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Trigeneration

Future of clean and green energy generation

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Pune, 23 June 2010

COOPERATION
REPUBLIC OF INDIA
FEDERAL REPUBLIC OF GERMANY

Contents

1. Energy Issues

Requirements:

- Energy security
- Cheap and reliable power

Problems:

- Peak shortage
- Power deficit
- No power security
- Open access allowed but not used

Issues:

- Subsidies
- Free electricity
- T&D losses

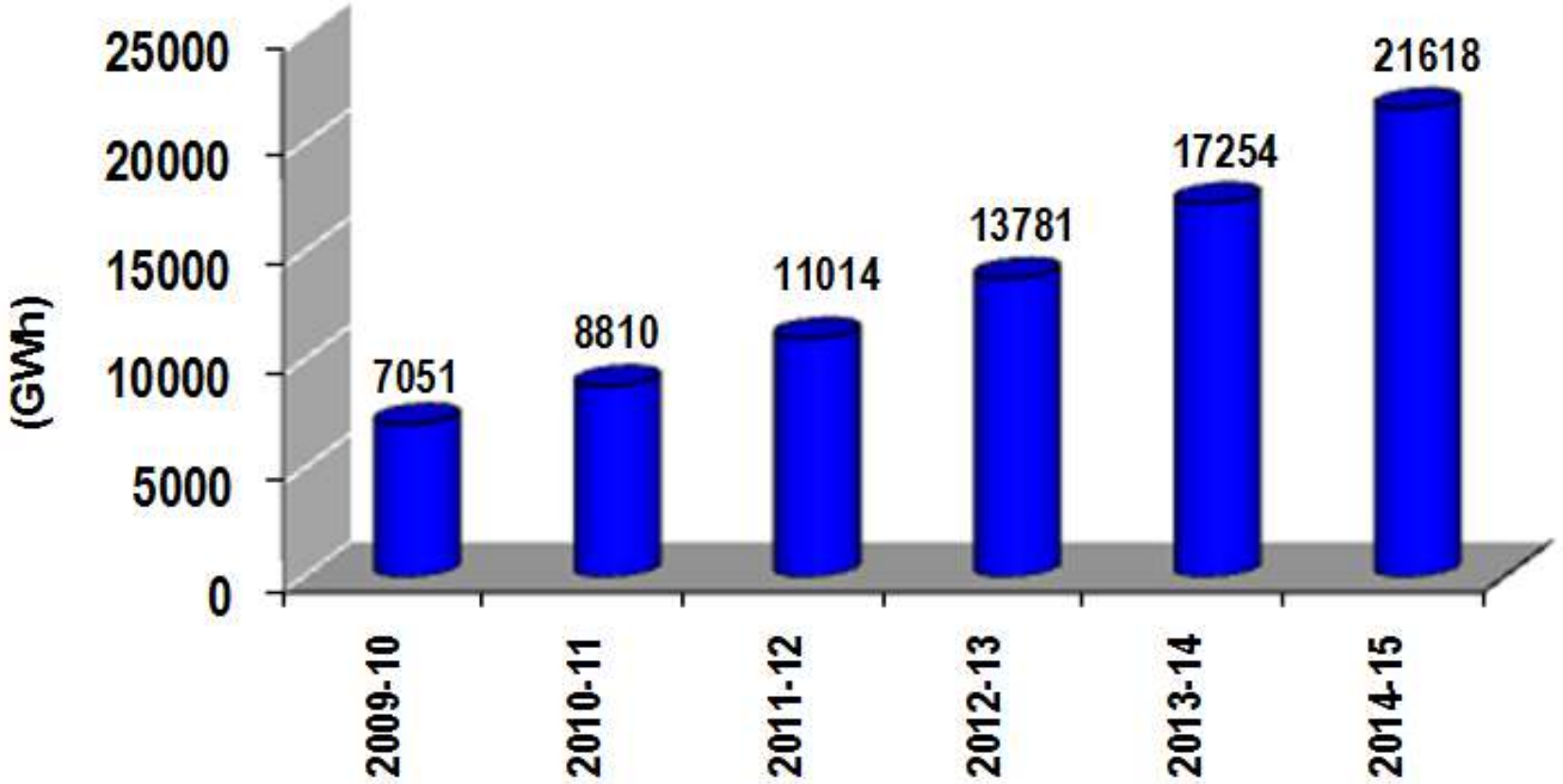
1. Indian commercial building sector - profile

- Demand for office space is rising due to increasing share of service sector
- Office space with higher standards are in demand
- Indian office space share
  - 70 % IT companies
  - 15 % financial service provider & pharma companies
  - 15 % other sectors
- Average energy consumption in buildings
  - HVAC – 55 %
  - Lighting + Electronics (27 % + 14 %) = 41 %
  - Others – 4 %

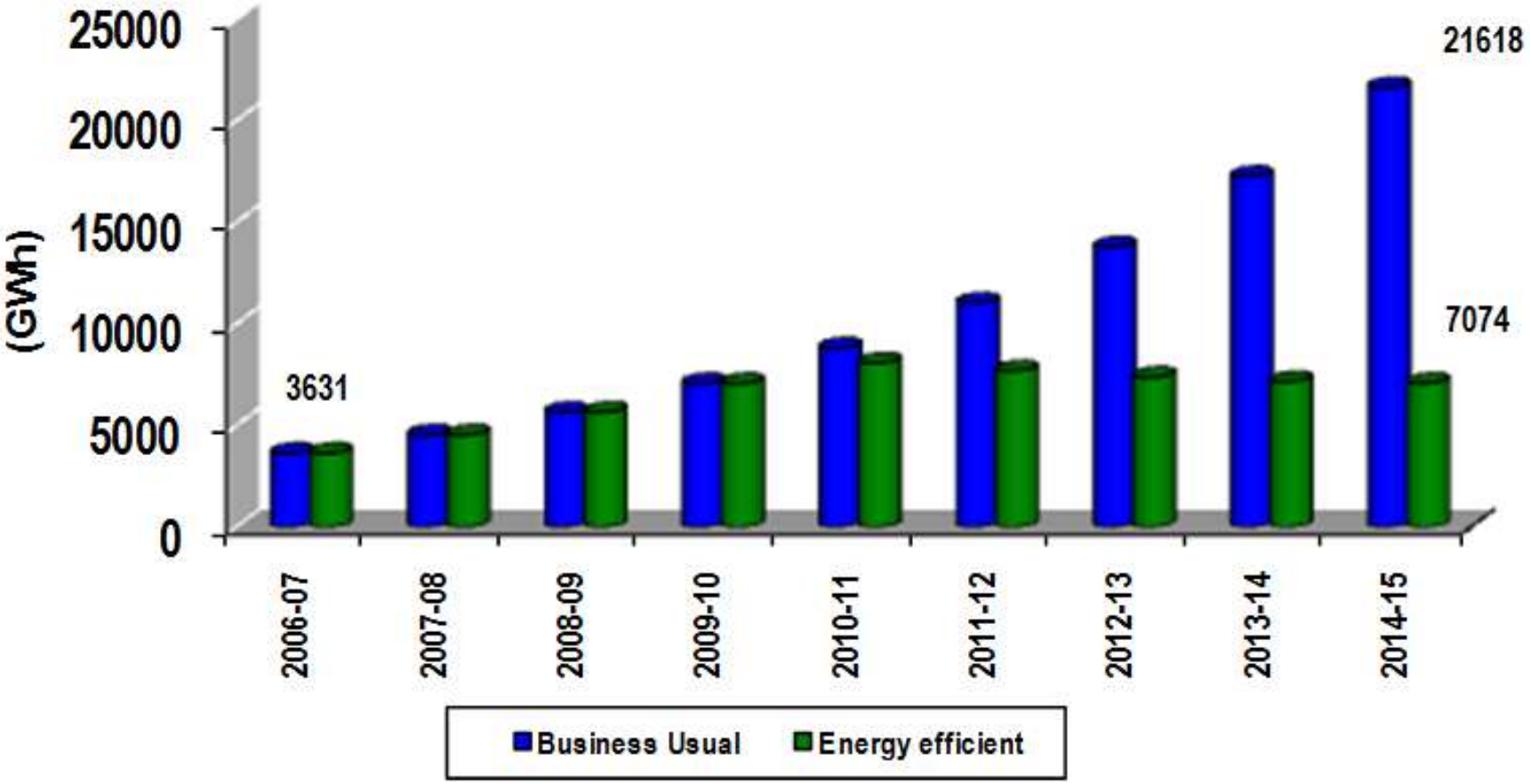
1. Factors that govern energy use inside a building

- Climate zones: Hot and Dry, Warm and Humid, Composite, Temperate, Cold and Cloudy and Cold and Sunny.
- Space use (function of): Occupancy
- Schedule: Working hours
- Building envelope: Glazing area
- Lighting: Natural and artificial
- HVAC systems: Conditioned/Non-conditioned
- Miscellaneous loads: Motors, exhaust fans, lifts escalators, refrigeration equipments, etc

2. Projected energy consumption in Hotels

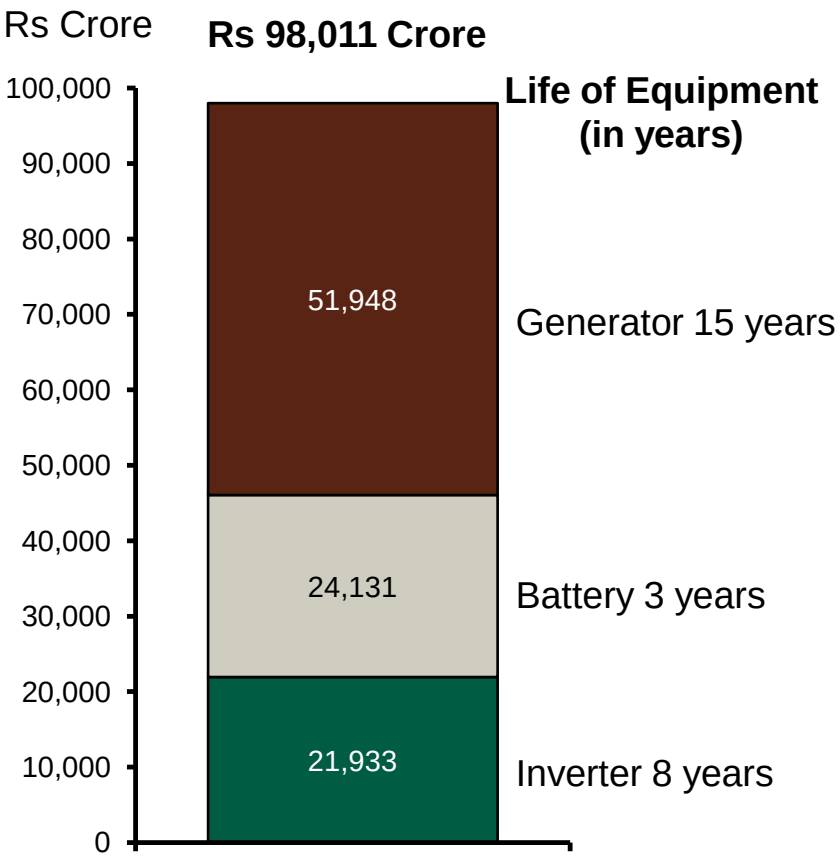


2. Energy Saving potential in Hotels

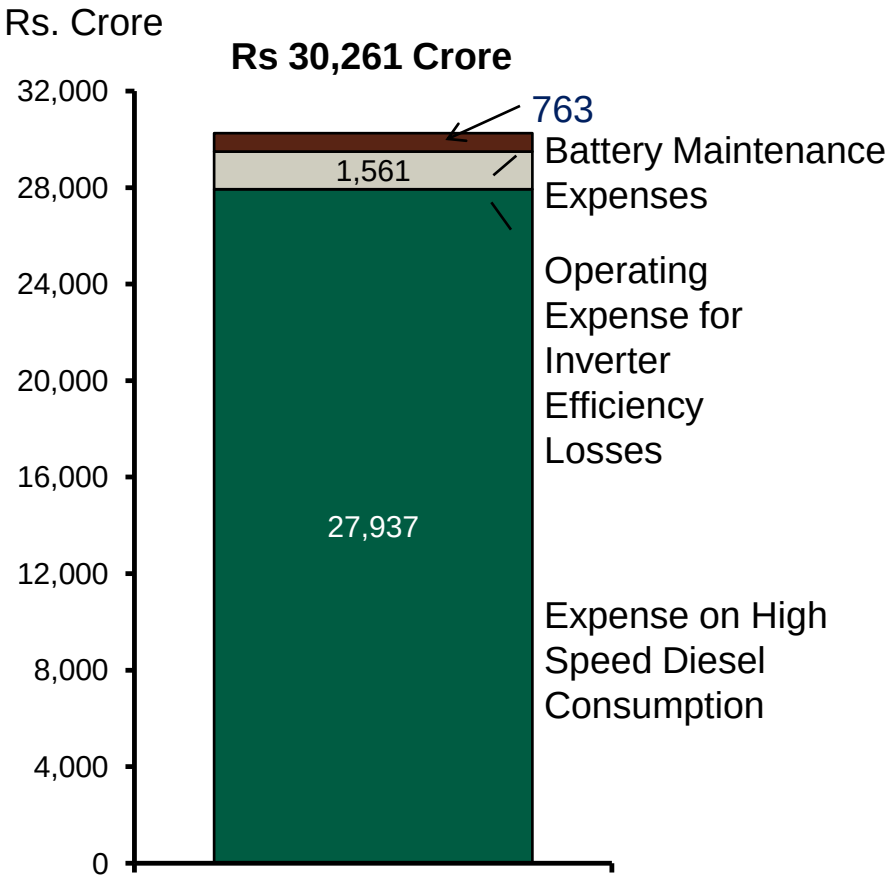


2. Investment in power backup

Investments in Backup Power Equipment

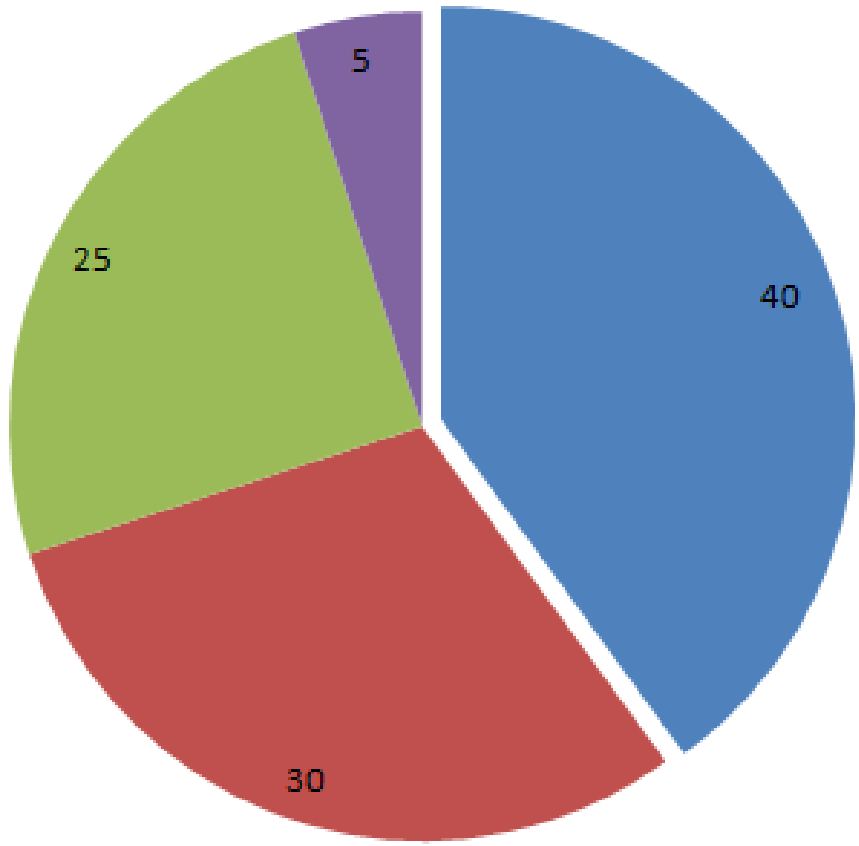


Annual operational expenses for Backup Power Generation



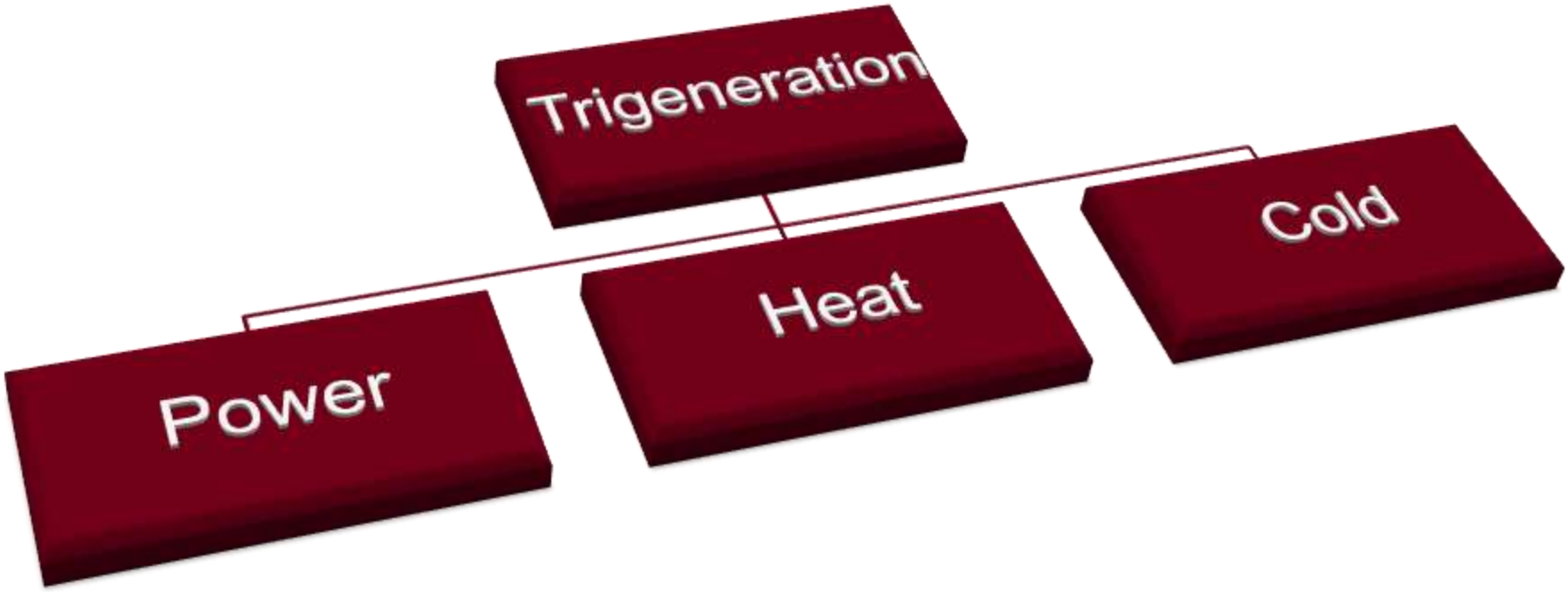
Source: The real cost of power, Wartsila

2. Energy from Diesel Generator (DG set)



Electrical Energy Output
Jacket Water Losses
Exhaust Gas Losses
Radiative Losses

3. What is Trigeneration?

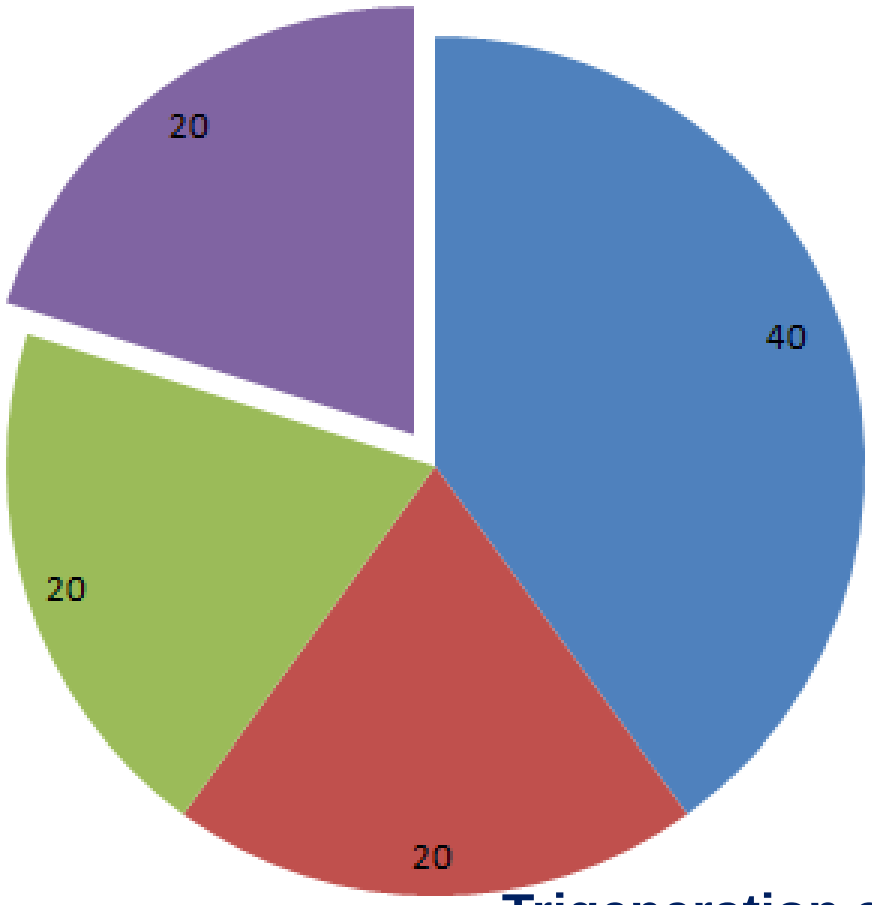


Simultaneous production of Electricity, Heat and Cold

3. Trigeneration Technology - Overview

- Electricity is the main product, heat as by-product is used for air conditioning and heating
- Trigeneration uses primary energy more efficiently i.e. up to 80 % efficiency
- Avoid high energy waste in the form of heat by utilizing waste heat
- Single system to provide electricity, heat & cooling

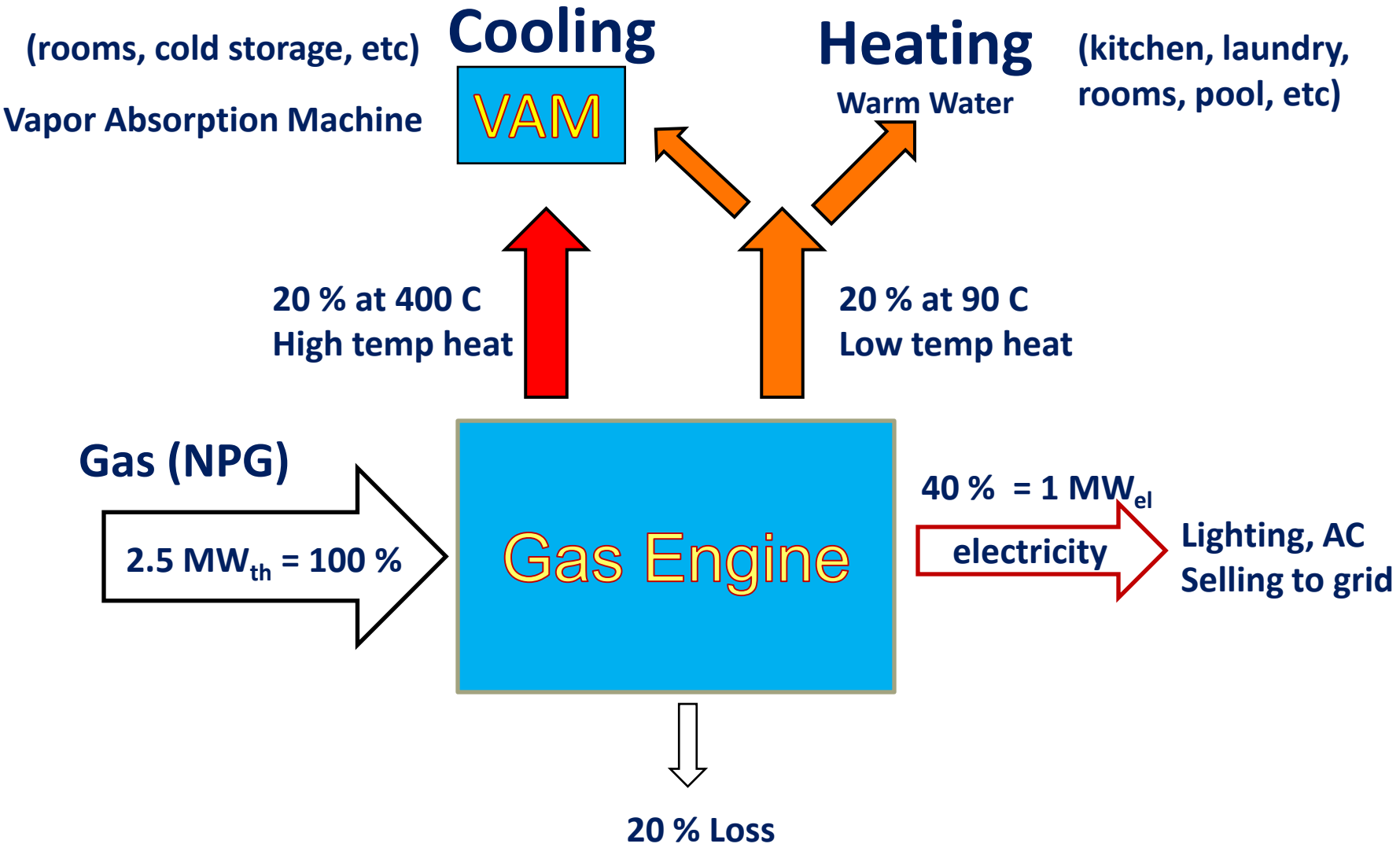
3. Energy generation from Trigeneration ~ 80 %



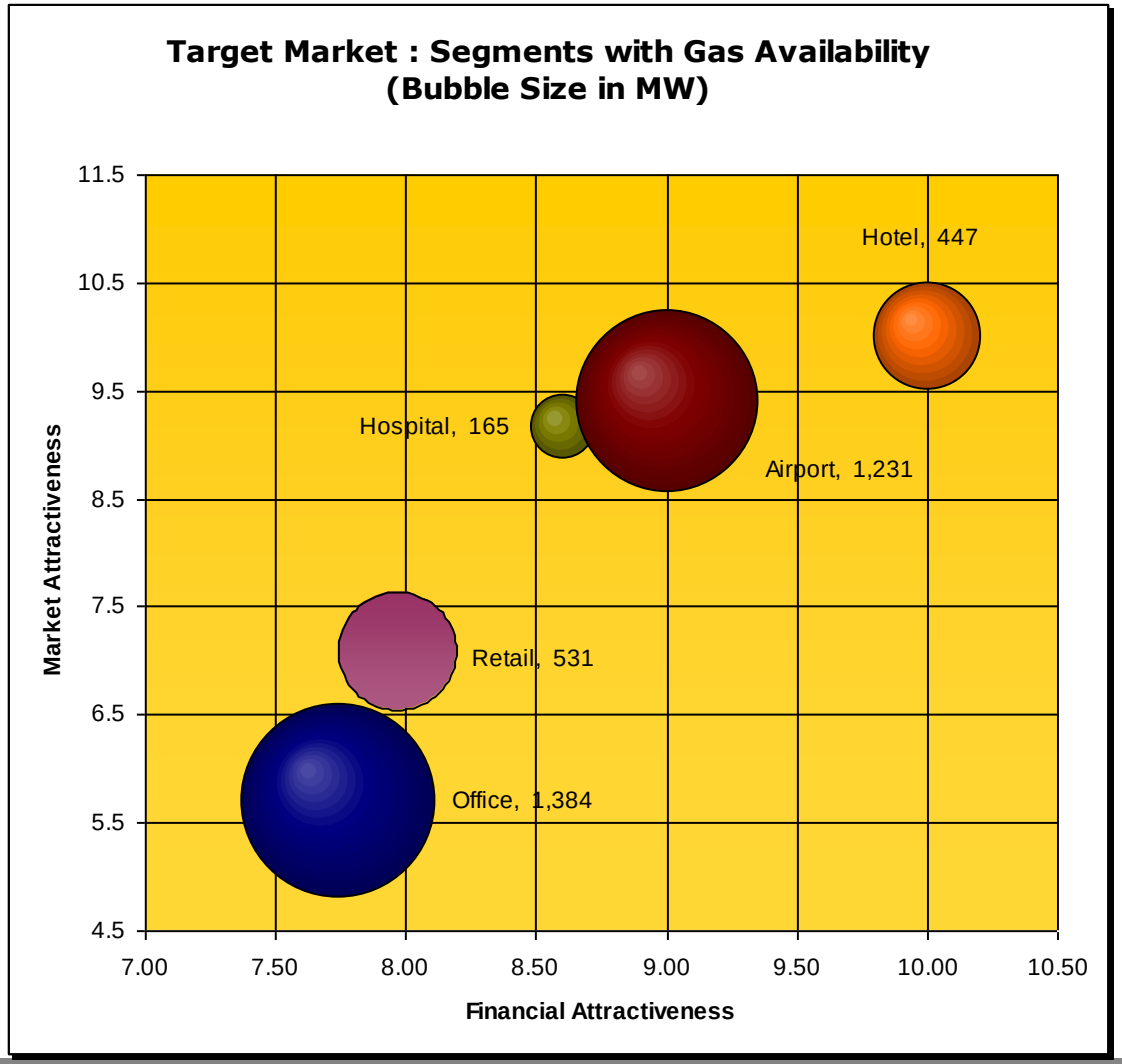
Electrical Energy Output
Jacket Water Recovery
Exhaust Gas Recovery
Losses

Trigeneration efficiency ranges around 80 %
conventional electricity generation operates at 40 %

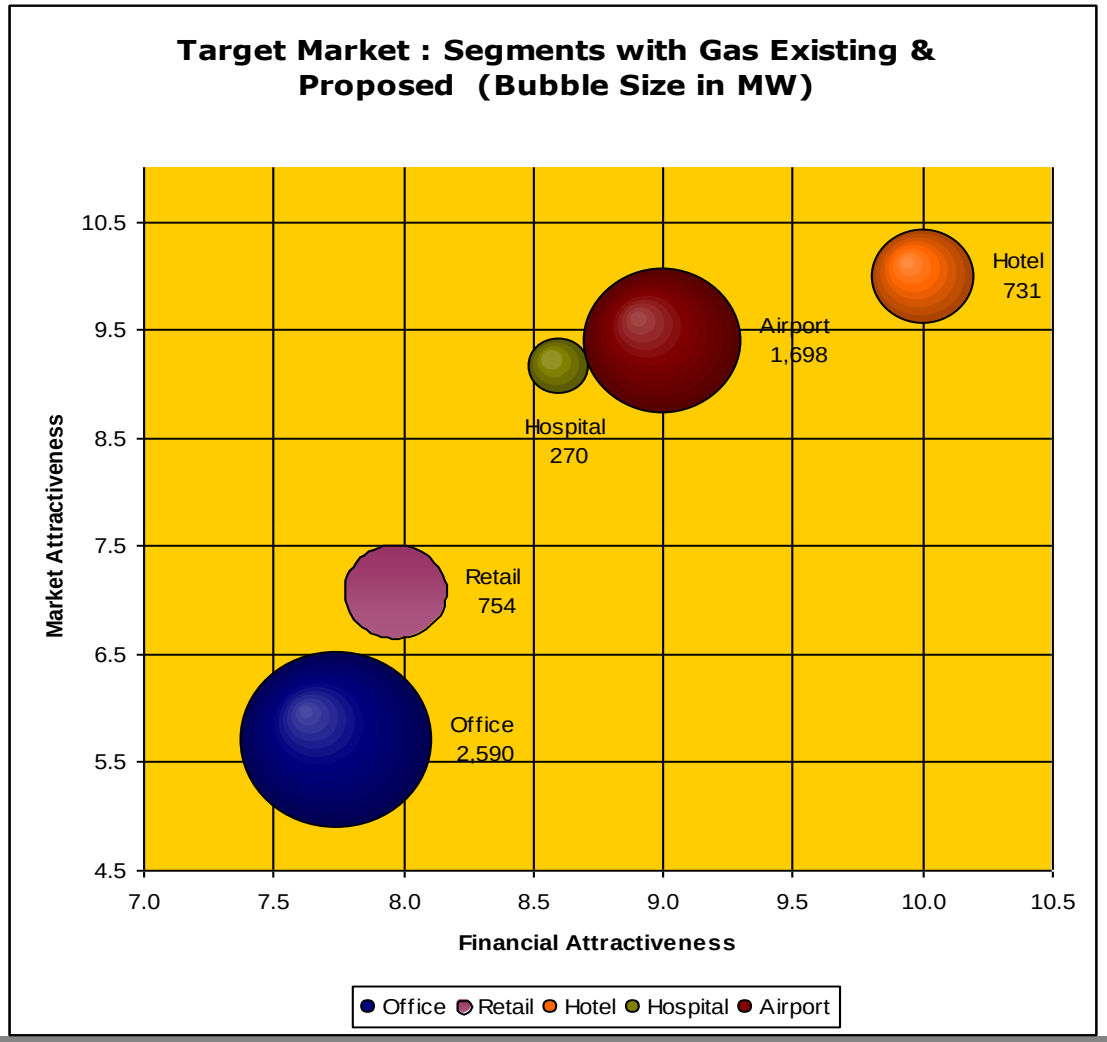
3. Main Components of Trigeneration:



2. Target Market: Segments with Gas Availability (in MW)



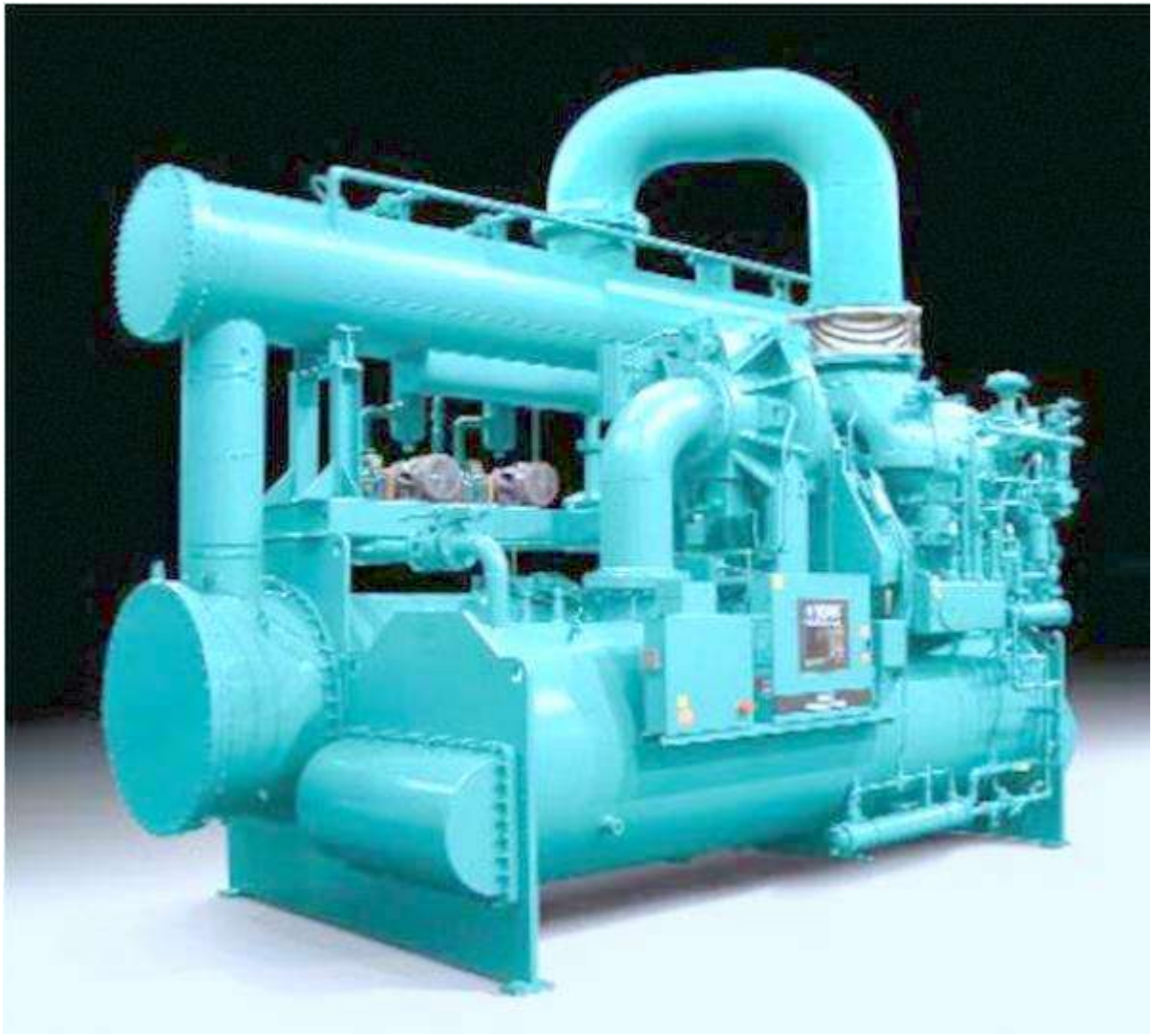
2. Target Market: Segments with Gas Availability and Proposed Gas (in MW)



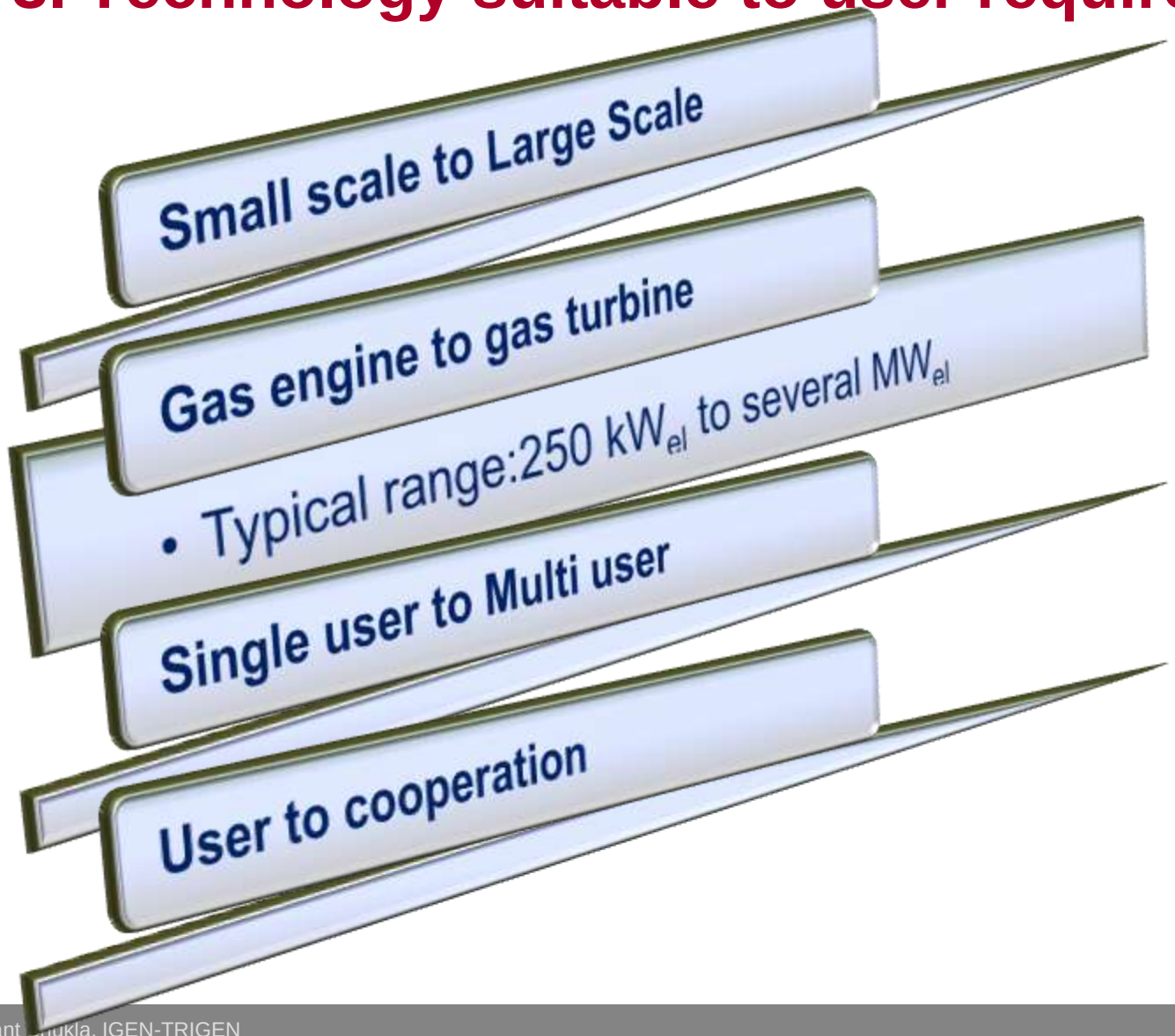
3. Main Components of Trigen – Gas Engine

3. Main Components of Trigen - VAM

3. Main Components of Trigen - Chiller



3. Technology suitable to user requirement



3. Application areas of decentralized power generation

All buildings and industries which use simultaneous electricity, heating and cooling

- Hotels, Hospitals
- Industries
- Data Centers
- Shopping Malls, Residential Societies

4. Technology benefits

Efficiency

- Improve energy efficiency

Fuel

- Reduces fossil fuels

Environment

- CO2 emissions reduced

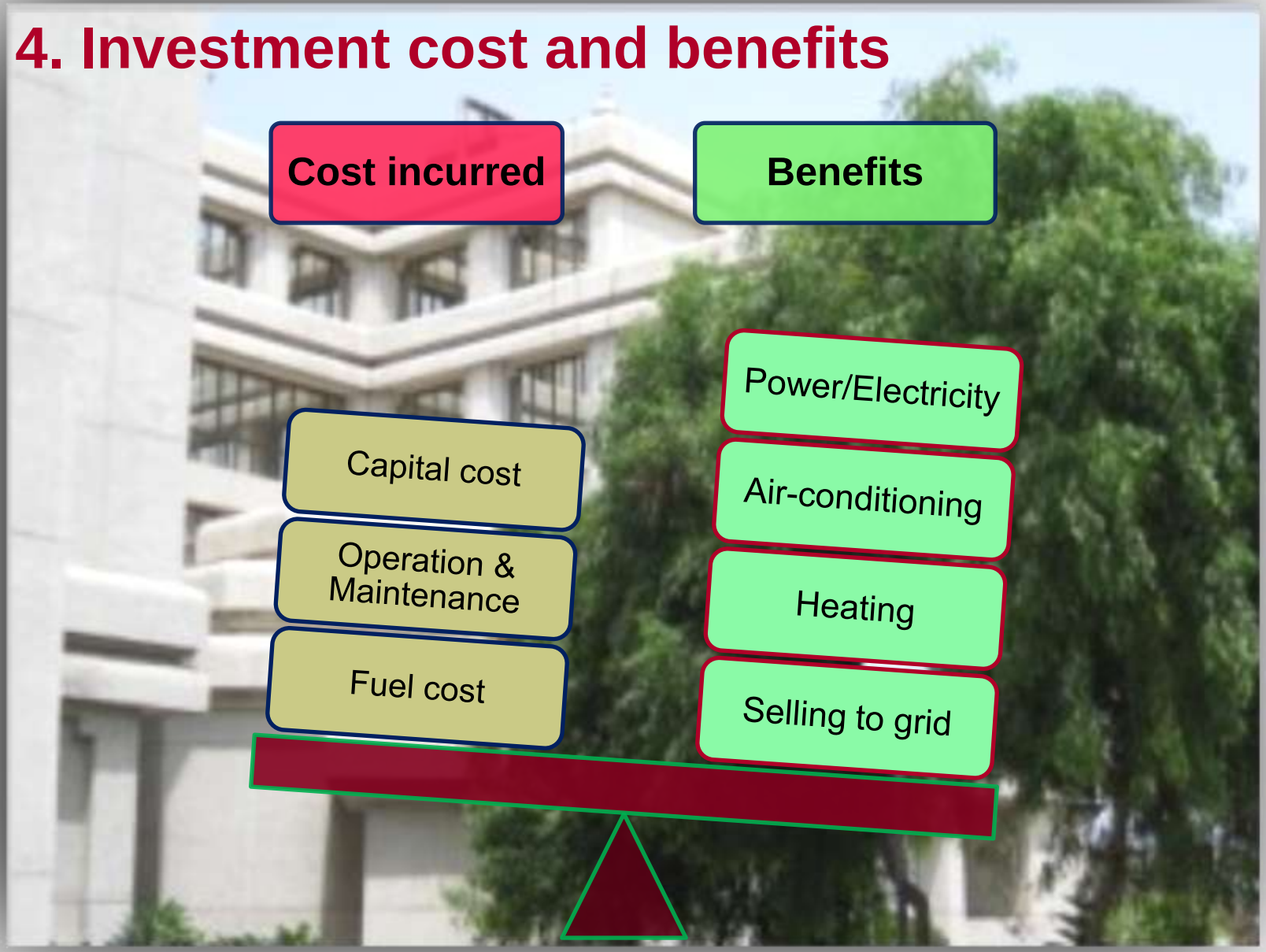
Cost

- Reduced energy cost

Supply

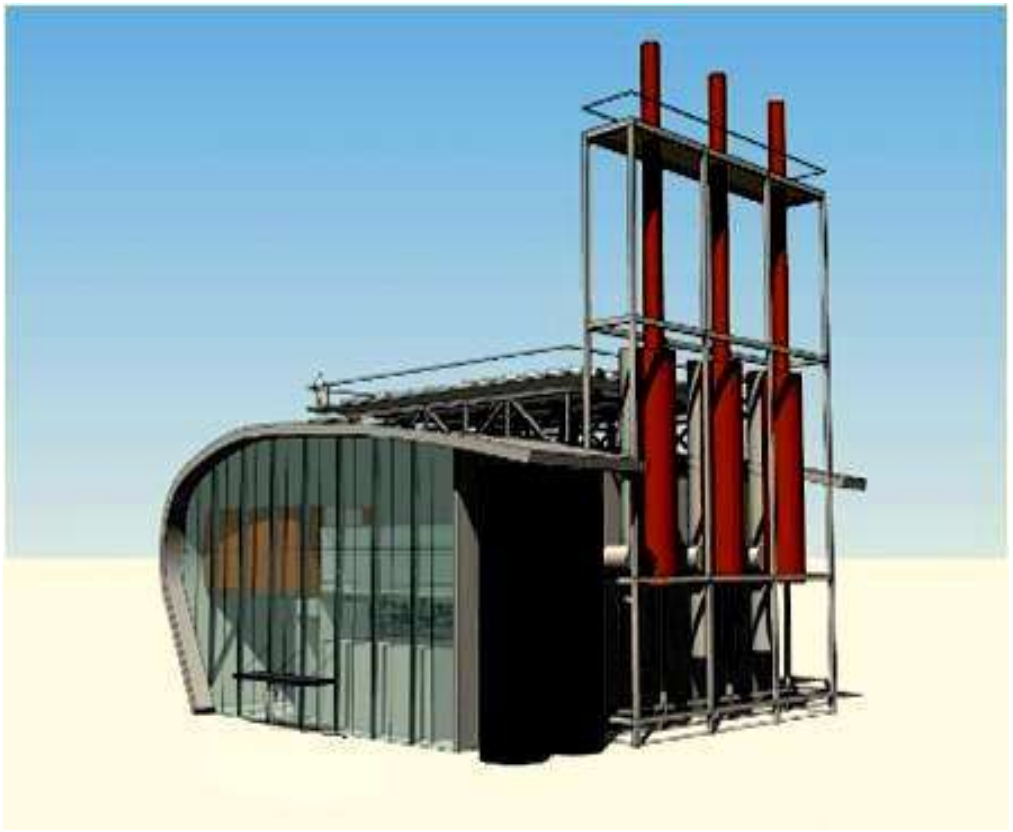
- Energy supply security

4. Investment cost and benefits



4. Addressing the issues:

- Low transmission and distribution losses
- Easy availability of power
- Optimized according to user requirement
- Low investment risk
- High profit, if surplus power fed into the grid
- **Efficient use of primary fuel through Trigeneration**



5. Pilot Project at New Delhi

Supply to the facility:

Electricity: 347 kW_{el}

Cooling: 265 TR (105 TR from waste heat recovery through VAM; balance from Centrifugal Chiller of 250 TR capacity)

Heating: 50 kW (LT heat recovery)

During power failures:

Three DGs of 1000 kW capacity installed

For more information about the project and activities visit

www.trigenindia.com

www.energymanagertraining.com

GTZ provides support in terms of:

- Feasibility study
- Project planning
- Technology cooperation
- Technology transfer
- Capacity building
- Interface between stakeholders
- Performance monitoring
- Dissemination of case study

Thank you

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