Federal Ministry for Economic Affairs and Climate Action

on the basis of a decision by the German Bundestag

INTERNATIONAL CLIMATE INITIATIVE

Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

DISTRICT COOLING

DEMYSTIFYING THE ECONOMICS

As urban areas expand, the demand for cooling is rising rapidly. District Cooling Systems (DCS) provide an efficient, sustainable, and cost-effective alternative. Yet, investors and planners often face uncertainty regarding long-term costs and benefits compared to conventional systems.

The analysis below quantifies the economic, energy, and environmental advantages of DCS, providing evidence-based insights to support informed investment and planning decisions. The findings are based on the following analytical case:

- Mixed-use development with 34 lakh sq.ft. of air-conditioned space and a 9,700 TR cooling load (offices, retail, residential, hotel).
- Lifetime cost model comparing DCS and conventional chilled-water systems over a 30-year horizon, including:
  - Capital, operating, replacement, energy, refrigerant, and water costs
  - **12% discount rate** and **5% annual escalation** for tariffs and Operation & Maintenance (O&M)

KEY FINDINGS AND BENEFITS FROM THE ANALYTICAL CASE MENTIONED ABOVE

Economic and Financial Performance

- **20% lower lifetime cost (NPV)** for DCS, ~INR 150 crore savings over 30 years.
- Annual equivalent[1] savings of nearly INR 10 crore from energy, water, O&M, and monetised space.

Energy and Environmental Impact

- 37% reduction in peak power demand; 19% lower annual electricity use
- 16% water savings via optimised cooling towers
- Reduced refrigerant leakage and maintenance frequency
- 20% reduction in GHG emissions (~4,800 tCO_2e/year; ~1.6 lakh tCO_2e over 30 years)

KEY INPUTS

Capital Expenditure (CAPEX)

- High-side equipment (chillers, cooling towers, pumps) costs more for DCS (INR 61,500/TR vs 50,000/TR) due to network requirements.
- Low-side equipment (AHUs, TFAs, in-building systems) similar across systems (INR 50,000/TR).
- Similar additional power infrastructure. (transformers, capacitor banks, etc.) (INR 12,500/TR) and DG Infrastructure (INR 15,000/TR).
- Replacement CAPEX over 30 years accounted via sinking fund structures (85% of CAPEX).

Operations and Maintenance (O&M)

- High-side Operations lower for DCS (INR 700/TR vs 1,000/TR) due to centralisation and optimisation.
- Low-side Operations OPEX comparable (INR 800/TR).
- Maintenance similar across systems as typically done by OEMs (INR 2100/TR).
- No refrigerant top-up costs for DCS due to better refrigerant management.

Energy and Water

- Electricity: Commercial tariff for DCS (variable charge @ INR 9/kWh, demand charge @ INR 300/kW).
- Water: Combination of Potable and TSE considered for cooling tower; DCS optimises water use.

Other Assumptions

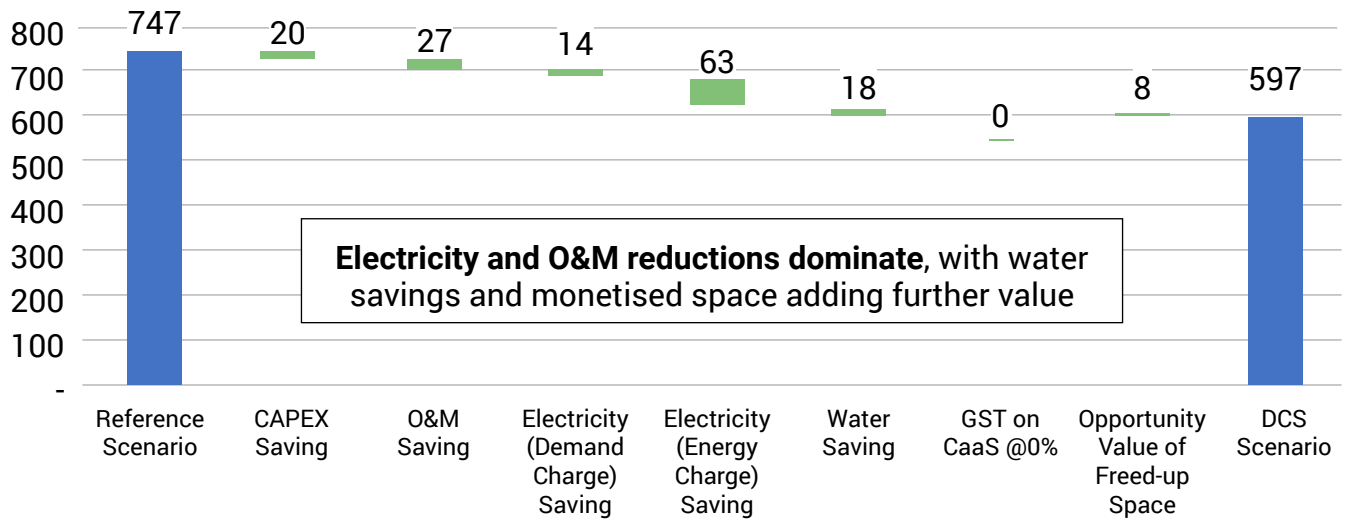
- Distribution network losses for DCS: 0.1 °C/km
- Chilled water plant space: 2 sq.ft./TR; freed-up space monetised at INR 25/sq.ft./month

[1] Refer case study at back

ANNUAL BREAKDOWN OF LIFETIME NPV SAVINGS

Category	Amount (INR crore/year)	Key Drivers
Variable electricity charges	5.55	Higher system efficiency
Fixed demand charges	1.24	Lower connected load
Water costs	1.67	Optimised cooling towers, TSE use
O&M costs	2.45	Professional KPI driven operations and maintenance
Monetisation of freed-up space	0.77	Smaller in-building cooling system footprint

Savings Waterfall (in INR Crore NPV Terms)



Published by

Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

Project

Energy Efficient Cooling

Registered offices

Bonn and Eschborn, Germany

T +49 61 96 79-0
F +49 61 96 79-11 15
E info@giz.de
I www.giz.de/India

Bureau of Energy Efficiency, Ministry of Power

West Block 2,
R.K Puram, Sector 1
New Delhi – 110066, India

On behalf of

Federal Ministry for Economic Affairs and Climate Action (BMWK)

Responsible

Nitin Jain
nitin.jain@giz.de

October 2025