



DISTRICT COOLING IN INDIA

India is the second fastest growing economy in the world. Increasing income levels, urbanization, industrialization and rising temperatures have led to a growth in demand for room air conditioners (RACs). Space cooling is no longer luxury and has rather become a necessity for the occupants in the commercial as well as the residential buildings. Cooling is also linked to human health and productivity. Because of this, it has now become a necessity to gain the maximum efficiencies at the equipment and system levels to minimize the massive impact of energy consumption in buildings.

The national cooling demand for space cooling in new commercial buildings or similar lies in the range of 110 million tons of refrigeration (TR) by year 2037-38. A report on the district cooling potential in India made by Energy Efficiency Services Limited (EESL) estimates that by 2038 approximately 51 million TR of the national space cooling demand could theoretically connect to district cooling systems (DCSs). If this level of demand were served by district cooling, it would reduce the need for up to 22GW of power capacity and reduce 27 million ton of CO₂ emissions annually. However, very strong policies and regulatory mechanisms would be required to trigger such market development and the study projects a more realistic scenario that 13 million TR is established by 2038 albeit still with significant policy support.

In 2019, India is one of the first countries in the world to develop a comprehensive “India Cooling Action Plan” (ICAP) which has a long-term vision to address the cooling requirement across sectors and lists out actions, which can help reduce the cooling demand.

The ICAP provides a 20-year perspective and outlines actions needed to provide access to sustainable cooling. The Plan seeks to

- Reduce cooling demand across sectors by 20% to 25% by 2037-38,
- Reduce refrigerant demand by 25% to 30% by 2037-38,
- Reduce cooling energy requirements by 25% to 40% by 2037-38,
- Recognise “cooling and related areas” as a thrust area of research under National Science and Technology Programme,
- Training and certification of 100,000 servicing sector technicians by 2022-23, synergizing with Skill India Mission.

ALREADY ESTABLISHED DISTRICT COOLING SYSTEMS IN INDIA

Cooling requirement is cross-sectoral and an essential part for economic growth and is required across different sectors of the economy such as residential and commercial buildings, cold-chain, refrigeration, transport and industries.

The currently installed and operational district cooling systems in India broadly consist of two types of systems; *single ownership* type of plants, and *merchant* type of plants.

District cooling is a well-known and energy efficient technology adopted across the world. District cooling makes great commercial and technological sense in large and mix-use developments in India as opposed to individual chiller plants. District cooling systems are 20 to 50% more energy efficient than AC systems, ensure minimal to zero refrigerant leakage, free-up space for better utilization of expensive real estate, and allow for peak shaving through thermal energy storage. Most of the existing district cooling plants and large central air conditioning plants are single ownership type. However, the merchant district cooling plants also hold significant potential from a technological standpoint. This is due to load diversity, flexibility in capital design, and installation. End users and developers mostly choose the single ownership type of plants in business as usual scenarios, since those systems seemingly are less complicated and more familiar.

On the other hand, potential barriers foreseen for adoption and implementation of the DCS technology must be taken into account. Although some political incentives are available, one cannot underestimate how significant policy and institutional barriers are in this context. Since the technology is fairly new and many people are unaware of its benefits, awareness about and promotion of DCS is very important. Maximizing efficiency is absolutely critical as well, from a financial standpoint. There is a risk related to inaccurate metering which includes low revenues leading to diminished profits or overbilling leading to spoiling customer relationship. For this reason, meters have to be of high quality with a regular calibration programme and cross-checks. Another risk in this regard occurs in the case of lesser than projected billing, however this depends on the rate structure.

There are several examples of district cooling systems in India. One of them being GIFT City in Ahmedabad, Gujarat, which is a merchant DCS. GIFT city is India's first globally benchmarked International finance service centre developed by the Government of Gujarat and includes commercial buildings, residential buildings, social buildings such as hotels, clubs and malls, and a hospital. The total requirement of 270,000 TR of air conditioning shall be met with just 180,000 TR of chillers. With the use of chilled water based thermal energy storage tanks, that can be charged during off-peak periods and discharged during peak periods, electric demand has been reduced from 240 MW to 135 MW. Despite being an overall success, GIFT City has met some challenges in terms of demand assessment. This means that only one plant of 10,000 TR is operational and feeds eight buildings.



Figure 1: GIFT City, Ahmedabad

Another example is the DLF Cyber City in Gurgaon, which is India's largest integrated business district. Consisting of 10 buildings with conditioned area of more than 1.7 million sq. m., the project has a cooling demand of 78,000 TR and power demand of 140 MW served by trigeneration. The DCS technology has helped DLF reduce power demand for 100 MW and save around 36,000 tonne CO₂ per year. One of the major downsides to this project is the placement of the cogeneration plant. It is located in the basement, which has caused some concerns regarding fire safety. On top of this, increase of gas prices over time may affect the viability of self-generation of power.



Figure 2: DLF Cyber City, Gurgaon

Other examples of DCSs in India are:

- Delhi Airport – Approx. 20,000 TR capacity
- Mumbai Airport – Approx. 20,000 TR capacity
- Chennai Airport – Approx. 12,000 TR capacity
- Infosys (various campuses) – Approx. 50,000 TR (approx.)
- Pragati Maidan, Delhi - Approx. 12,000 TR capacity (In Construction)
- India International Convention Centre, Delhi – Approx. 10,000 TR capacity (In Construction)

The latest to join the DCS list is the proposed Hyderabad Pharma City (HPC). Telangana State Industrial Infrastructure Corporation Ltd (TSIIC) in Feb 2022 released a RFP for “Designing, Financing, Implementation, Commissioning and Operation and Maintenance of District Cooling System(s) and other associated components designed in a phase wise manner starting with the Module I for an installed capacity of 2,500 TR and accommodate maximum capacity of 1,25,000 TR”.



Figure 3: Hyderabad Pharma City, Telangana

MARKET TRENDS AND PROOF OF POTENTIAL

Even though the DCS market in India is relatively premature and many things are still in the early stages, major investments have already been made in the sector. The strong policy push and scientific support means that private actors have started to look at DCS as an innovative model to address the deteriorating climate situation that is on everyone's top of mind.



Strong organizations such as the World Bank have published reports and done research within the area of district cooling in India, and have even recommend private investments in district cooling technologies. Key arguments being that DCSs bring down the cost for providing cooling to individual buildings and can reduce energy bills by 20-30 percent compared to the most efficient conventional cooling solution. World Bank also mention that keeping spaces cool using alternative and innovative energy efficient technologies such as DCS, can open an investment opportunity of USD 1.6 trillion by 2040. All while reducing greenhouse gas emissions and creating upwards to 3.7 million jobs.

The topic of district energy also made its way to the COP27 panel debate in Sharm el-Sheikh. It is a given that people need cooling as temperatures rise, but how they get it without increasing emissions is the important question. One of the attendees at the panel debate, Danfoss (represented by Rasmus Abildgaard Kristensen), offered an answer. Take district energy and add renewable energy sources. Then you have the key ingredients, which cities can use to provide cooling for citizens in a carbon neutral way, and especially in India and the rest of the Global South. Danfoss further urged the world leaders to act on this knowledge.

This market is full of opportunities and The Danish Embassy in India is ready to assist you along the way.



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