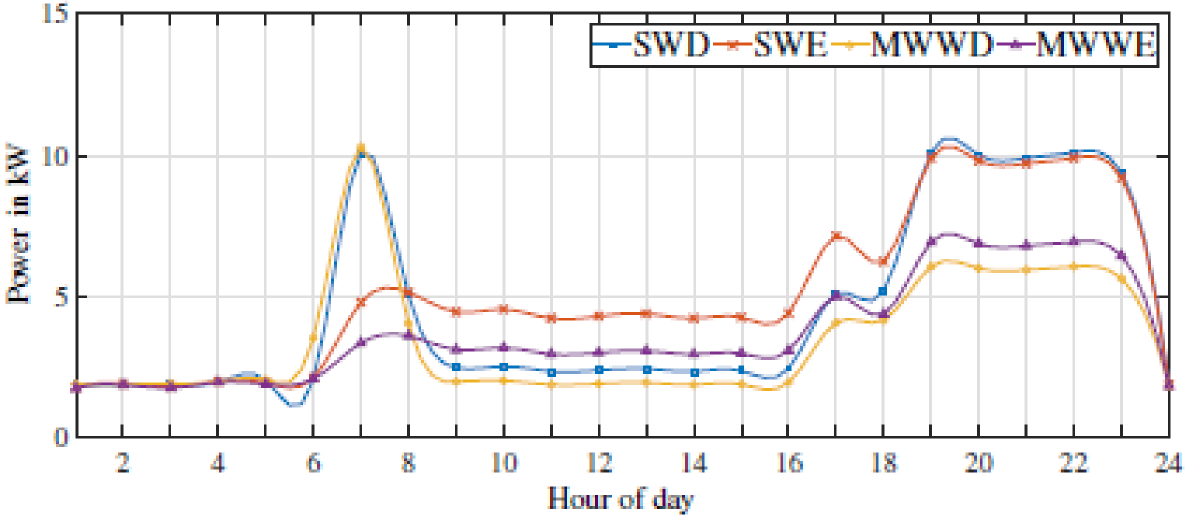


Figure: Load Pattern of Hostel

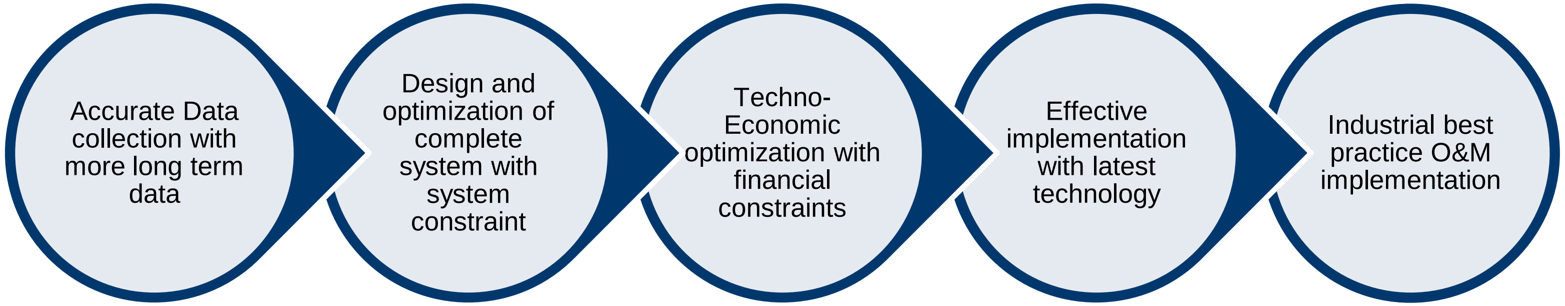
Case study-RSET

CASE STUDY

Brief Contents

Conclusion

- **Summary of key steps for a successful implementation of CCHP in Microgrids or individual entities**



- **Advanced level scope**
  - Budget constraint optimization
  - Generation and load expansion planning
  - Effective storage
  - Community level participation in energy transfer and optimum management system

For more information feel free to contact us:

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Thank You