Cooling As A Service Through District Cooling Systems

HISTORY OF DISTRICT HEATING/ COOLING

The oldest district heating system was created in the early 14th century in Chaudes-Aigues Cantal - a village in France

The first commercial district heating system was created by Birdsill Holly in Lockport, New York

In the 1930's, large district cooling systems were created for Rockefeller Centre in New York City and for the U.S

HOW DISTRICT COOLING WORKS?

Chilled water is produced in a central plant and distributed via a system of pipes that can run underground on the surface or over rooftops

Inside the buildings, these transmission pipes are normally connected to a conventional air handling unit or fan coil that allows the chilled water to cool the air

This cooling system is more flexible and operates with higher efficiency under all load conditions compared to traditional chillers

ADVANTAGES OF DISTRICT COOLING SYSTEM

- Improve efficiency of energy
- Protect environment
- Save space
- Improve urban view
- Re-use the heat from exhaust system
- Prevent disaster
- Reduce manpower for operation and maintenance

Components

- **District Cooling Plant**: to generate, and many times store as well, chilled water and reject heat into the surroundings
- **Distribution Network**: to distribute chilled water to buildings through insulated chilled water piping
- **Energy Transfer Station**: interface with buildings AC circuits which depending upon the scale of the project, may include heat exchangers and tertiary chilled water pumping network on the customer side
- **Instrumentation**: Monitoring, and Control System to monitor and control the entire DC system
- **Measurement and Billing System**: to measure the cooling energy generation and associated energy expenditure at the DCP, and cooling energy consumption at the customer's end to generate cooling bills

Success Stories – District Cooling System

District Cooling in “La Alpujarra”, Colombia

Location: Administrative Complex of “La Alpujarra”

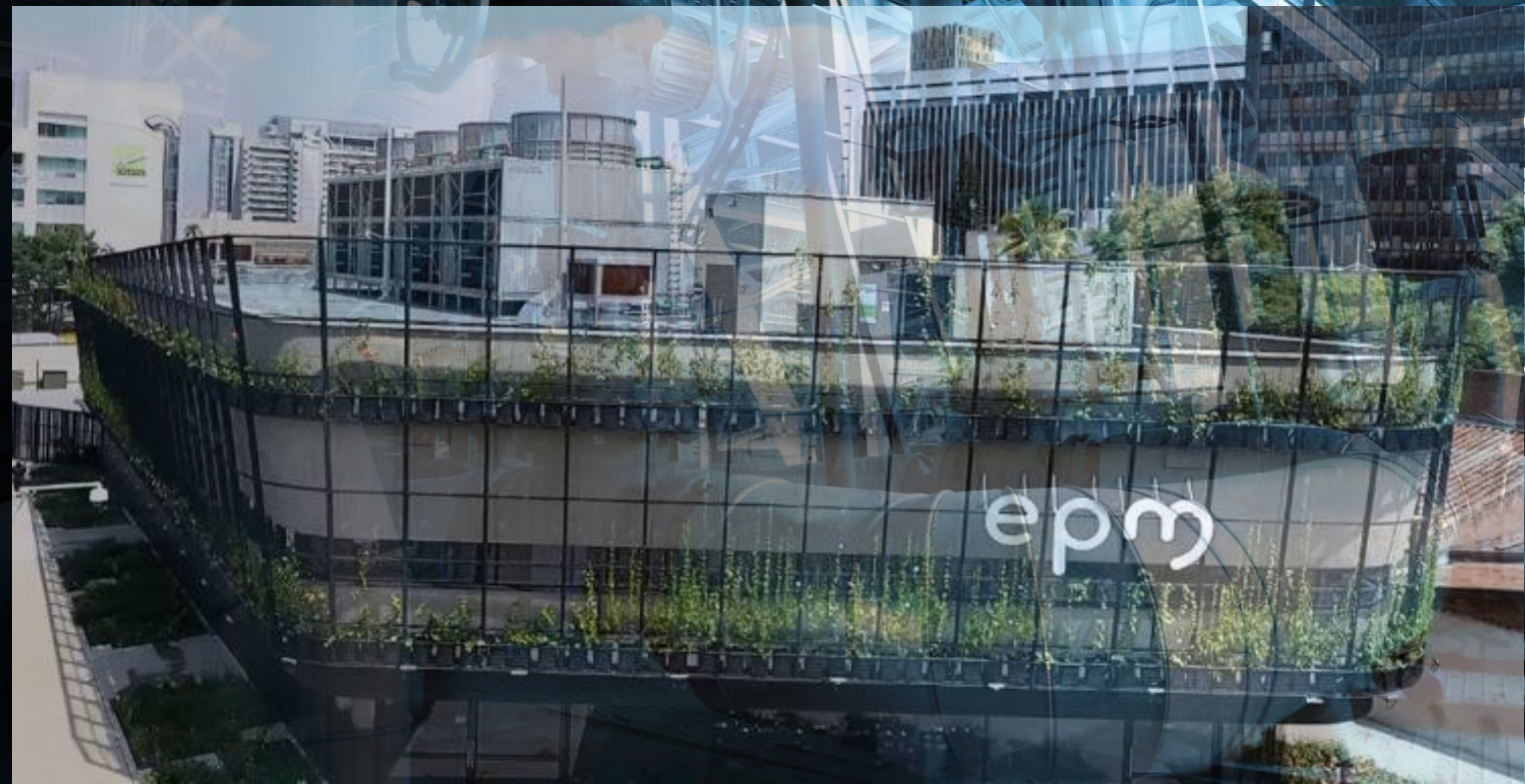
Consist of many buildings (such as the Antioquia Province City Hall, The City Council, The Province Assembly, the Tax Revenue Authority, the Customs Authority, and the Tigo-UNE Telecommunications Utility, among others)

Project Status: Implemented District Colling System in 2016

Capacity: 3,600 tons of refrigeration (TRs) including thermal storage system

This project helped to reduce about 30% if its CO_2-equivalent emissions

Project involves co-generation of electricity plus an ice bank to storage cold connected buildings in the district making the system very efficient.



India’s First District Cooling System at GIFT City

Global Adoption of District Cooling System

DCS is a widely recognized and energy-efficient technology implemented globally

Introduction of DCS in India

GIFT City in Gujarat introduced the District Cooling System, marking the first implementation of its kind in India

Operational Status

The first phase of the DCS at GIFT City, with a capacity of 10,000 TR, has been in operation since April

Energy Efficiency Milestone

The DCS at GIFT City serves as a milestone in energy efficiency and sustainable cooling solutions for India

GIFT City's Adoption of DCS

- Developed on 886 acres with 62 million sq
- Estimated air conditioning load requirement is 270,000 TR, with an electrical power demand of 240 MW
- Feasibility study favored DCS due to high efficiency, better reliability, lower space requirement, reduced noise, and lower operating costs

Plant Capacity and Optimization

- GIFT City planned with three DCS plants of 60,000 TR each, strategically located for optimized distribution
- Chilled water-based thermal energy storage tanks redu chiller capacity to 150,000 TR, lowering electrical demand to 135 MW
- Achieved a significant reduction from the initial 240 MW electrical demand

Cooling as a Service

- Cooling as a Service (CaaS) is an innovative financial instrument to overcome key market barriers to clean and efficient cooling, without upfront investment.
- CaaS involves building and business owners paying for the cooling service instead of purchasing the equipment and infrastructure that delivers the cooling.
- A third party (ESCO, technology provider, integrator, SPV) owns the cooling system, maintains it, and covers all operational costs including electricity.

Cooling accounts for 10% of global electricity consumption and demand is expected to triple by 2050:

International Energy Agency

Why CaaS ??

- **Energy Efficiency and Sustainability:** Promotes energy-efficient cooling solutions, reducing the environmental impact and supporting sustainability goals.
- **Financial Flexibility:** Eliminates the need for large upfront investments , thus end user can allocate capital to other critical business areas instead of cooling infrastructure.
- **Risk Mitigation:** Service providers are responsible for system performance, maintenance, and upgrades which avoids end user risks associated with equipment ownership, breakdowns, and obsolescence.
- **Scalability and Adaptability:** Services & Cooling System can be scaled up or down based on changing needs with flexibility to access to advanced technologies

Success Stories – Cooling As A Service (CaaS)

Cooling as a Service: HVAC Solution for Colombian Commercial Building

Need of Services

Q Group in Medellín, Colombia was constructing a new building of 100 offices with an aim to deliver a high-quality building (LEED certified) for its occupants

Best Options

MGM Innova Group invested on a high efficiency HVAC solution and provided Cooling As a Service with monthly payment on Cooling Utilised Model.

Operational Status

Year Of Implementation: 2017

Installed Capacity: 2,040kW (580TR)

Technology: Magnetic Bearing Centrifugal Chiller

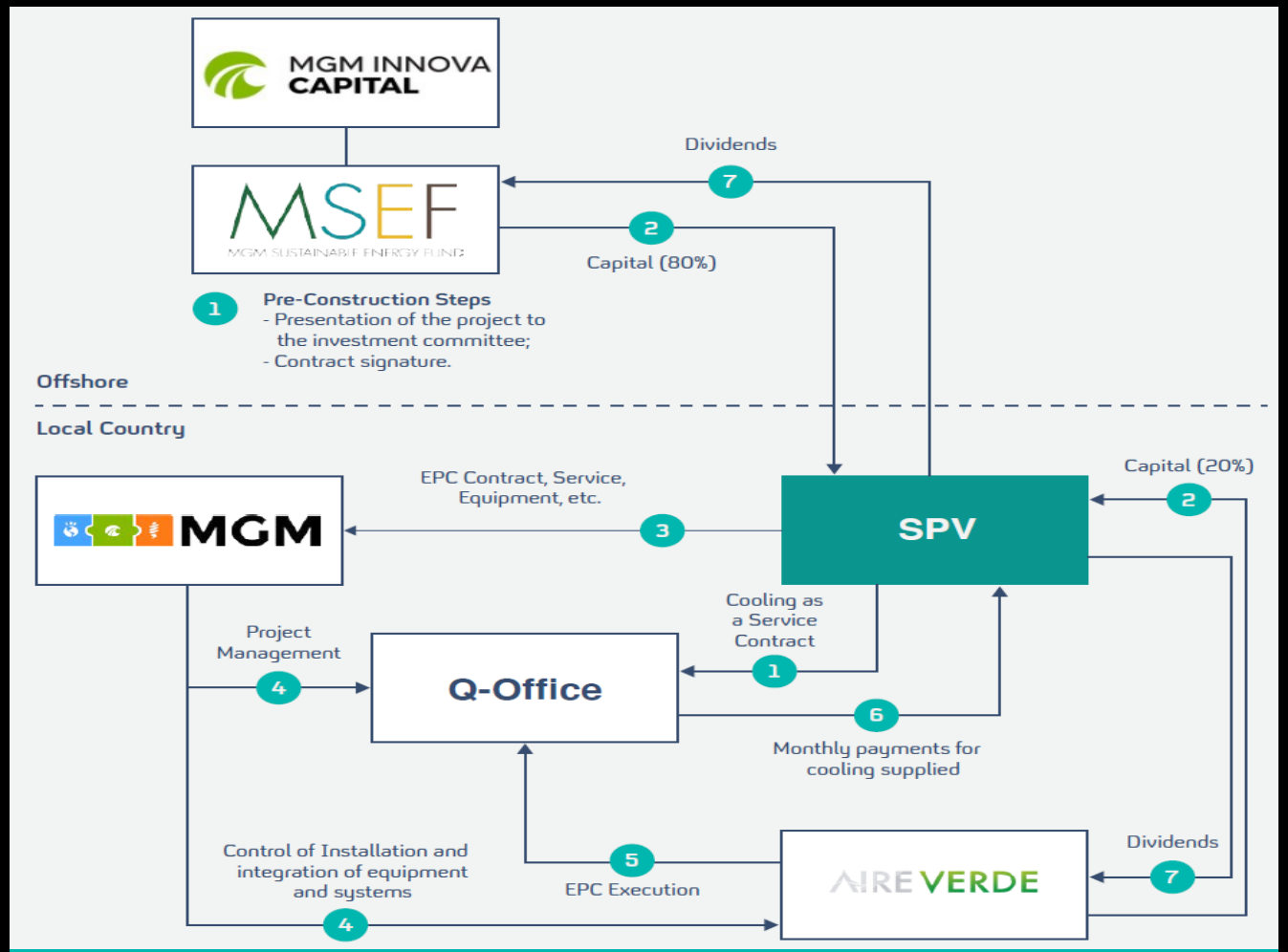
Benefits

End-users demands for high-quality air-conditioning system fulfilled while focusing on their core-business and avoiding capital expenditures

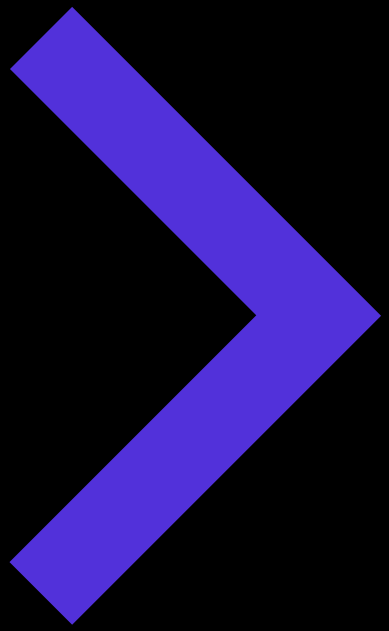
Energy Efficiency Milestone

The system amounts to an annual energy saving of about 1,2GWh while GHG emissions are reduced by an estimated 440- ton CO2e/year.

Investment Structure – Cooling as a Service Contract



1. Contract signature between the SPV and the client
2. Capitalisation of the SPV by MSEF & Aire Verde
3. The SPV buys the equipment, contracts service providers and manages the project implementation through a service contract with MGM Innova (MGM) & Aire Verde
4. MGM Innova manages the project and controls the integration
5. Aire Verde executes EPC activities
6. Investment repaid through the sale of CaaS services and backed by the savings generated by the project
7. SPV reimburses MSEF and Aire Verde (dividends)



Challenges & Opportunities

Bottlenecks/ Challenges

Infrastructure

Establishing central plants, distribution networks, and building connections is complex and costly

Regulatory Hurdles

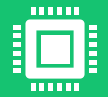
Navigating local regulations on energy distribution, environmental standards, and land use can be challenging

Initial Costs

High upfront investment may deter stakeholders, emphasizing the need for clear communication about long-term savings

Consumer Acceptance

Educating building owners and residents about district cooling benefits and overcoming resistance to change is an ongoing challenge



Technical Expertise

Specialized technical skills for designing, operating, and maintaining district cooling systems may be scarce in some regions

Mitigating Challenges

Infrastructure	Optimize infrastructure with expert collaboration, thorough studies, and phased construction for efficiency and cost management.
Regulatory Hurdles	Engage early with local authorities, collaborate with policymakers to align goals with environmental standards, and participate in public consultations for support.
Initial Costs	Develop financial models, seek government incentives, and communicate economic benefits for stakeholder engagement.
Consumer Acceptance	Launch educational campaigns, organize events, and provide incentives to boost district cooling adoption.
Technical Expertise	Collaborate with global experts, invest in local training, and create industry knowledge-sharing platforms.

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