EE Cool Project - Developing sustainable and efficient cooling solutions for cities in India

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giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

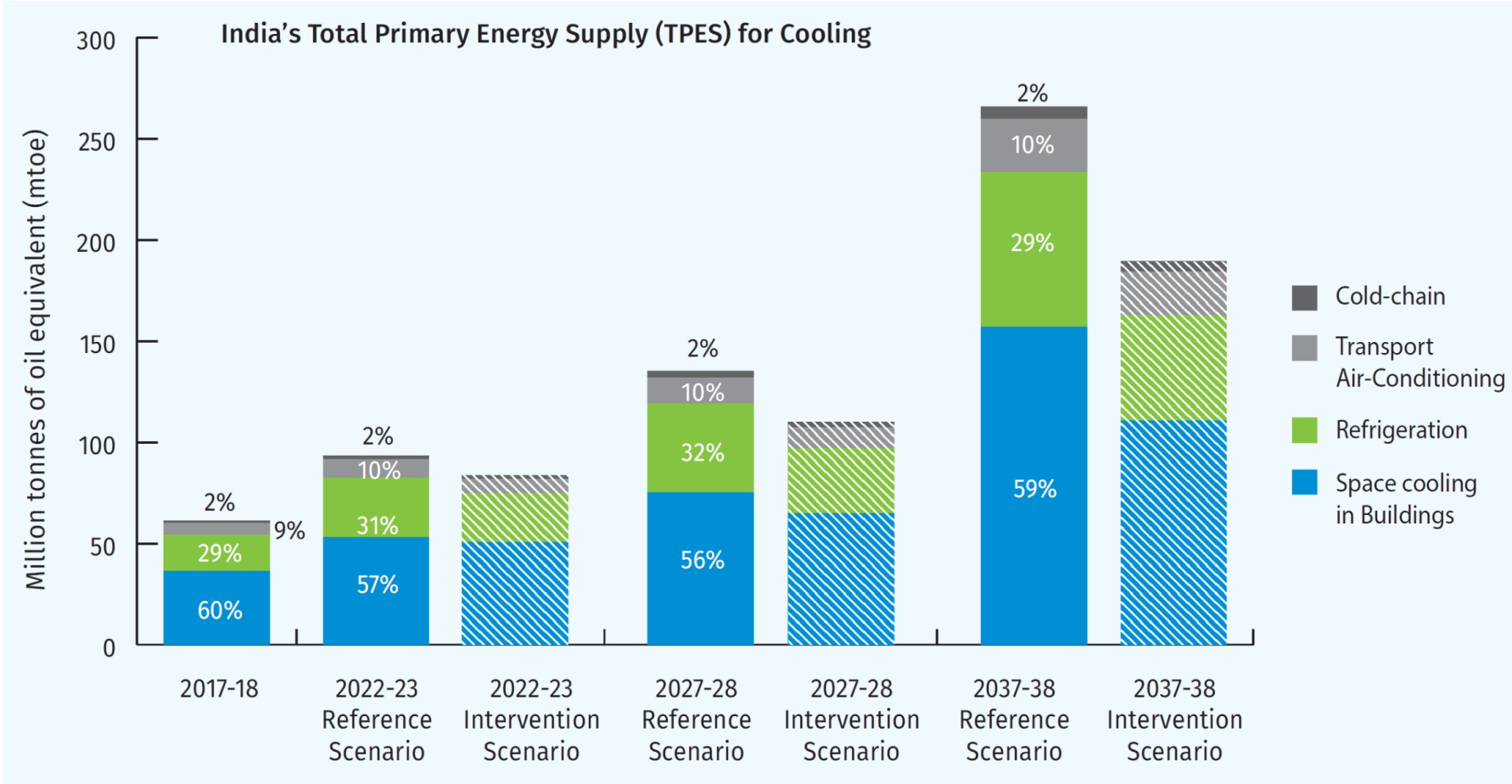
On behalf of:

Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

of the Federal Republic of Germany

BUREAU OF ENERGY EFFICIENCY

Government of India, Ministry of Power



Source: India Cooling Action Plan

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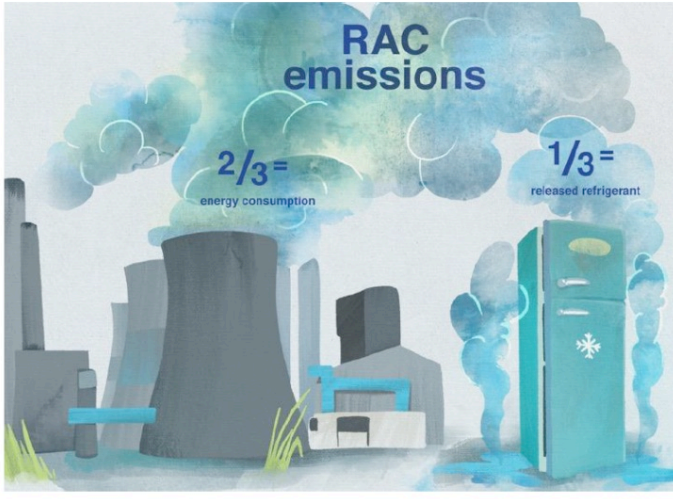
Climate impact of refrigerants not to be underestimated!



GWP	Examples			
Ultra-high >10,000	HFC-23			
Very high 3,000 -10,000	R-404A			
High 1,000 – 3,000	R-410A	HFC-407C	HFC-134a	
Medium 300 – 1,000	HFC-32	R-447A	R-454B	
Low 100 - 300	R-454A	R-455A		
Very low 30 - 100	R-430A			
Ultra-low <30	R-717	R-744	R-290	HFO-1234yf

Natural refrigerants with ultra-low GWP are available for most applications …

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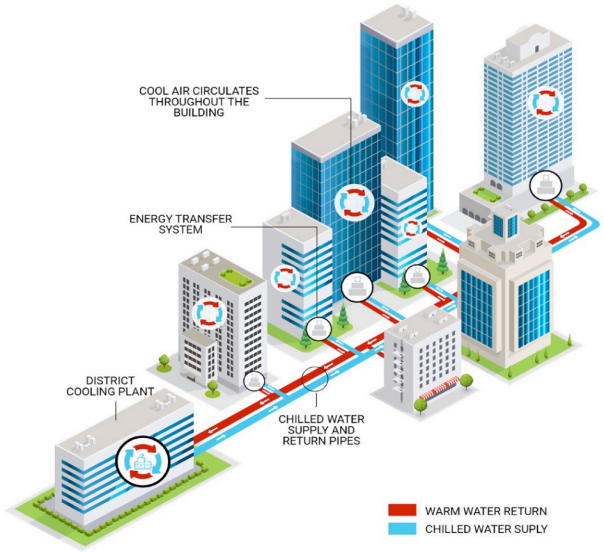
Overview District Cooling System (DCS)

District Cooling (DC): Efficient way to air-condition clusters of buildings - chilled water supplied to multiple buildings through an insulated underground piping network



- ICAP also recommends promoting not-in-kind technologies such as **district cooling** for the building sector
- DCS also has a potential for the application of natural **refrigerants with low or zero GWP**
- **Potential users** include commercial, residential, and industrial buildings or even the entire city.
- **Risk and Challenges for technology implementation:** Design and technical risk, lack of skilled resources, limited knowledge on M&V, scalable business models, regulatory risks such as interest rates, tariffs and taxes

> **District Cooling is already happening in India**

Key Benefits of DC technology

- It avoids the capital costs of installing chillers and cooling towers at the building level and frees up valuable rooftop and building space.
- By aggregating the cooling needs of multiple buildings, district cooling creates economies of scale.
- Traditional air conditioning systems create more than 50% of the peak electricity demand in a building, usually at peak cost.
- With district cooling, peak demands on the grid are avoided, and operating energy consumption also gets reduced by upto 40%.
- More professional and systematic approach compared to conventional system; improved energy efficiency
- Effective refrigerant management and operation

District Cooling Supports Climate Change Mitigation

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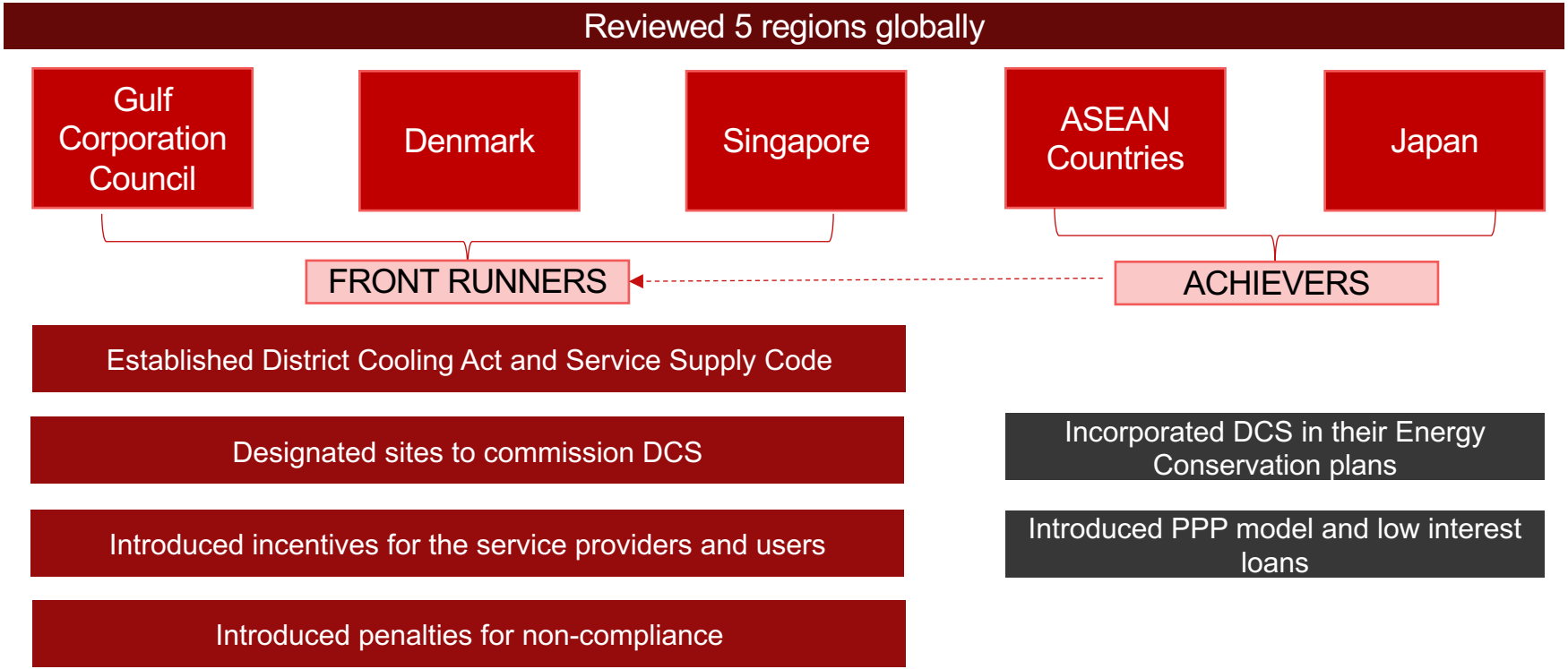
International District Cooling Initiatives



National District Cooling Initiatives

Name of Initiative	Key Highlight	Key Learnings
Gujrat International Finance Tech City (GIFT City)	• **Coordination between different institutions** at the state and local levels played a pivotal role. • **Digging-free policy and planned underground utility corridor** provides with easy access and low maintenance and operations issues • **Standard operational policies and procedures** were setup in advance	• There should be an **integrated approach while planning a city** with relevant stakeholders including state level actors. • **Standard operating policies shall be made and consensually agreed** by different actors working in close vicinity of the projects.
DLF Cyber City	• **Fluctuation in gas prices reduced the viability** of trigeneration plant and thus district cooling. • The **equipment location** raised concerns regarding **electrical and fire hazard**.	• **Renewable energy integration** shall be planned initially to offset fossil fuel fluctuations. • Emergency services shall be planned in the nearby vicinity of DCS to mitigate any vulnerable situation that may arise.
Amravati	• **Change in political leadership and agenda** led to modifications in approved projects and masterplans and the overall development was put on hold leading to low confidence and withdrawal of funds.	• **Public awareness, acceptance, and consensus** can play a key role in India. • **Robust policy and implementation that does not allow deviation from** with change in political leadership.
UNEP District Energy in Cities Initiatives (*Rapid assessment of five Indian cities*)	• **National Project Steering Committee** comprising of Governmental, CSOs, think tanks was formed. • **Payback period** was found to be around **10 – 15 years**. • **Cooling has not been incorporated in local energy strategies, targets, or policies.**	• **Municipalities can create priority zones** depending on district cooling viability. • **Incorporating district cooling in the smart city masterplan and proposals**. • Development of new & innovative business models.

About the Project

The project supports the BEE in the implementation of the India Cooling Action Plan (ICAP) with regard to energy-efficient District Cooling Systems (DCS).

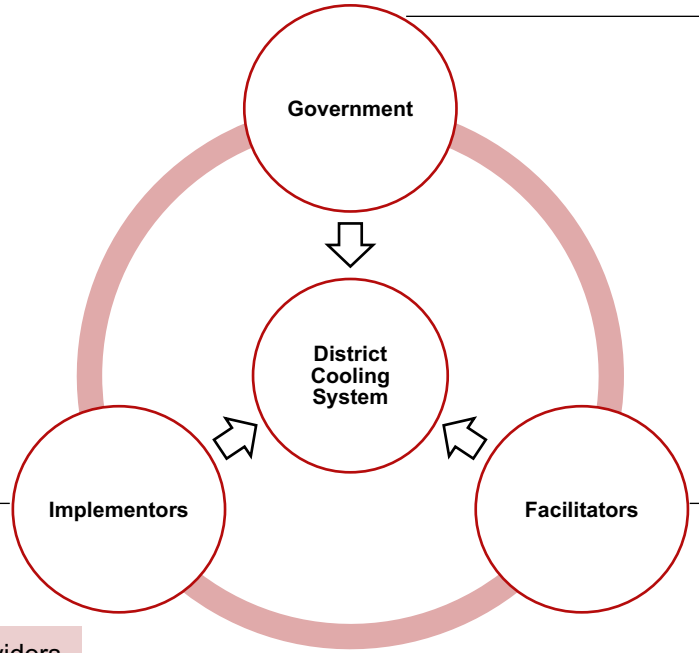
IMPACT	OUTCOME
Reduction of cooling related greenhouse gas emissions in the Indian building sector (compared to the business as usual (BAU) scenario).	In the implementation of the ICAP the conditions for the application of energy-efficient DCS have improved and the use of natural refrigerants with low or zero global warming potential (GWP) is encouraged in these systems wherever possible.

OUTPUT 1	**Technical and economic solutions** to reduce GHG emissions in the cooling of large buildings with DCS are known to **the partners and included into the regulatory processes and policies by them,** the use of natural refrigerants with low or zero GWP will be encouraged wherever possible**.**
OUTPUT 2	**Viable business models** for the application of energy-efficient DCS in buildings are described, thereby encouraging the use of natural refrigerants with low or zero GWP (**including the regulatory and economic frameworks required for their viability).**
OUTPUT 3	**An open application to fund** incentives for energy-efficient DCS in buildings has been developed by BEE with the support of the project (only if Output 1+2 have been successfully completed, the use of natural refrigerants with low or zero GWP shall be encouraged wherever possible).

Institutional Structure for DC Implementation

Governmental institutions – *provides national context and prioritizes actions in accordance with national policies*

Ministry of Power, MoEF&CC, MoHUA, CPWD, NBCC



Implementing institutions – *brings project to a reality*

Design consultants

Technology providers

Developers

System integrators

Facilitator institutions – *facilitate a project and provide means for the development of a project.*

Financial Institutions

Knowledge Partners and Associations

“Collaborative approach necessary for successful implementation”

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Potential District Cooling Contracting models

Contracting Models: (Based on review of International Best Practices)

A single-offtaker concession model:

- A ***single off-taker enters into a cooling services agreement with a district cooling provider and purchases the district cooling plant's entire capacity*** on an availability model basis. e.g. service provider

A typical concession arrangement:

- The ***builder/developer engages a district cooling provider***
- Builder ***finances the construction*** of the plant ***and permits the provider to offer district cooling services to end-users*** at the development site. e.g. Developers and Service providers
- In this arrangement,
  - **Builder ensures**: End-users purchase district cooling from the appointed provider.
  - **Service providers ensures:** Take full responsibility to meet the required demand, monitor and collection of bills

Cooling as a Service (CaaS) e.g. End users or customers

- It is a ***pay-per-service model*** for clean cooling systems.
- It ***eliminates the component of the upfront investment cost in clean cooling technology for customers***.
- The ***technology provider is incentivized to install and maintain the most efficient equipment possible.***
- This cooling business model is cheaper for customers and more profitable for technology providers

Supply Side – Generator, Distributor (sell), Billing and Collection companies.
Demand Side – End consumers, Customers, Building owners

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Thank you for your kind attention.

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