District cooling for higher energy efficiency in regional level

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2022.11.14 Clean Heat & Cool Forum

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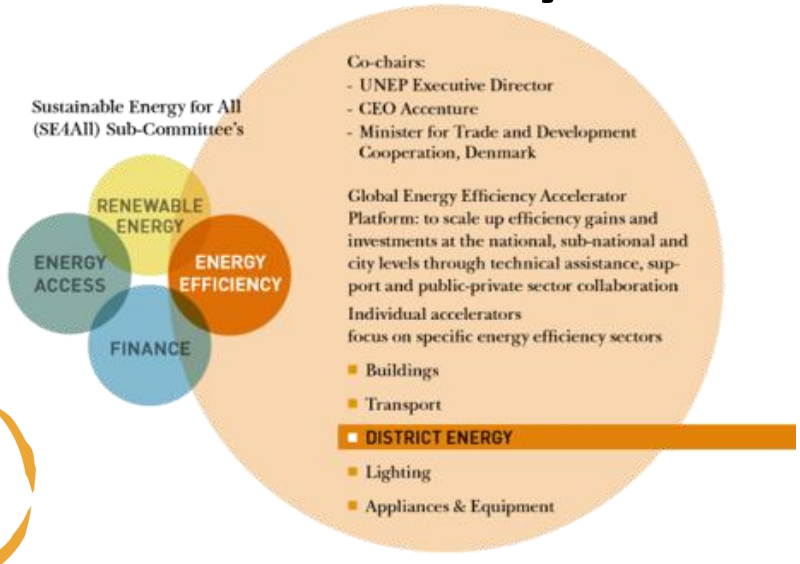
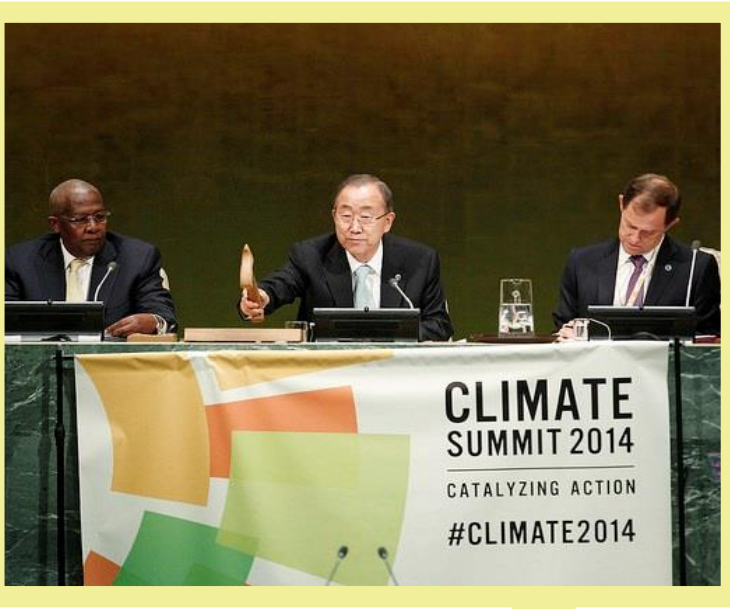
Introduction: Why district cooling?





SUSTAINABLE ENERGY FOR ALL

Cool Coalition

BEAT THE HEAT
COOL CITIES AND COUNTRIES PAVE THE WAY TO CLIMATE ACTION

Cool Coalition in Climate Summit 2019

Agenda 2030

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gef GLOBAL ENVIRONMENT FACILITY

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KIGALI COOLING EFFICIENCY PROGRAM

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Introduction: Why district cooling?

ENSURING *universal access* TO MODERN ENERGY SERVICES.

DOUBLING THE GLOBAL RATE OF IMPROVEMENT IN *energy efficiency.*

DOUBLING THE SHARE OF *renewable energy* IN THE GLOBAL ENERGY MIX.

SUSTAINABLE DEVELOPMENT GOALS

Sustainable cities & communities

Affordable & Clean Energy

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Global Alliance for Buildings and Construction

SUSTAINABLE ENERGY FOR ALL

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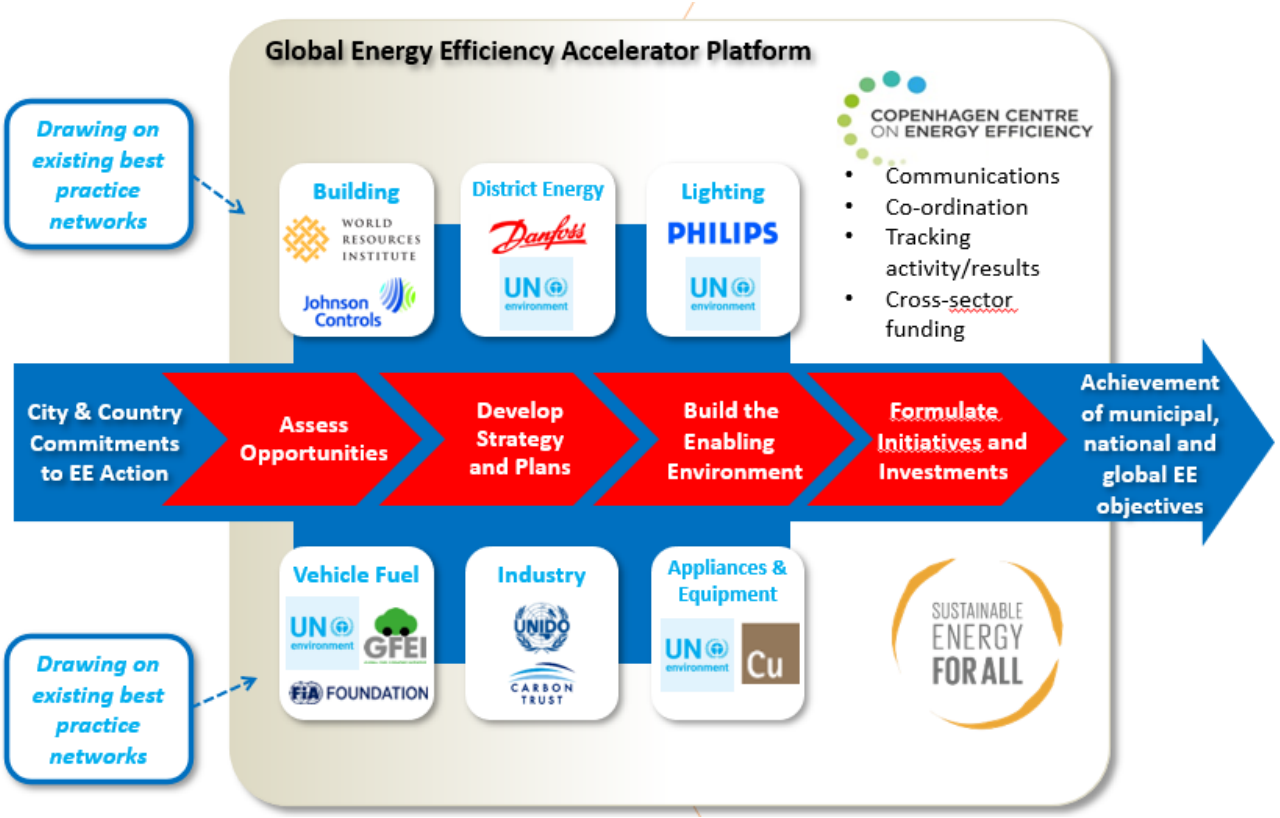
Introduction: Why district cooling?



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What are the challenges for efficient cooling?

Lack of local capacity

Lack of data

Design investable or bankable projects

Bridging the gap between the regulatory level and ground level

Long-term support to local authorities

Communication and awareness raising

Standardisation and transferability

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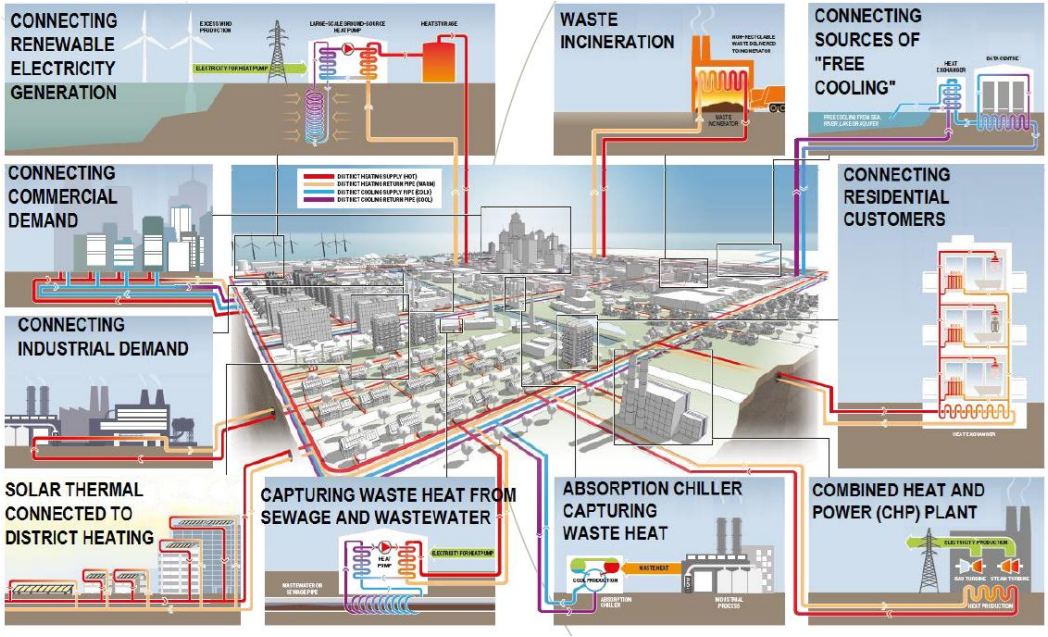
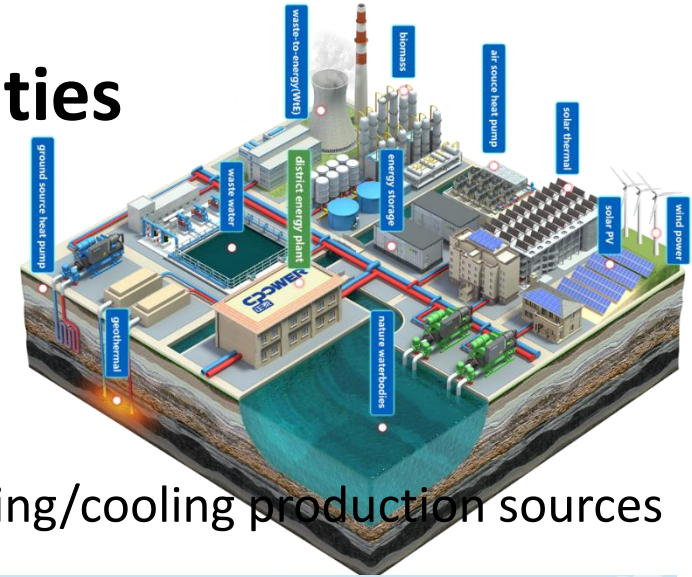
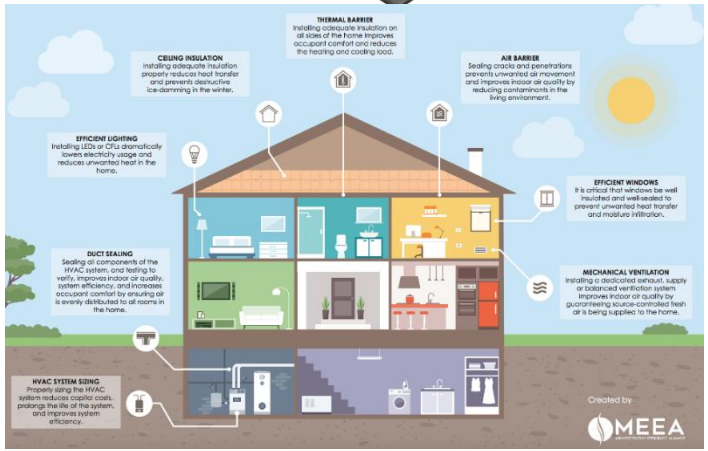
Introduction: Energy systems in cities



District energy systems for heating & cooling



Heating/cooling production sources



Building energy system

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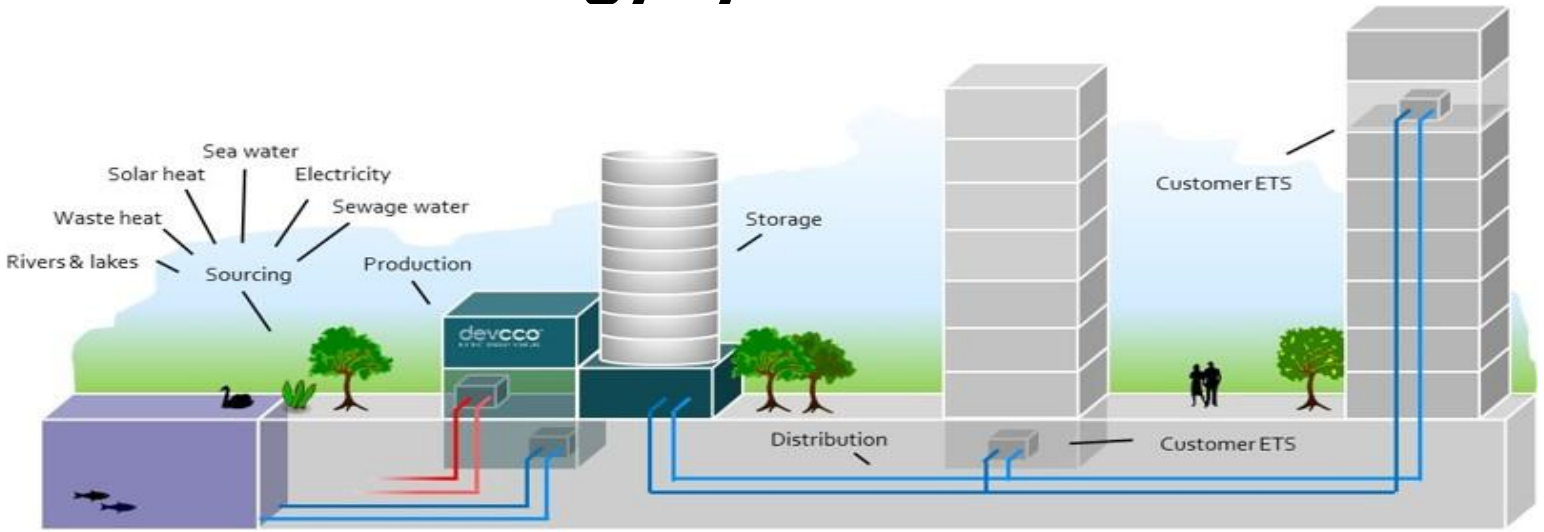
Introduction: Energy systems in cities



District energy aims to use **local energy sources** that otherwise would be wasted or not used, in order to offer for the local market a **competitive and high-energy-efficient alternative** to the traditional heating and/or cooling solutions.

District heating and cooling projects implementation

- Working in over 62 cities of 25 developing countries and emerging economics since 2016.
- The purpose of our work is to unlock investments from private sector for district energy systems through pilot projects/demonstrations.

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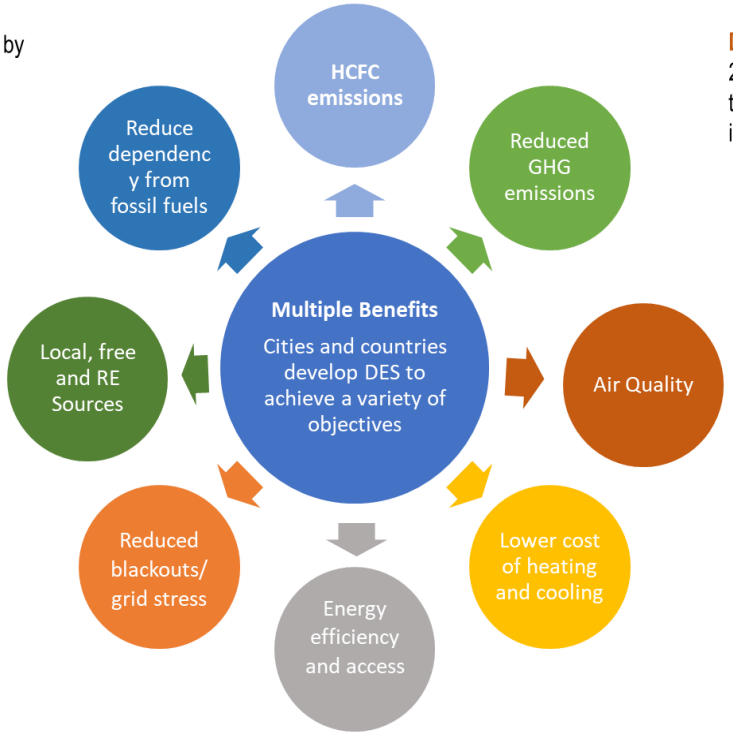
Multiple benefits of district cooling for cities

DH can help **reduce gas imports** by switching to readily available sources: heat pumps, surpluss energy, biomass, solar….



Denmark, has achieved a 20% reduction in CO2 through district energy that integrates renewables

Cities like **Toronto** or **Paris** use free cooling from rivers and lakes for cooling supply

Improving cities air quality and reducing PM2.5 emissions is the main driver for district energy in **Chile**

Dubai, UAE shifts peak electricity demand with cold storage lowering power transmission investment

Qatar, to produce 1 TR hour DC consumes 55% less electricity than individual window units and 47% less than air-cooled chillers (source: Kahramaa)

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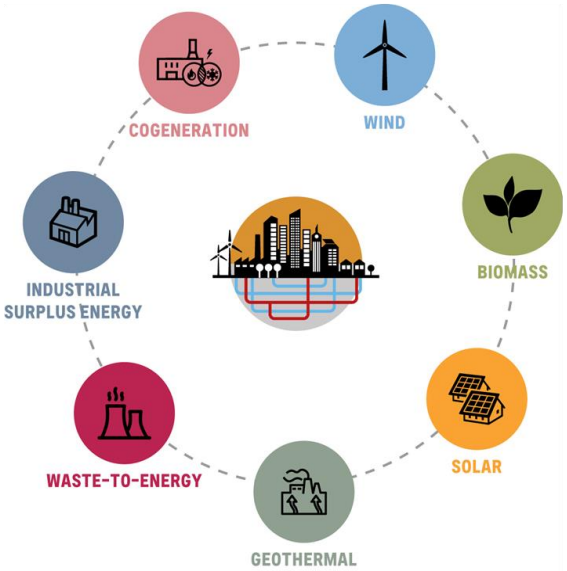
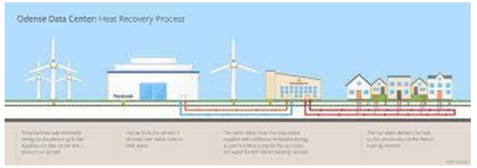
Multiple benefits of district cooling for cities

District energy systems are an important part of heating and cooling sector decarbonisation, as they allow for the integration of flexible and clean energy sources into the energy mix, which could be challenging at the individual building level in urban dense areas.

Toronto Deep Lake District Cooling(Canada)

Waste to energy Issy les Moulineaux(France)





Waste Heat recovery from Facebook Data Center in Odensee (Denmark)

Geothermal DH plant Gentilly(France)

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District cooling VS. other cooling technologies

- Higher energy efficiency than conventional cooling technologies

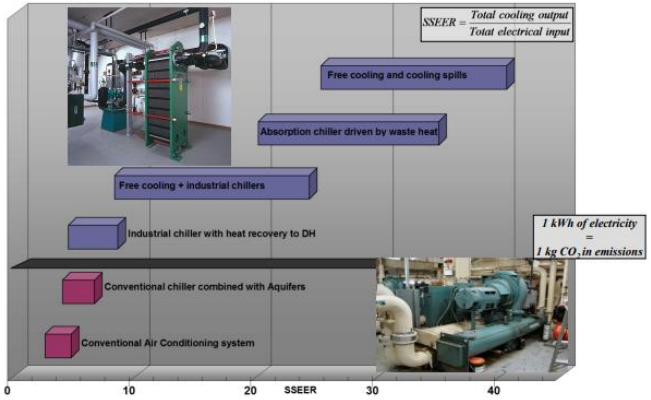


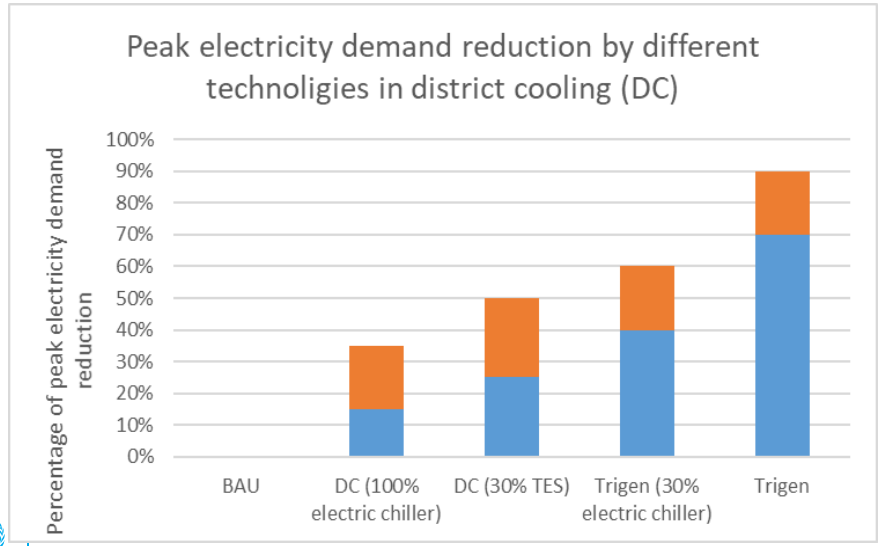
Figure: Comparison in COP for various production systems

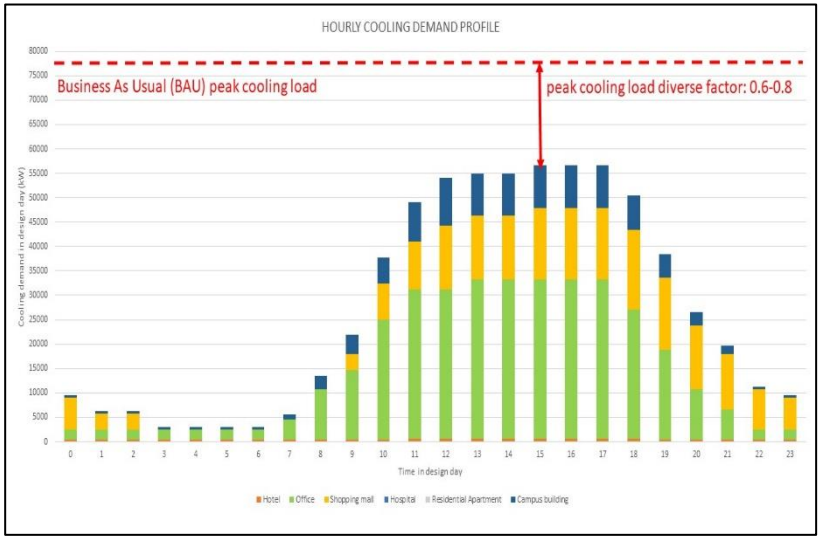
Cooling system type	Primary Energy Efficiency	Peak load shifting factor-Electricity
Split AC, VRF/VRV	25%-30%	0
Conventional Central (water-cooled elec. chiller+ FC/AHU)	20%-30%	10%-15%
Conventional Central (air-cooled elec. chiller+ FC/AHU)	15%-30%	10%-15%
District cooling (all elec. chiller)	25%-30%	15%-25%
District cooling (free cooling+elec. chiller)	30%-60%	30%-50%
Tri generation (electricity, district heating, district cooling, domestic hot water)	60%-80%	30%-50%
Tri generation (30%TES)	55%-75%	40%-60%

*Assumption: Grid electricity PEF=35%, cooling factor=0.15, heating factor=0.2, electricity=0.5, all equipment reaches A-level under Energy Star or ASHRAE/ASME

District cooling VS. other cooling technologies

- Peak electricity load shifting
- Cooling load reduction to save total investment in the district





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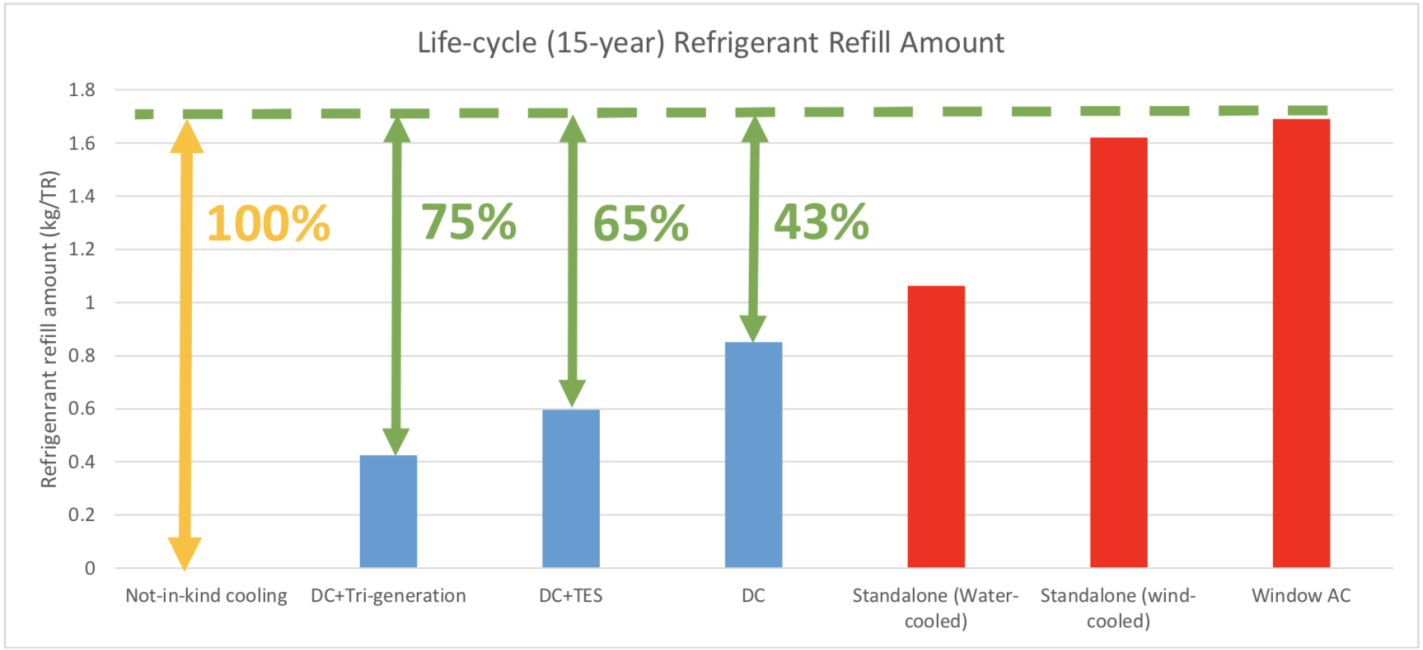
District cooling VS. other cooling technologies

- Refrigeration phasing out



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District cooling VS. other cooling technologies

- Better indoor environment and air quality

		DC+Central End (FC, AHU)	Conventional Central (FC, AHU)	Split AC	VRF/VRV
Indoor Environment Parameters	Temperature				
	Humidity			Not humidify, but dehumidify	
	Wind speed				
	Fresh Air ratio				
Indoor Air Quality (IAQ)	VOC (CO, CO2)				
	PM10, PM2.5				

Thank you very much!

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