

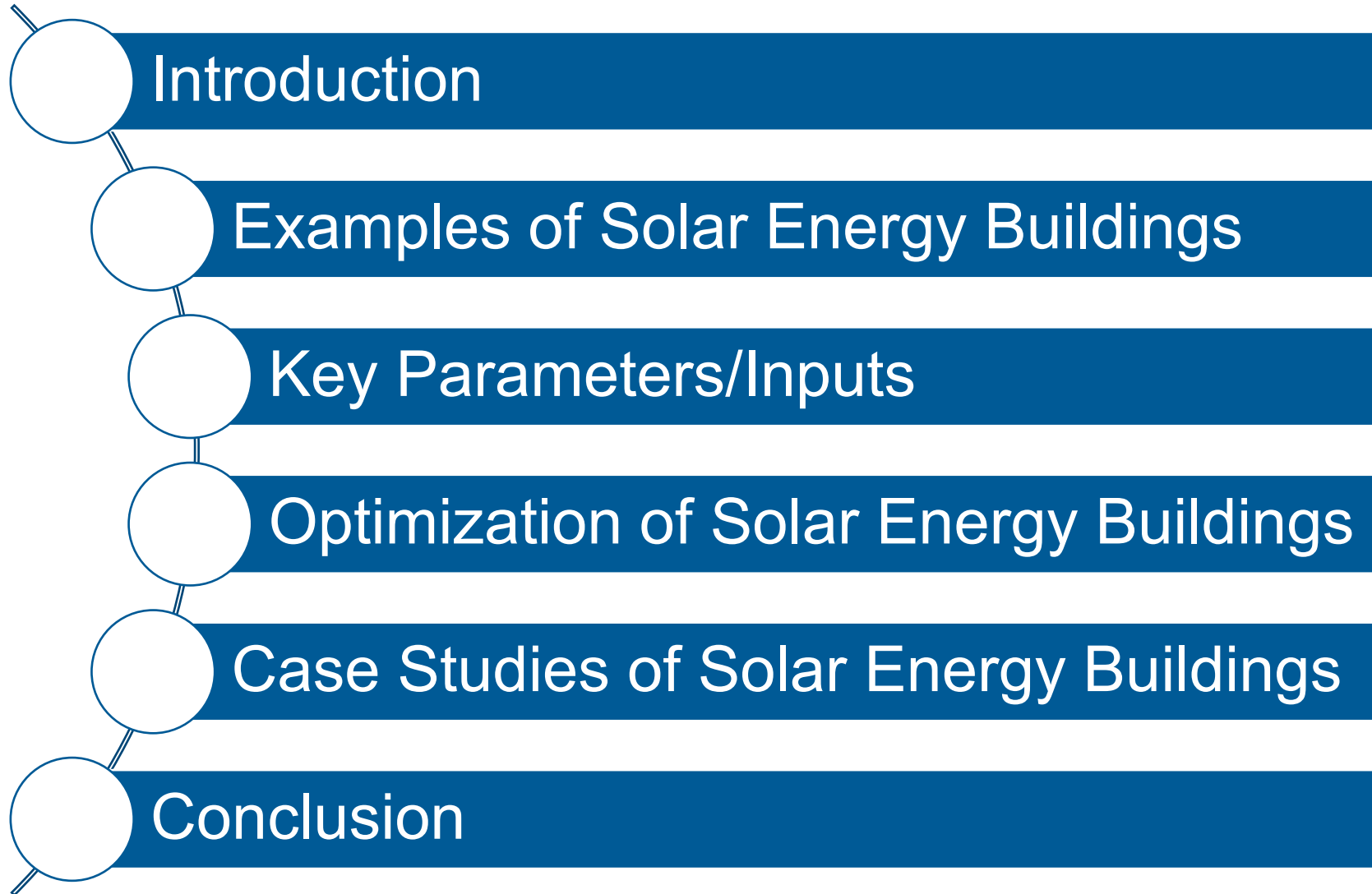
STEAG Energy Services (India) Pvt. Ltd

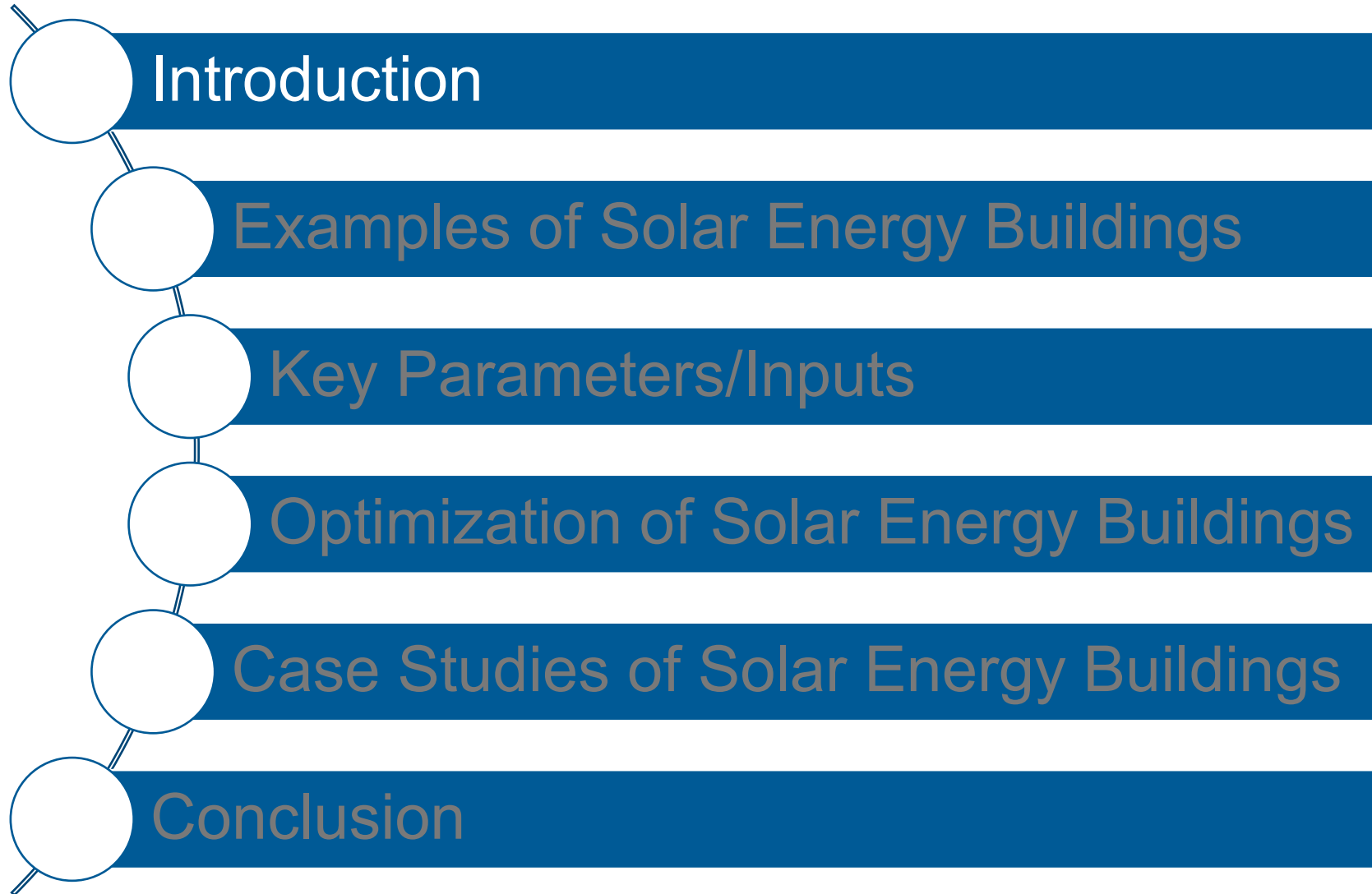
# Examples of Typical Solar Energy Buildings in India



Dr. Arun Kumar Vaiyapuri  
Project Manager- R&D and Renewable Energy

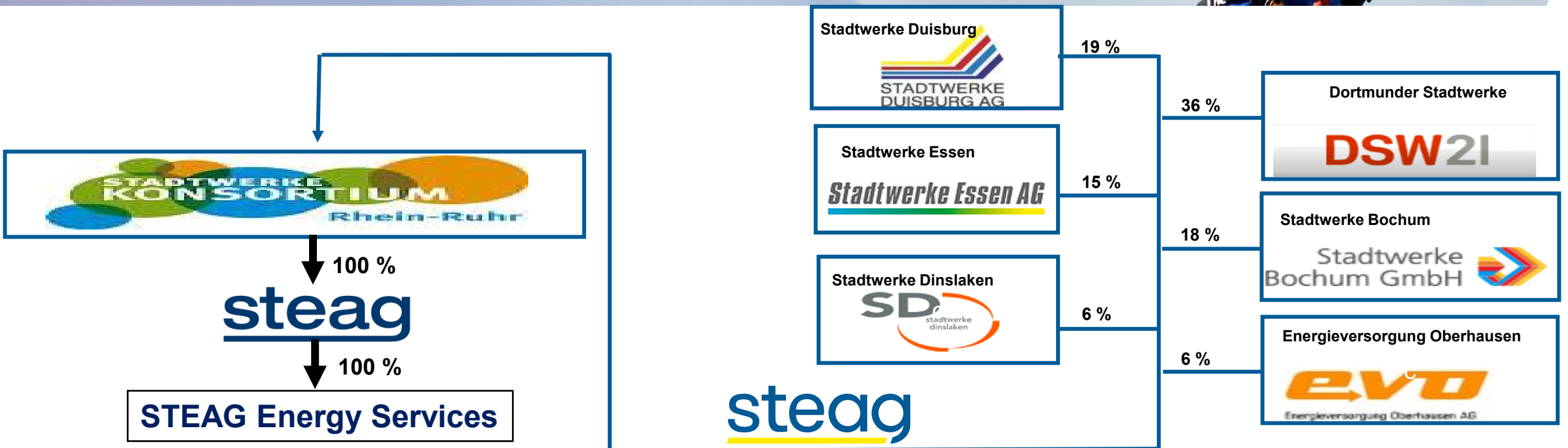








# STEAG– Shareholder Structure



# 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.**

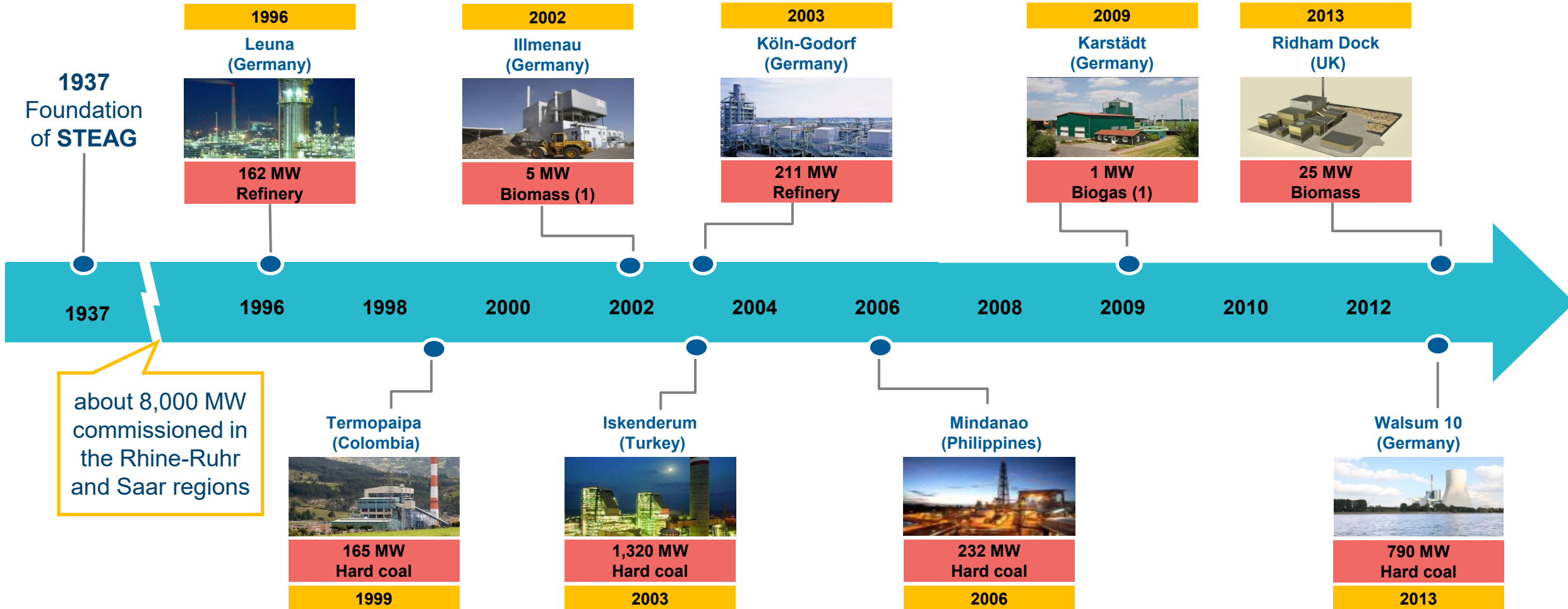
Ankara, Turkey  
Established in 1996

### **STEAG Energy Services (India) Pvt. Ltd.**

Noida, India  
Established in 2001

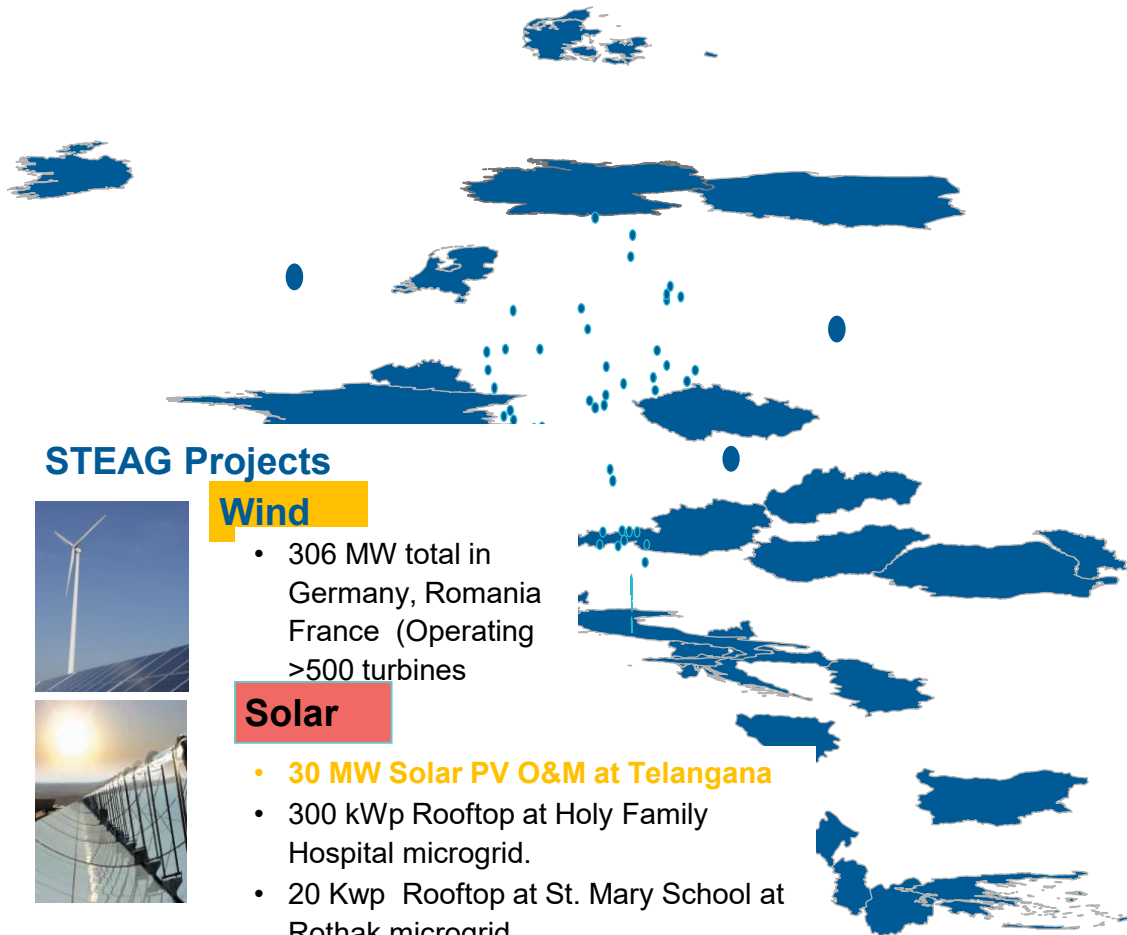


# STEAG's proven track record for future success



# 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.



### Biomass\*

- since 2002
- #3 in Germany



### Biogas

- since 2007
- First own biogas plant commissioned



### Mine gas

- since 1908
- #1 in Germany



### Geothermal

- since 1994
- #1 in Germany



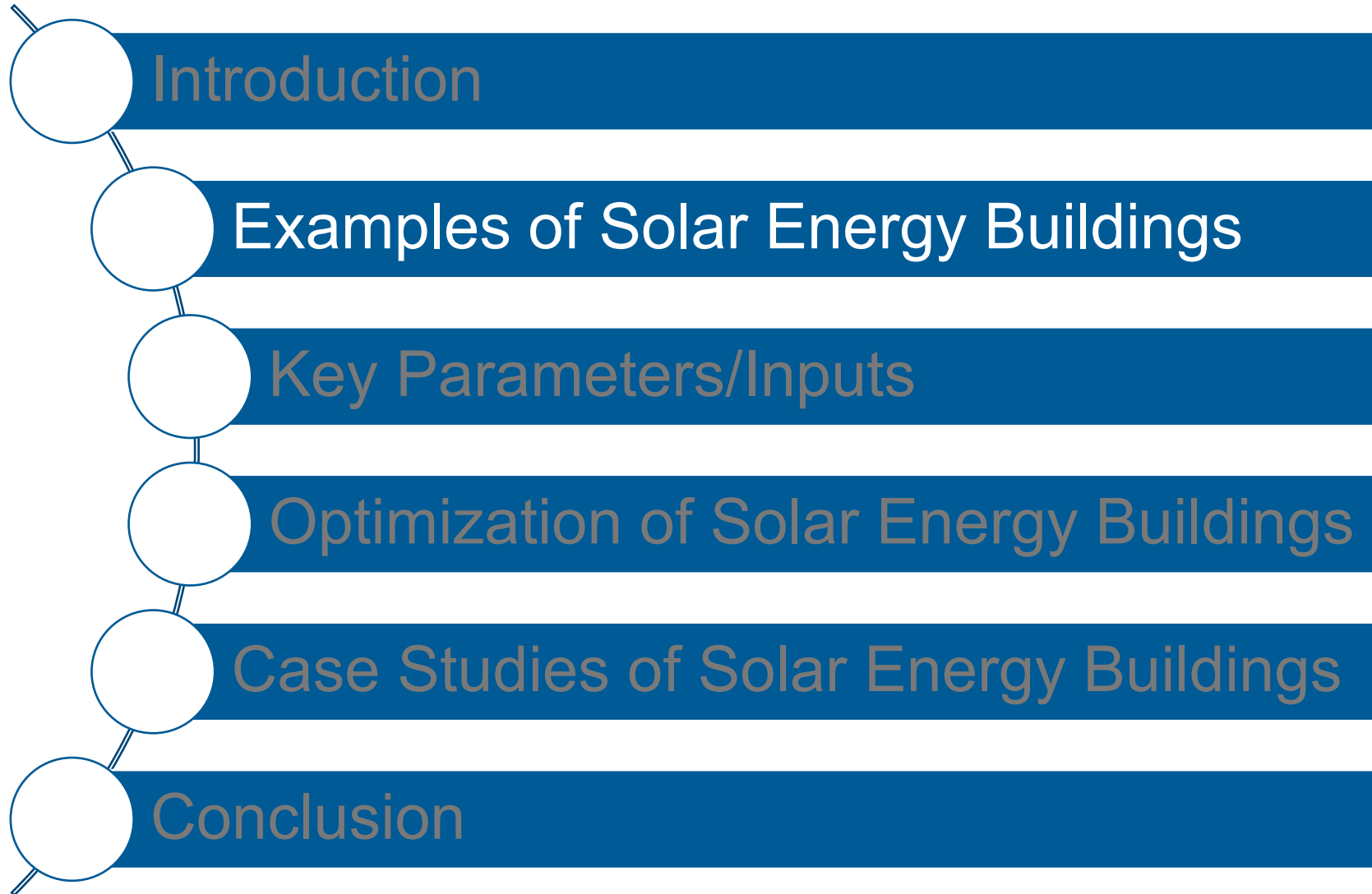
### Contracting

- since 1961
- #2 in Germany

Installed capacity		Plants
MW <sub>el</sub>	MW <sub>th</sub>	
66	154	13
177	139	108
--	71	2
77	905	100
<b>319</b>	<b>1,271</b>	<b>223</b>



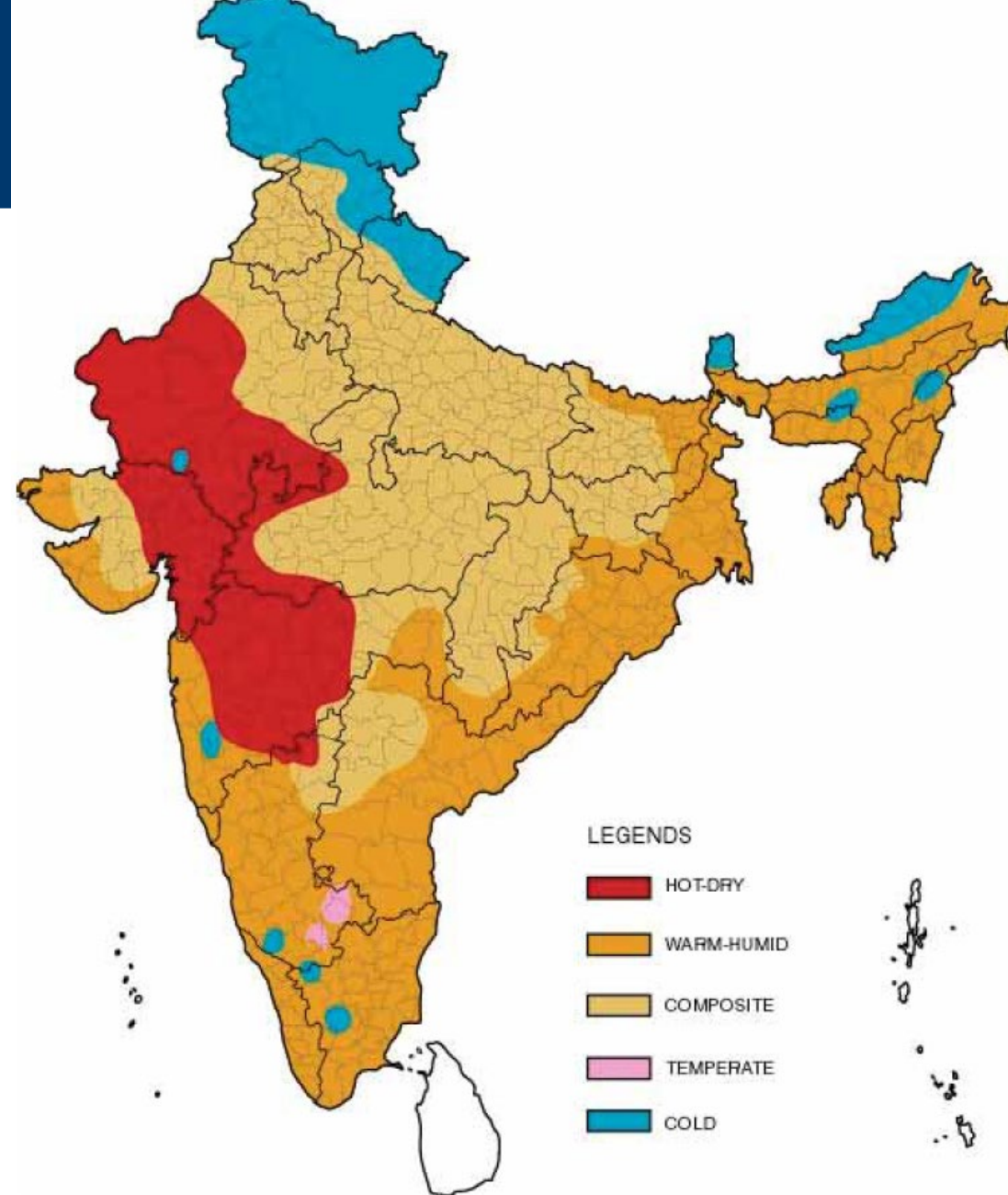




# Temperature Zones



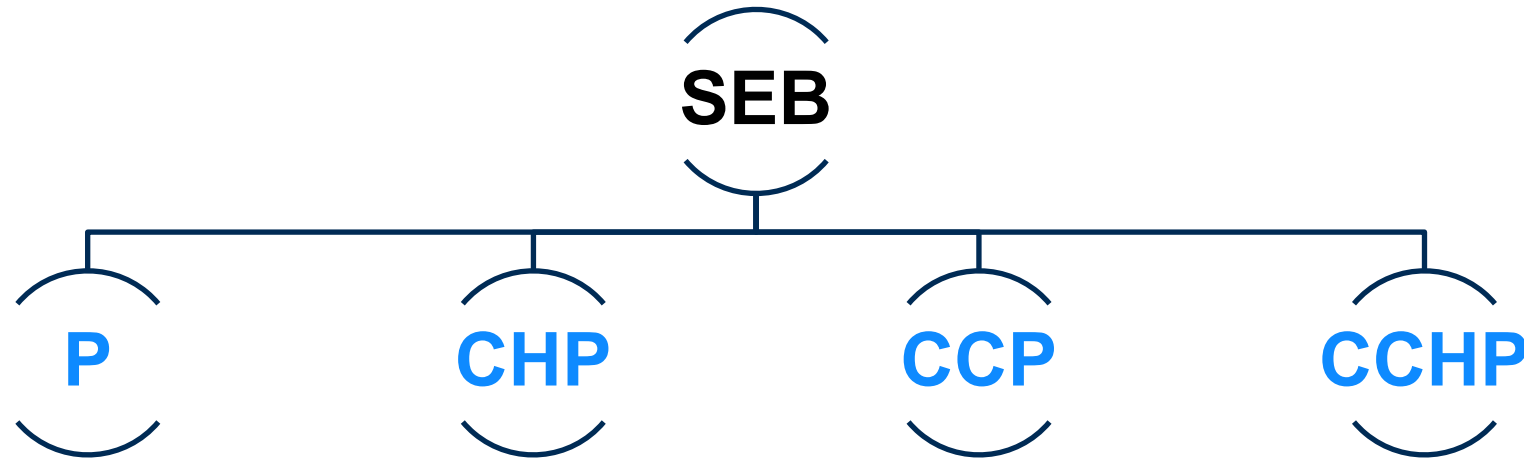
Climate Zone	Mean Temperature (°C)			
	Summer midday (High)	Summer night (Low)	Winter midday (High)	Winter night (Low)
Hot and Dry	40 to 45	20 to 30	5 to 25	0 to 10
Warm and Humid	30 to 35	25 to 30	25 to 30	20 to 25
Temperate	30 to 34	17 to 24	27 to 33	16 to 18
Cold (Sunny/Cloudy)	17 to 24/20	4 to 11/17	(-7) to 8	(-14)
Composite	32 to 43	27 to 32	10 to 25	4 to 10



**LEGENDS**

- HOT-DRY
- WARM-HUMID
- COMPOSITE
- TEMPERATE
- COLD

# Examples of Solar Energy Buildings (SEB) Load Types



P- Power

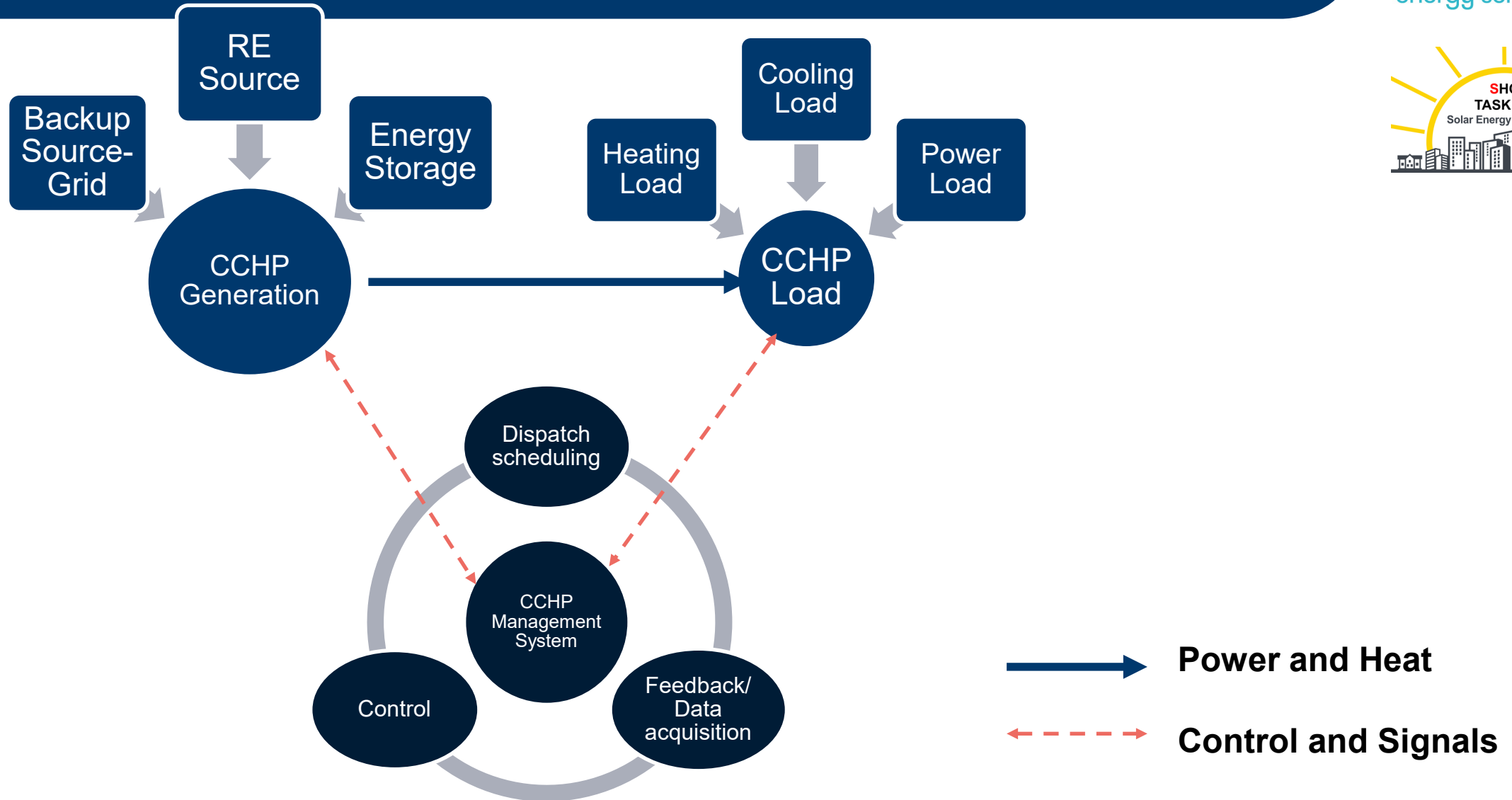
CHP- Combined Heat and Power

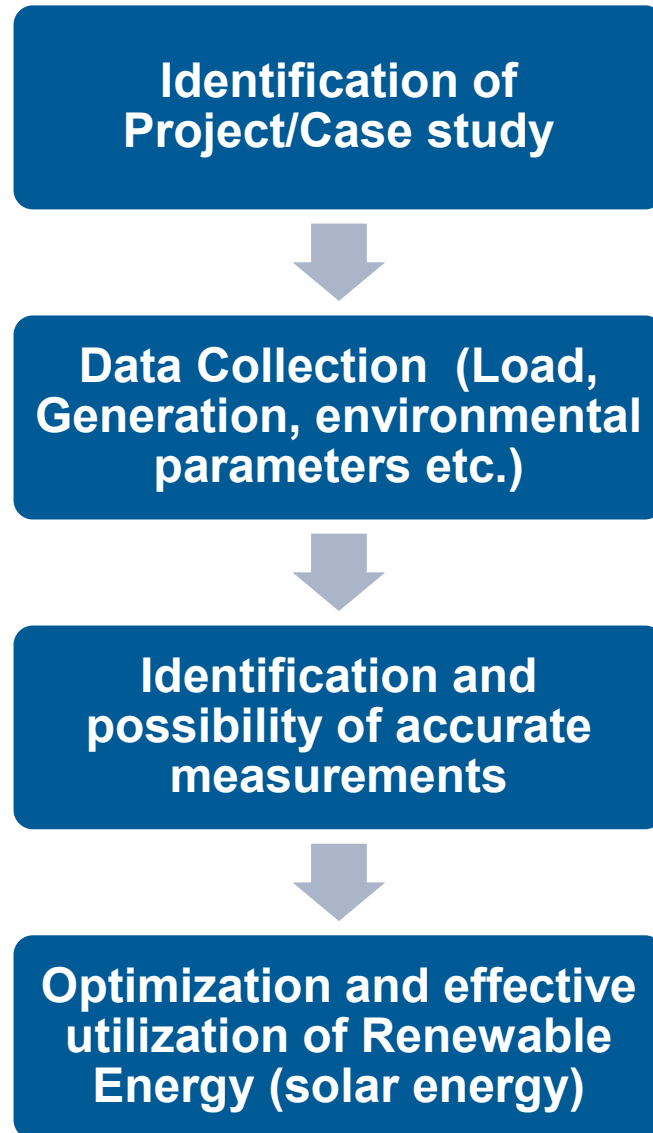
CCP- Combined Cooling and Power

CCHP- Combined Cooling, Heat and Power

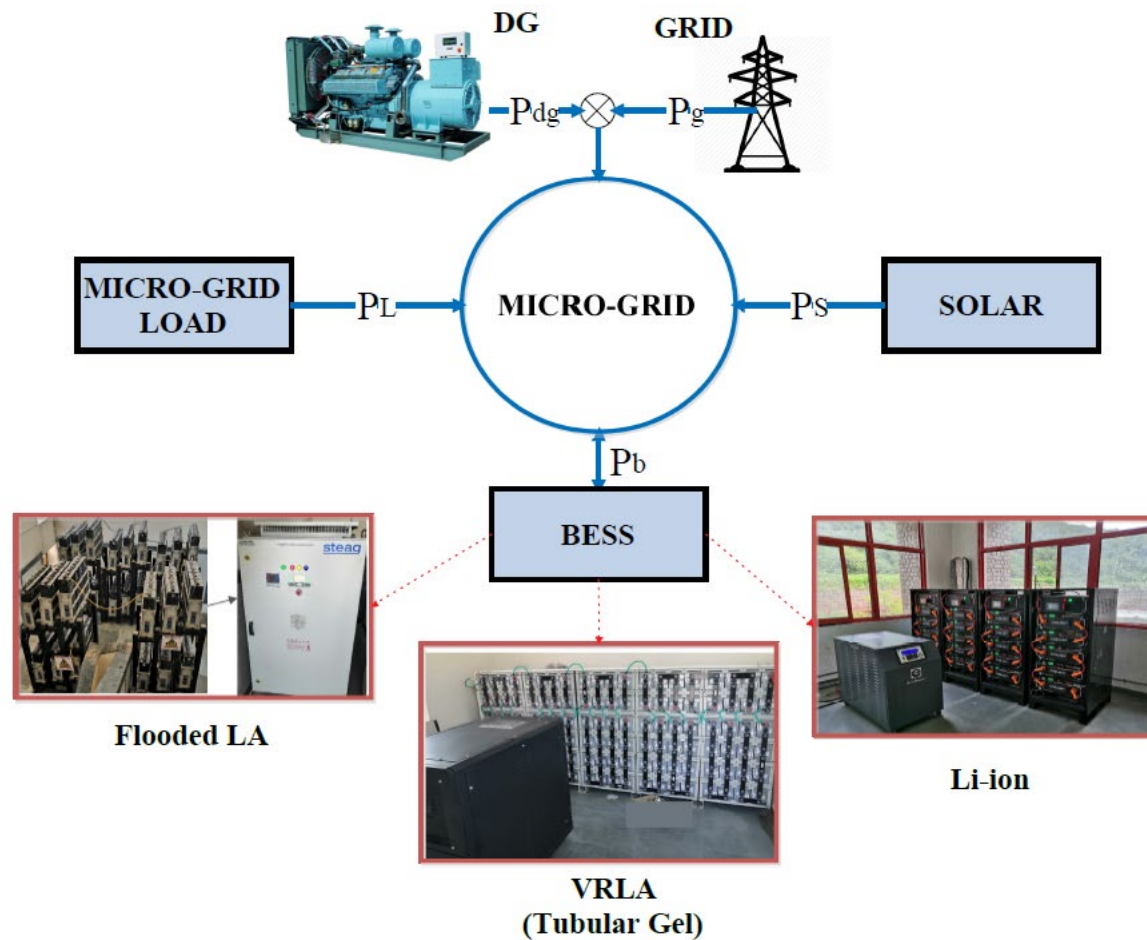


# CCHP Components

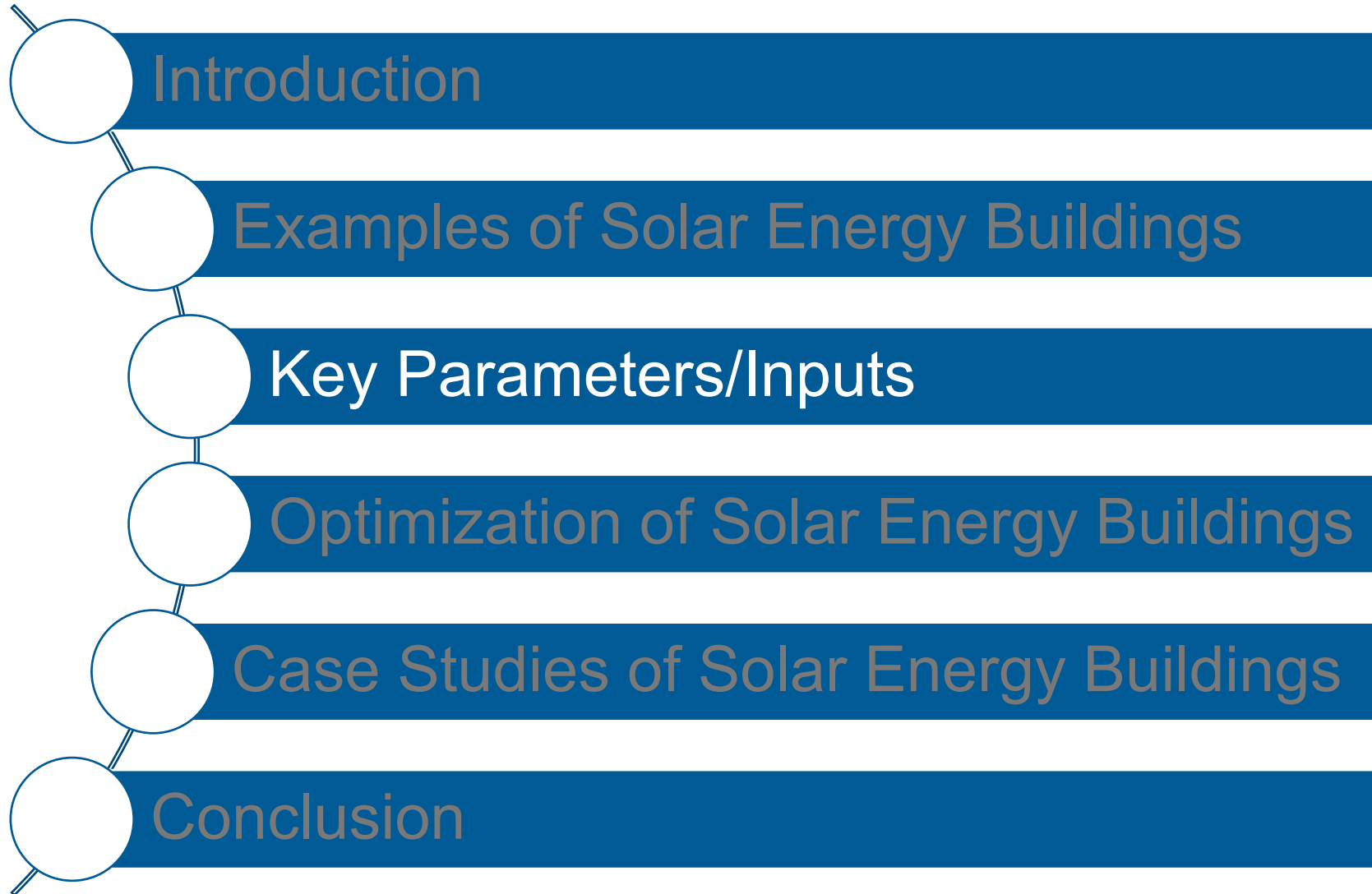




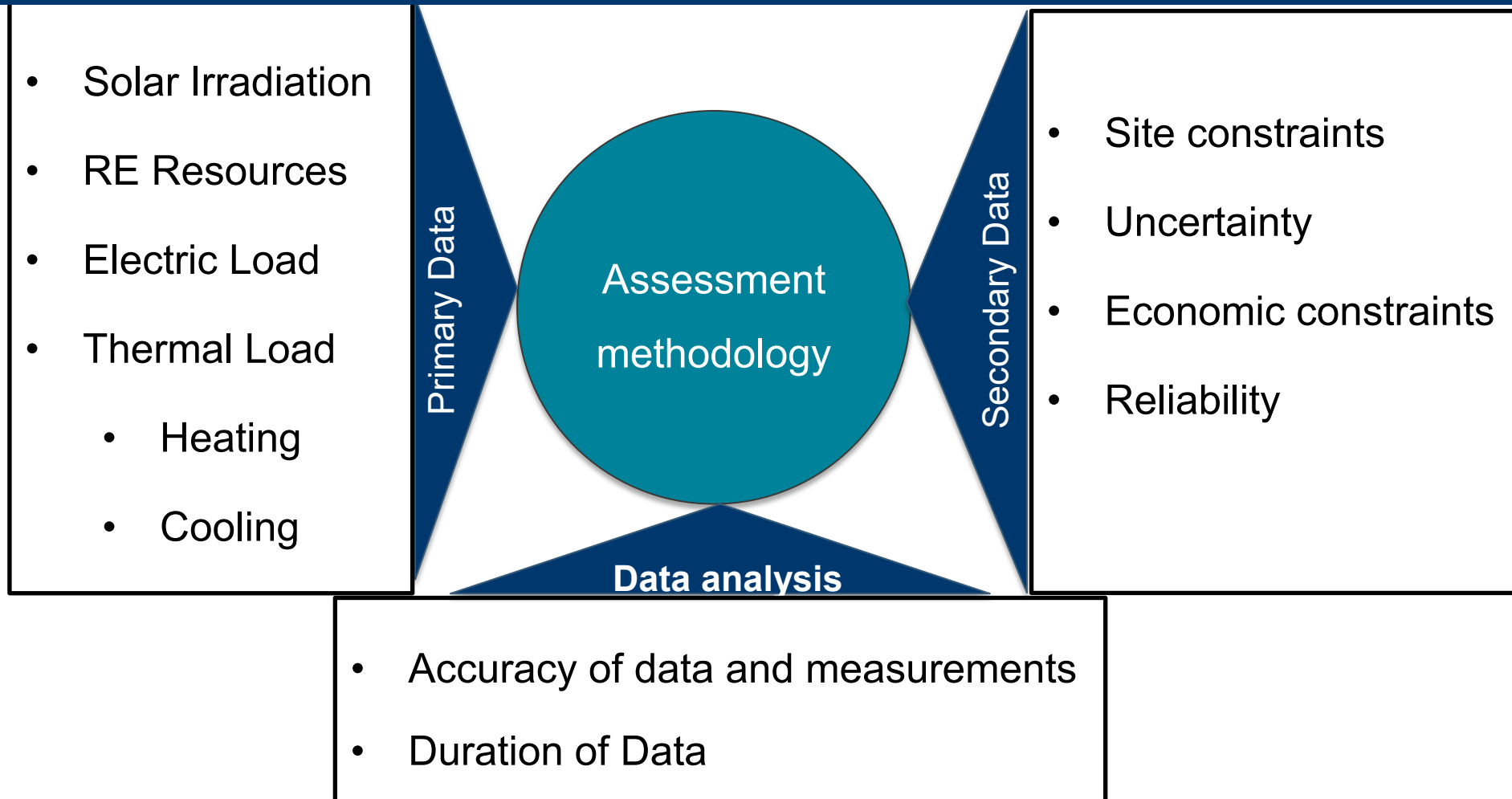
# Different BESS options for microgrid







## Combination of primary and secondary Data





- **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**

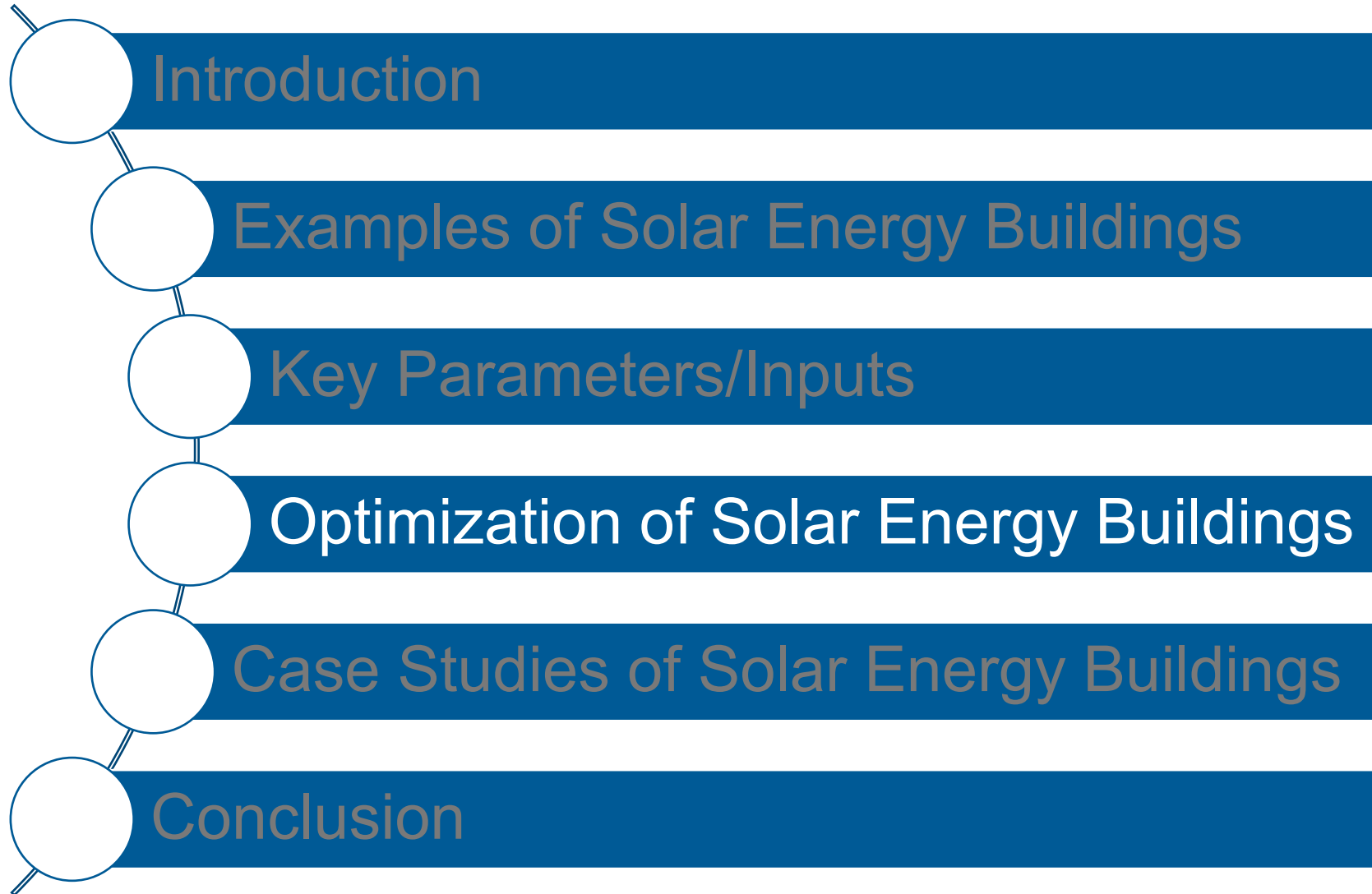
- Temperature
- Humidity

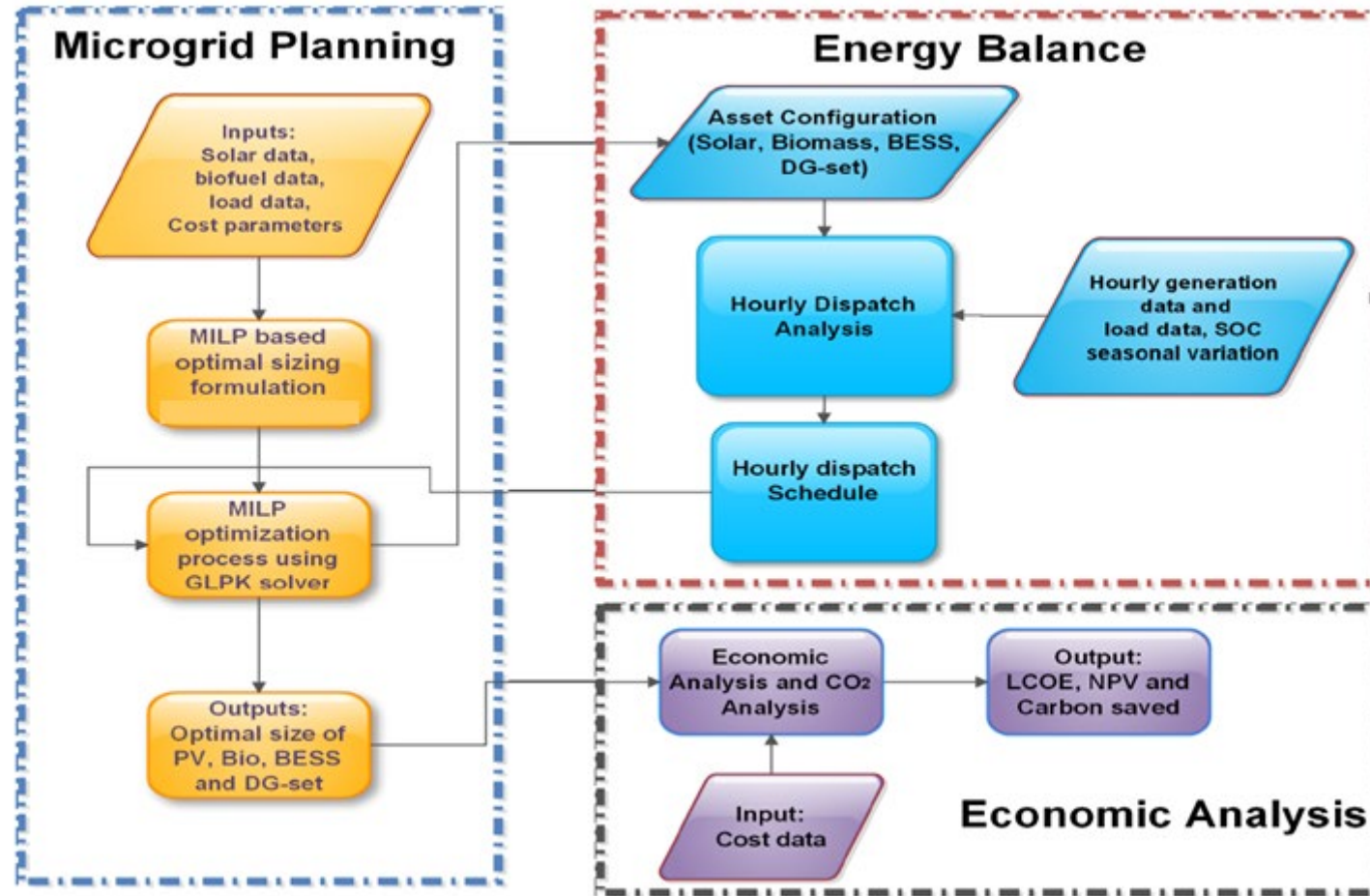
- **RE resource Data**

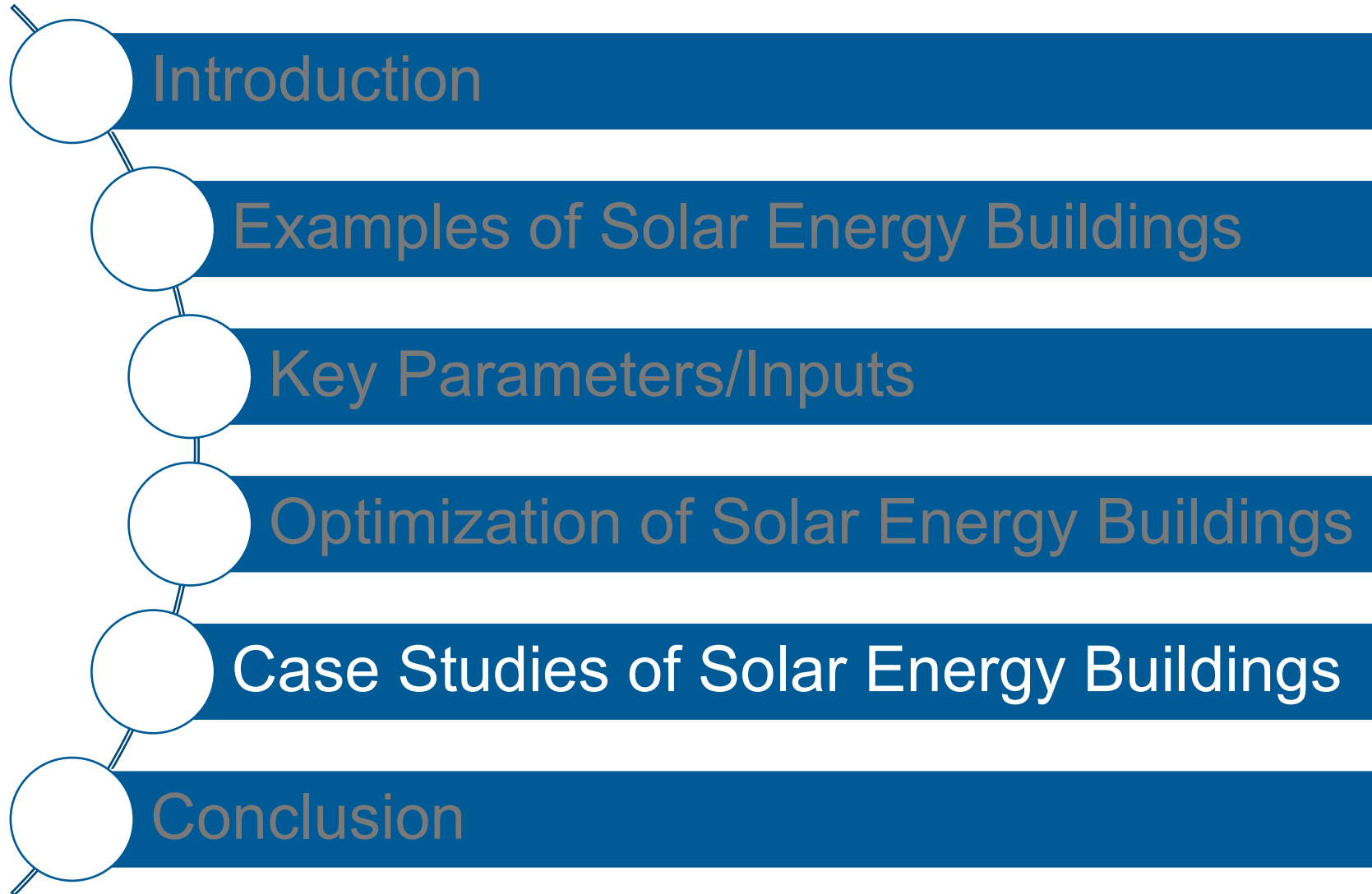
e.g. **Solar Radiation Data**

- GHI
- DNI (Wherever heat is considered)









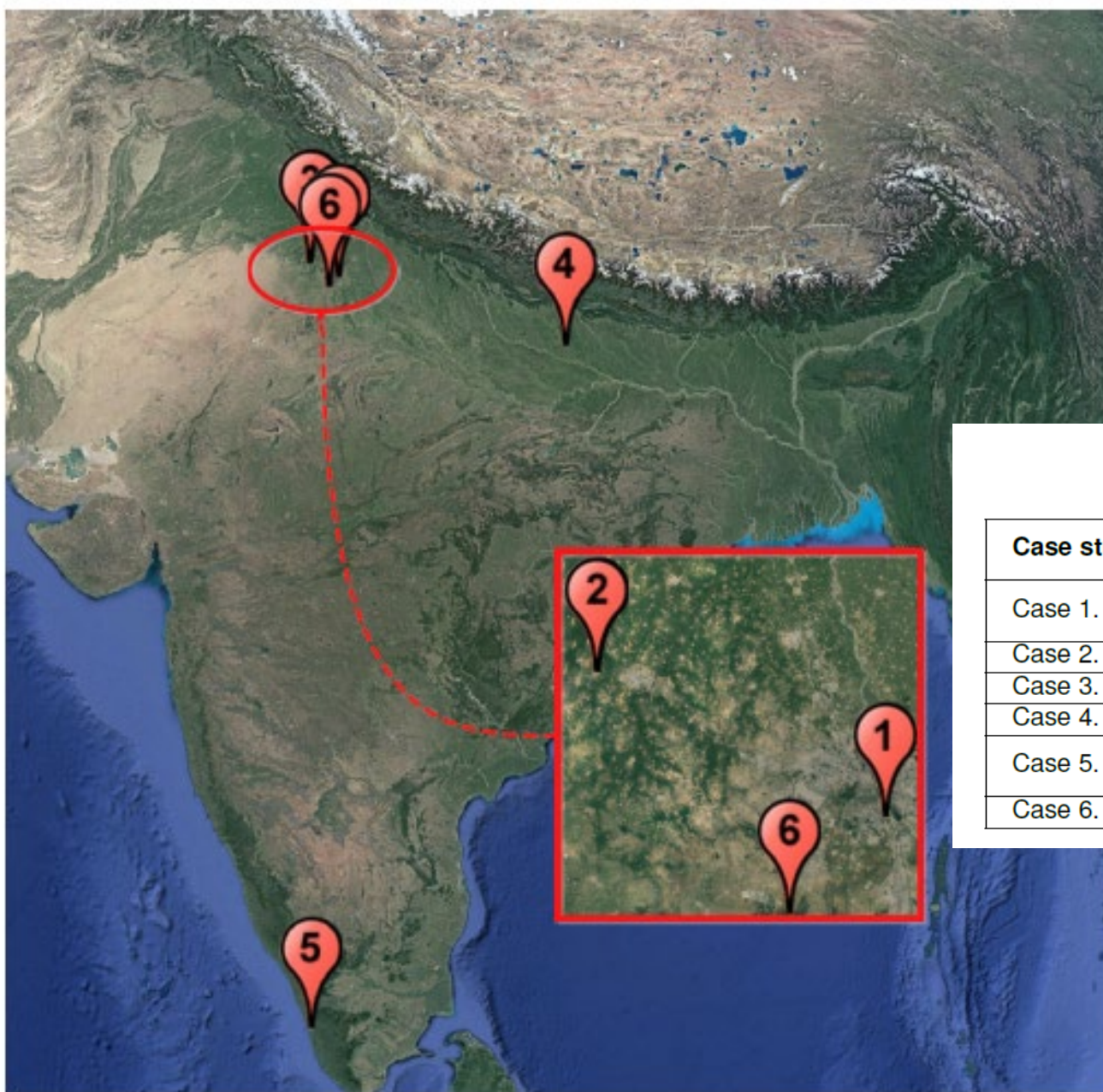


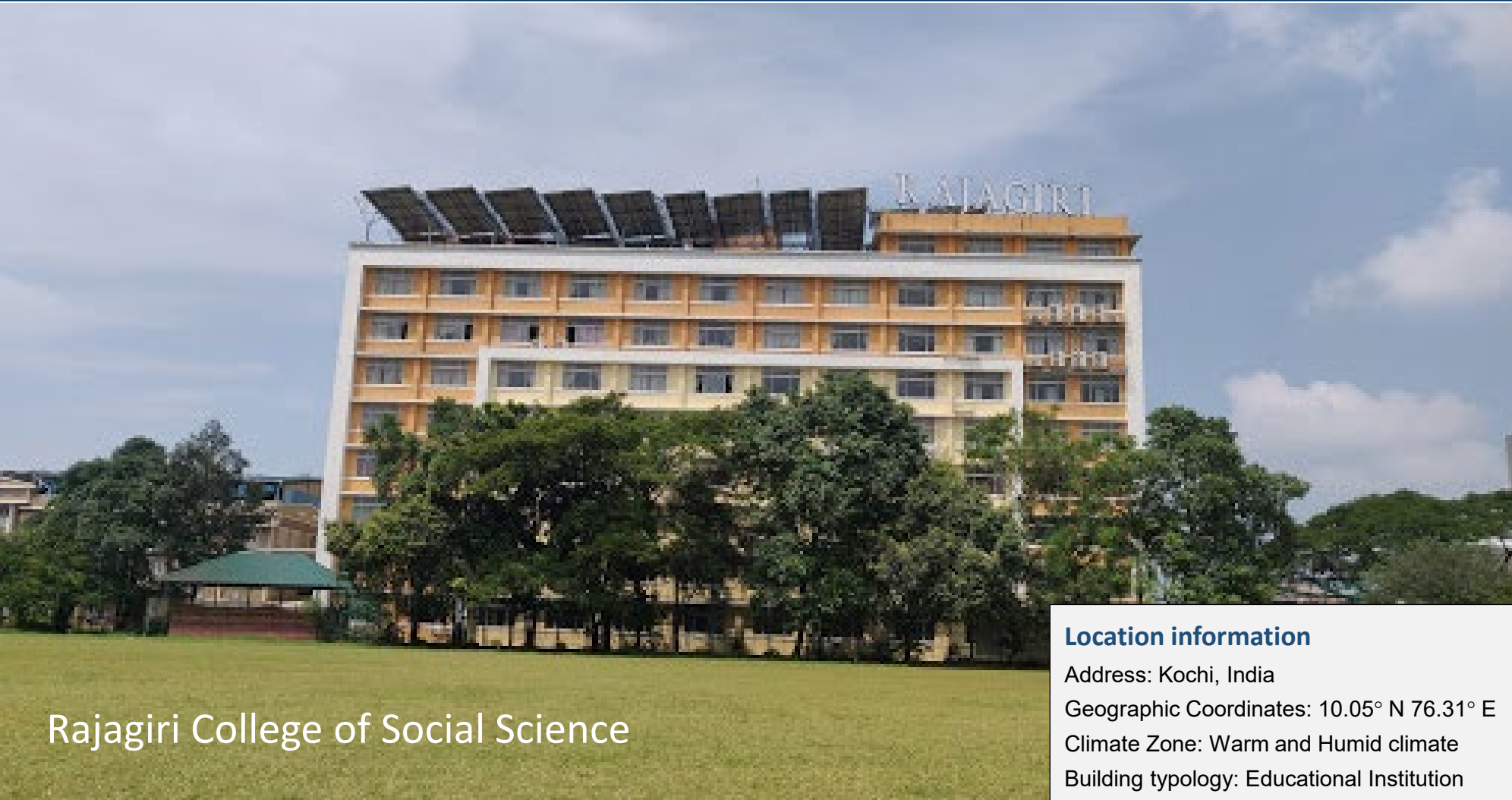
Table: Case Study details

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

Figure: Location of Case-study



# Case Study-RCSS



Rajagiri College of Social Science

## Location information

Address: Kochi, India

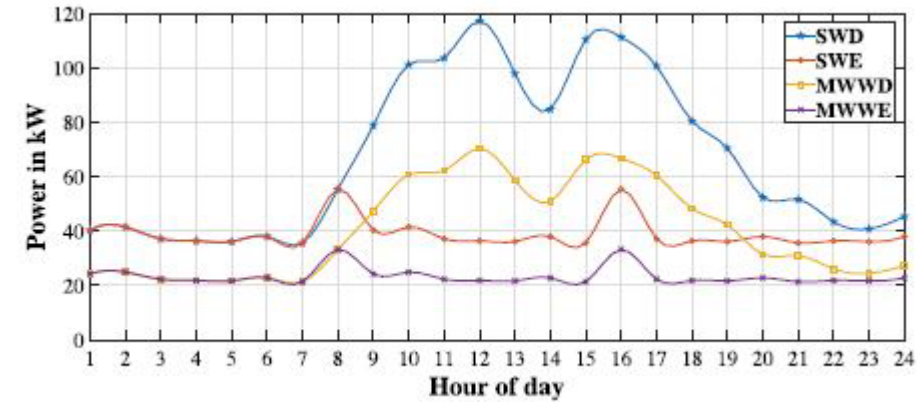
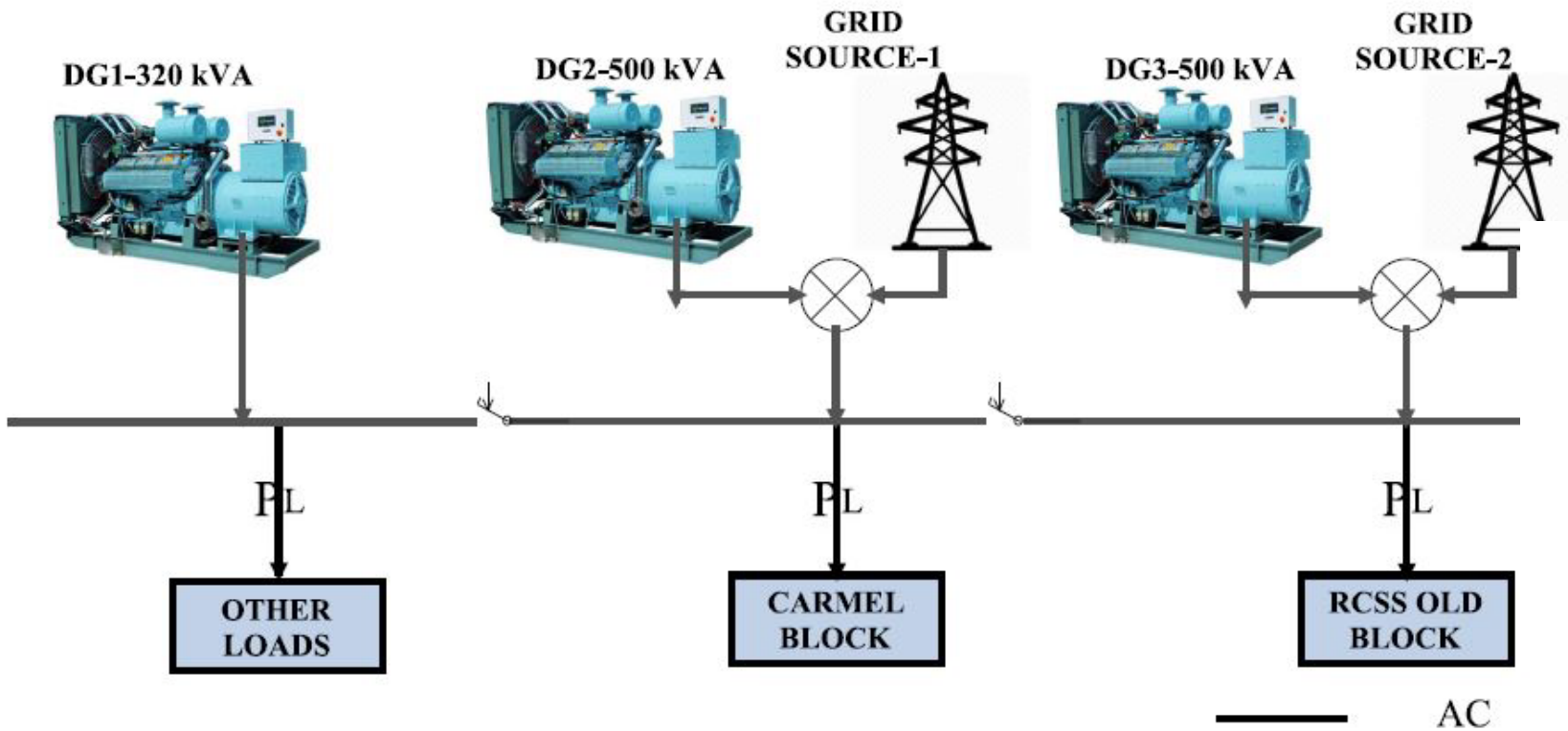
Geographic Coordinates: 10.05° N 76.31° E

Climate Zone: Warm and Humid climate

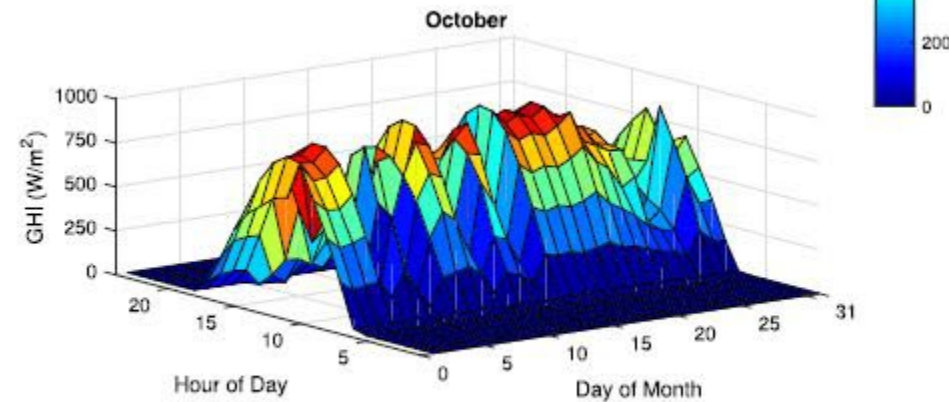
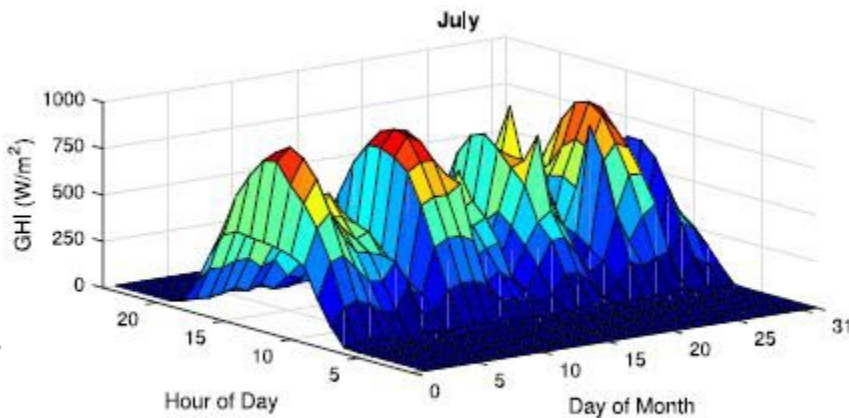
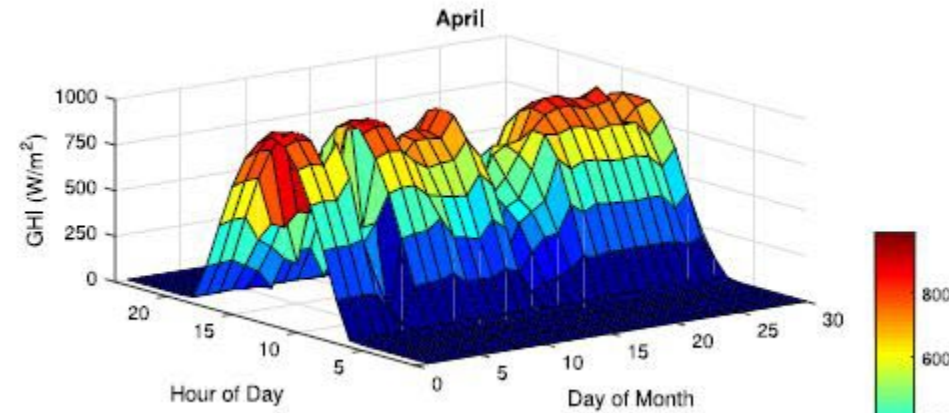
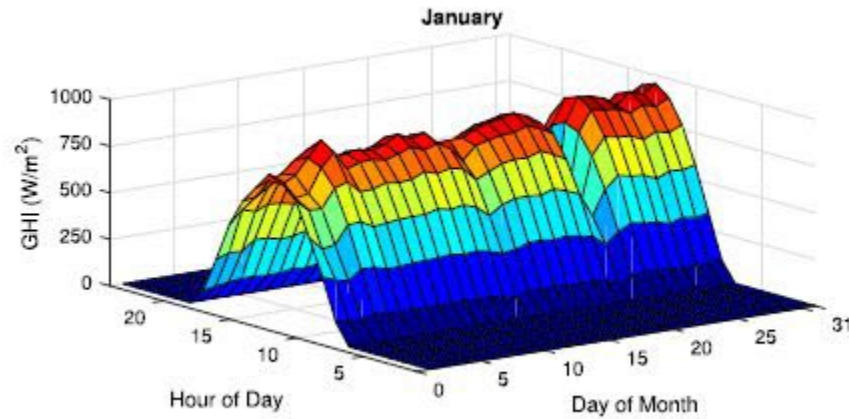
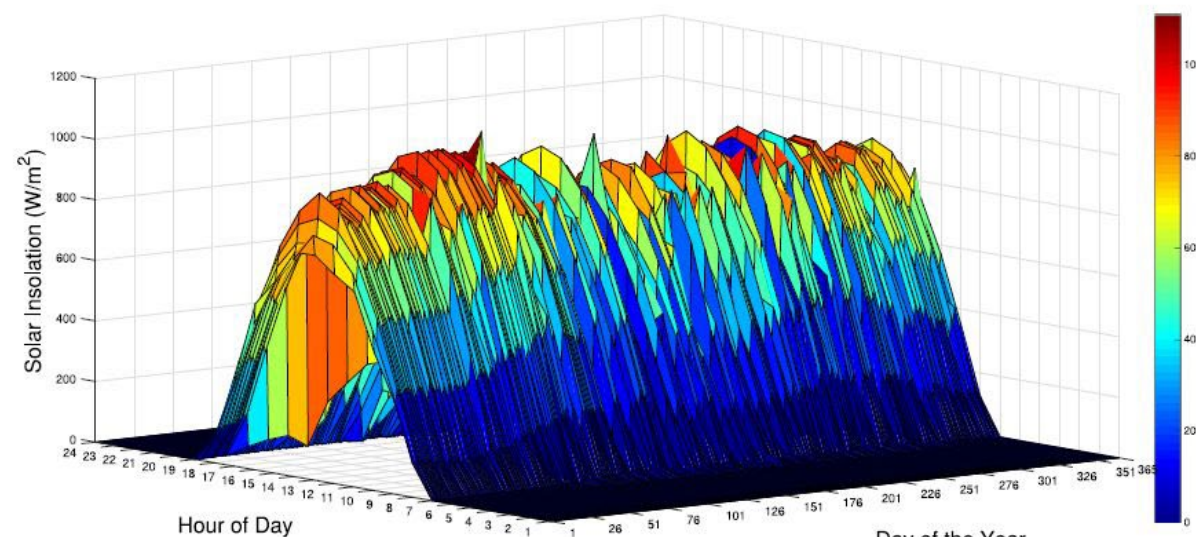
Building typology: Educational Institution



# Case Study-RCSS



# Case Study-RCSS





# Case study-RCSS

## CASE STUDY





# Case Study-SMS and SMH

## Location information

Address: Haryana, India

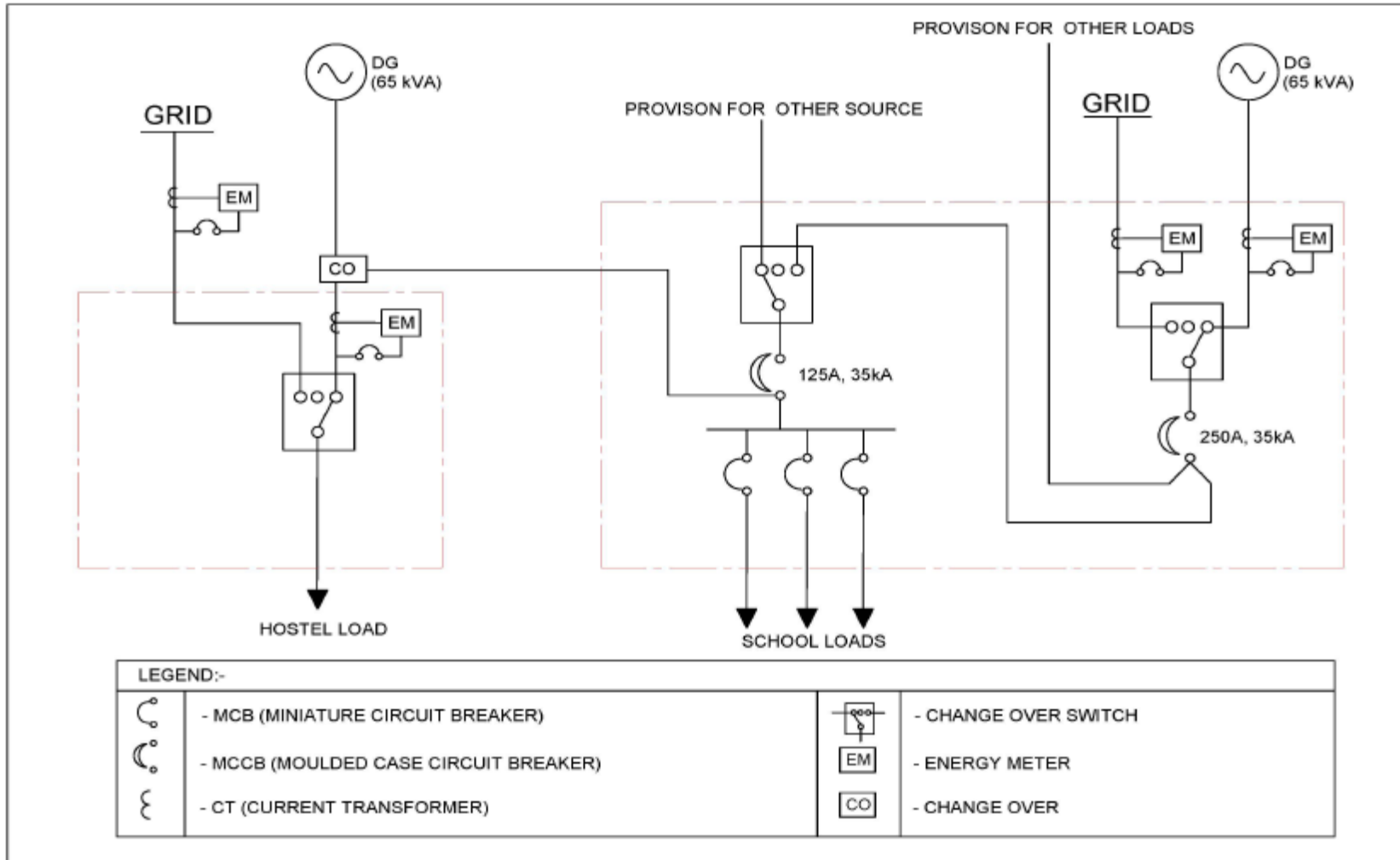
Geographic Coordinates: 28.91° N 76.48° E

Climate Zone: Composite climate

Building typology: Educational



# Case Study-SMS and SMH





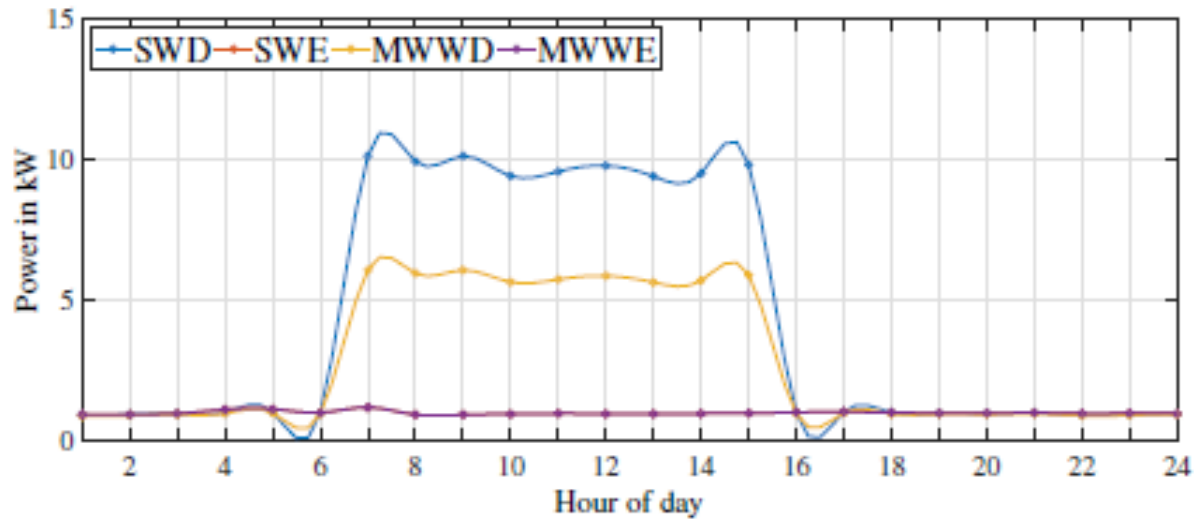


Figure: Load Pattern of School

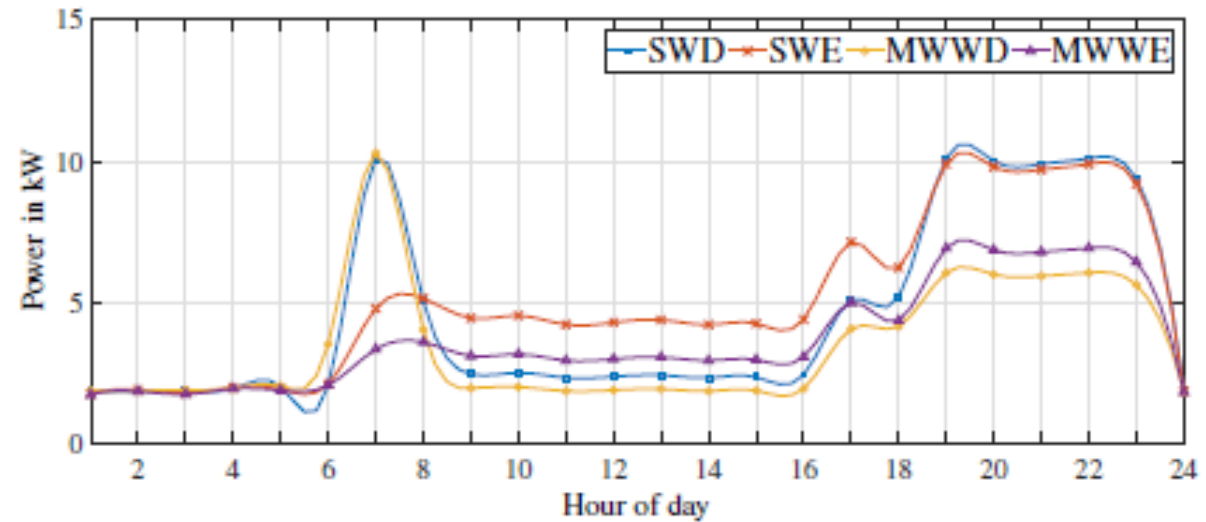
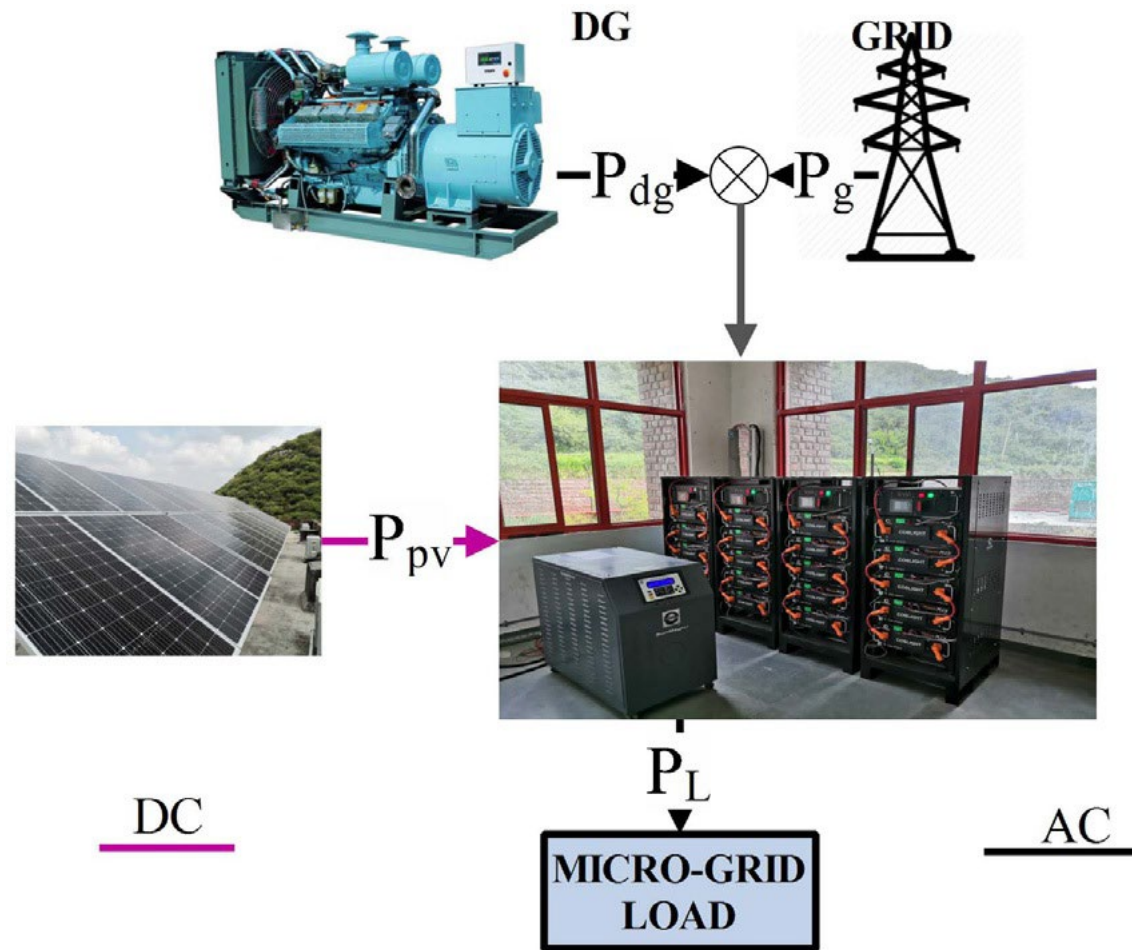


Figure: Load Pattern of Hostel

# Typical Block Diagram





# Case study-RSET



## Location information

Address: Kochi, India

Geographic Coordinates: 09.99° N 76.36° E

Climate Zone: Warm and Humid climate

Building typology: Educational Institution

# Case study-RSET



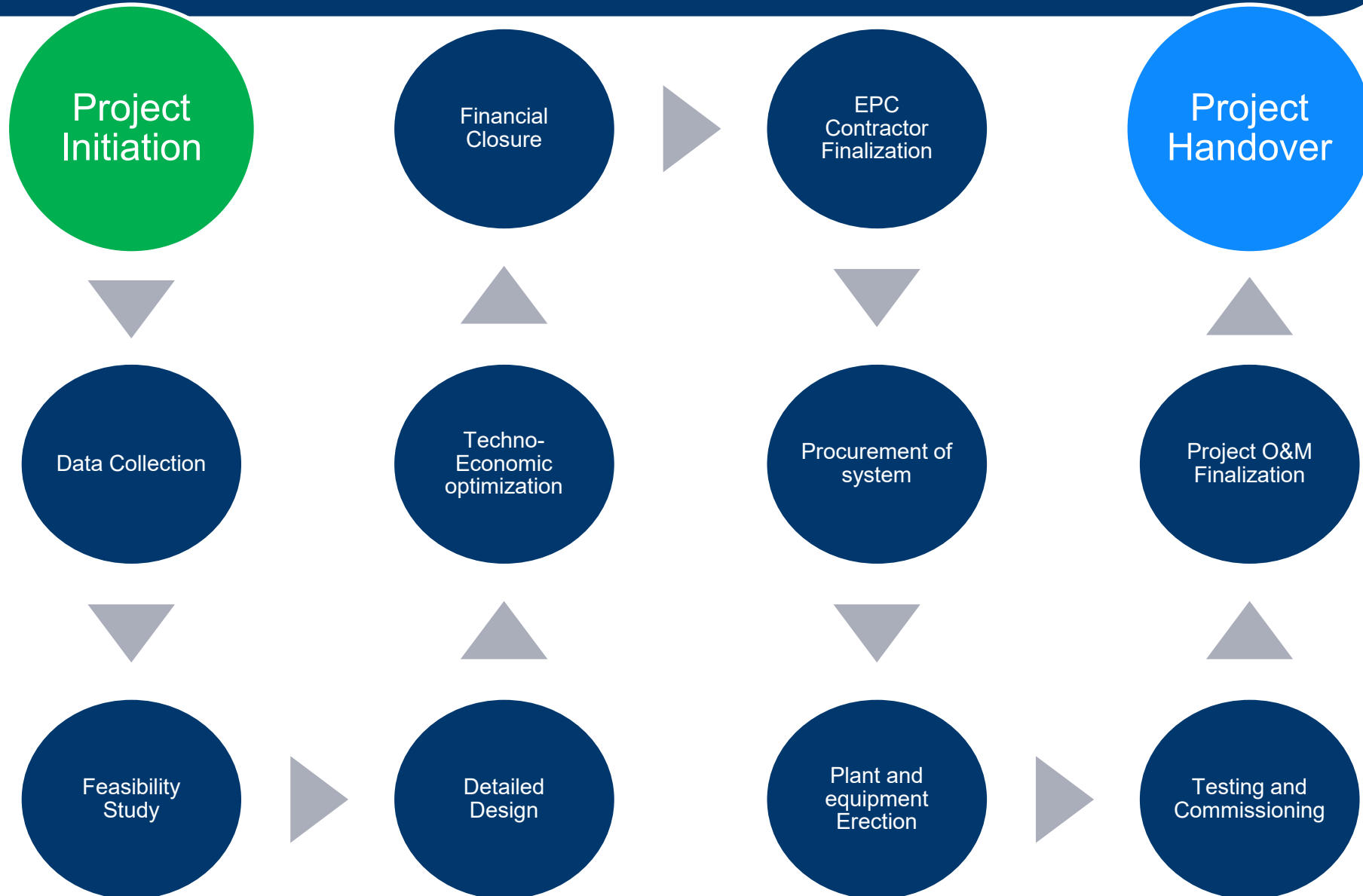
Mittwoch, 8. Februar 2023

Dr. Arun Kumar Vaiyapuri

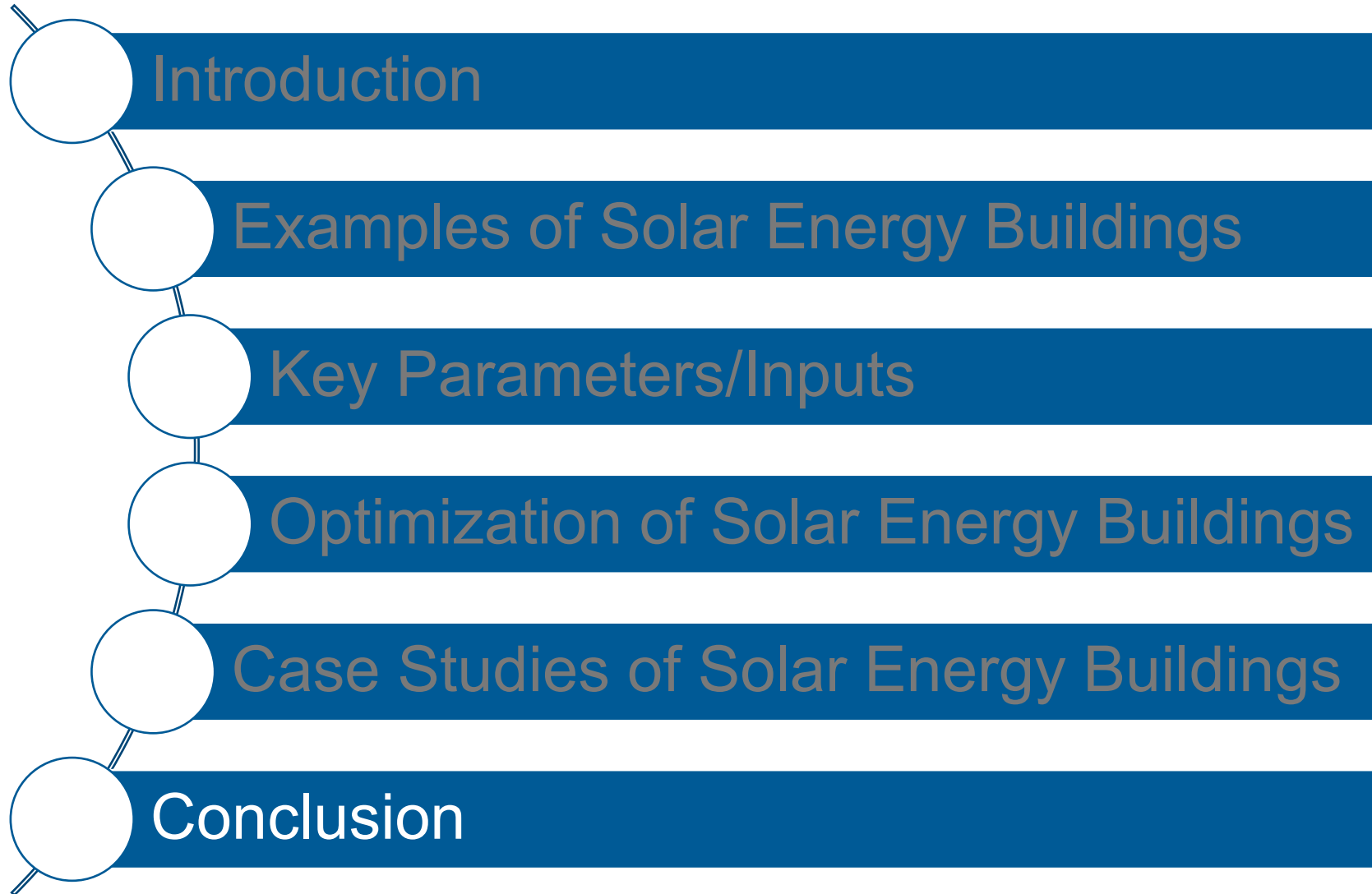
CASE  
STUDY



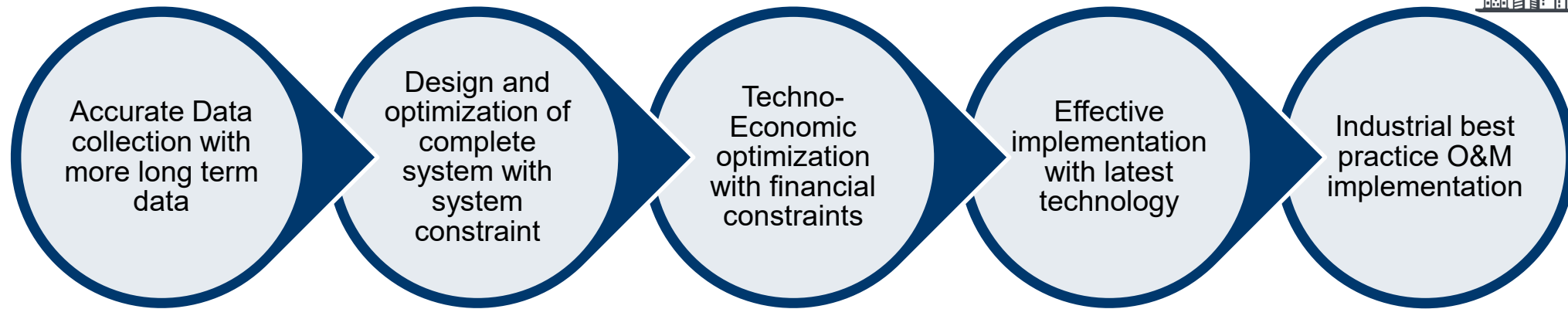
# SEB Project Stages







## • Summary of key steps



## Areas of future focus to reduce energy consumption in SEB in India

- Building Insulation and ventilation
- Natural light based architectural design
- Smart energy monitoring and Control system
- Maximize the Solar installation by using available areas effectively including Façade
- Integrated participation in the form of B2G and V2G
- Active online day ahead optimal dispatch based on forecast ( SEMS-Smart Energy Management system)

For more information feel free to contact us:

**Dr. Arun Kumar Vaiyapuri (Project Manager- R&D and Renewable Energy)**

[akv@steag.in](mailto:akv@steag.in)

***Thank You***