

BUSINESS MODELS IN DISTRICT ENERGY SYSTEMS WEBINAR

16 FEBRUARY, 2021

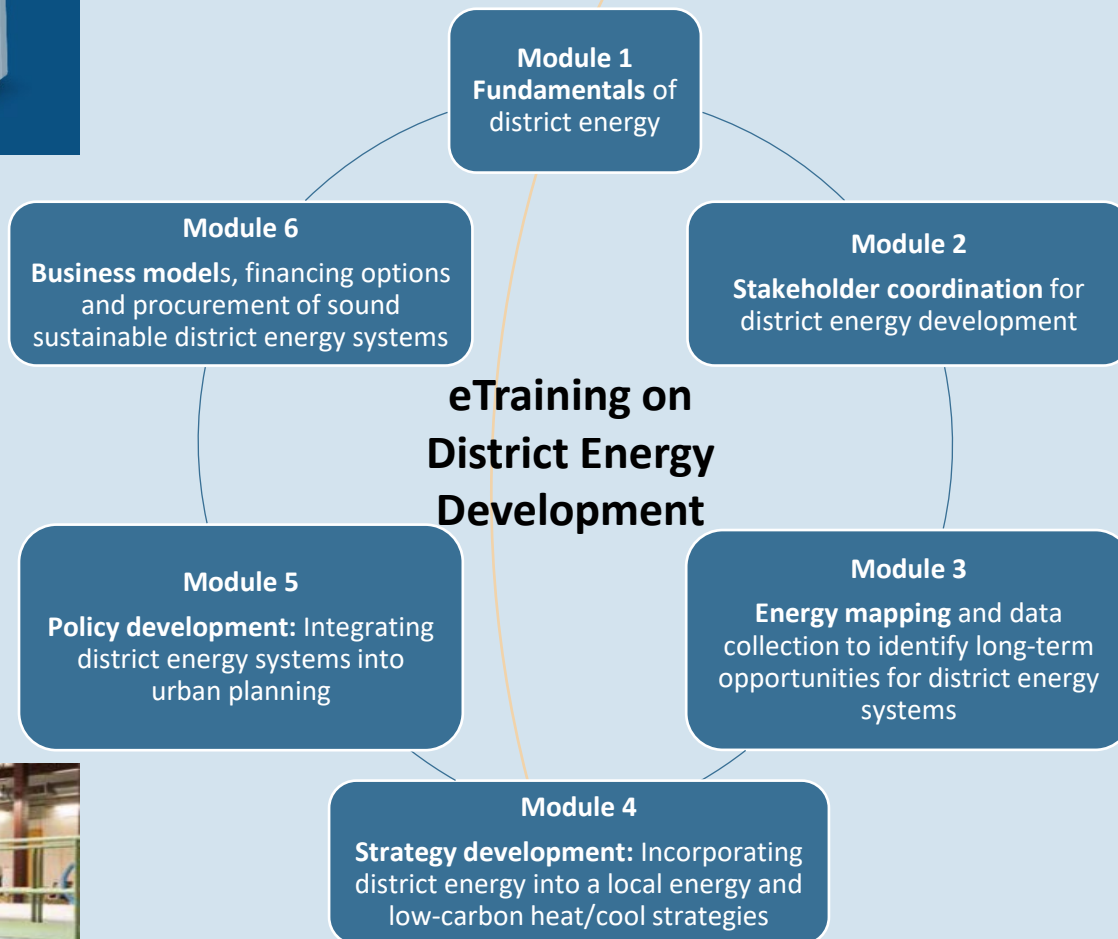


DISTRICT ENERGY IN CITIES

A GLOBAL INITIATIVE TO UNLOCK THE POTENTIAL OF ENERGY EFFICIENCY AND RENEWABLE ENERGY



COPENHAGEN CENTRE
ON ENERGY EFFICIENCY
SEforALL EE HUB





WHAT DO WE DO?

- Our goal:** Help cities tackle the energy transition through district energy
- Our model:** A private-public partnership with over 60 partners
- Our Approach:** Take best practices from around the world, adapt and replicate
- Where are we:** Supporting over 30 cities in 14 countries
- What we do:**

MARKET TRANSFORMATION



1. Increase **knowledge** of multiple benefits of district energy
2. Provide **technical assistance** to identify potential pilot projects, undertake pre-feasibility studies, design business models, support the tender process and develop long-term local district energy strategies.
3. **Scale-up** locally, through the establishment of local multi-stakeholder coordination units, and nationally , supporting the development of a national framework to support project development.
4. **Unlock investments:** Support the identification of financial mechanisms to address financial barriers and support the first projects in new markets.



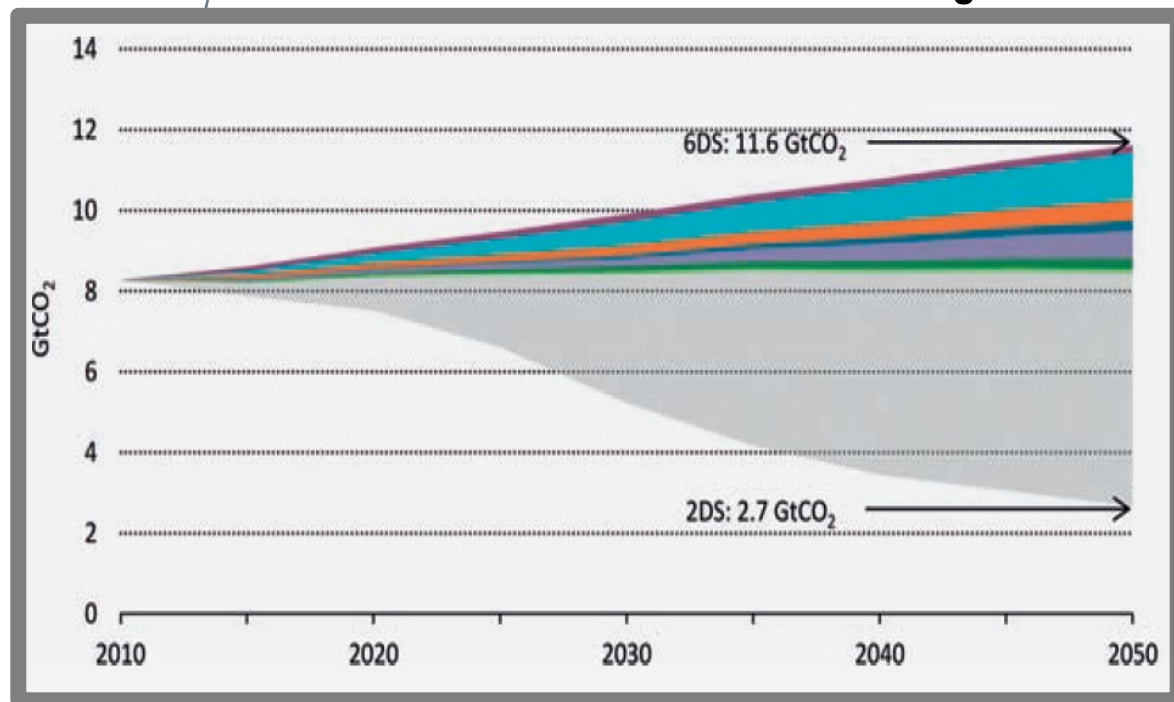
WHY IS DISTRICT ENERGY IMPORTANT?

Heating, hot water and cooling account for **60% of the global energy consumption** in buildings, largely met by fossil fuels

Emissions from the buildings sector need to be **reduced by approximately 75% by 2050**

Cooling demand will **grow by 625% by 2050** in selected regions of Asia and Latin America (IEA 2°C scenario)

CO2 emission reductions needed from buildings sector

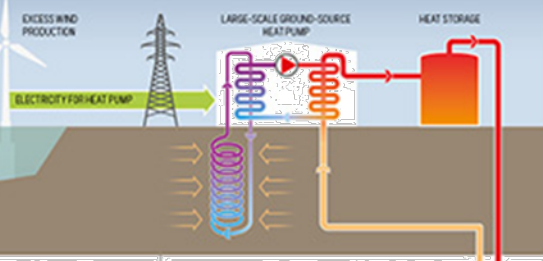


DISTRICT
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WHAT IS DISTRICT ENERGY?

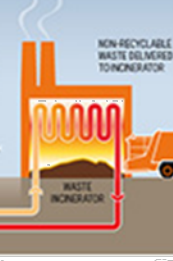
CONNECTING RENEWABLE ELECTRICITY GENERATION

Excess variable electricity production, such as wind generation, can be utilized and stored using district energy, providing valuable demand response for the power system. This electricity can power large-scale heat pumps, which capture low-grade heat (such as from underground) to produce hot water to be stored as heat or fed directly into a district heating network. Similarly, high-efficiency electric chillers could provide demand response and store surplus cold water as cold to be used in district cooling. Through such means, district energy can enable higher shares of renewable energy in power systems.



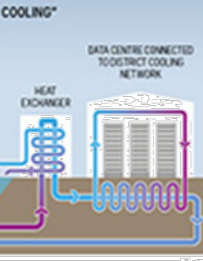
WASTE INCINERATION

Instead of sending non-recyclable municipal solid waste to landfills, cities can incinerate it. The waste burns water into steam, and this heat is transferred into the district heating system. Some larger waste incinerators also have a steam turbine to produce electricity and heat. The exhaust fumes of the incinerator must be controlled so as not to contribute to local air pollution.



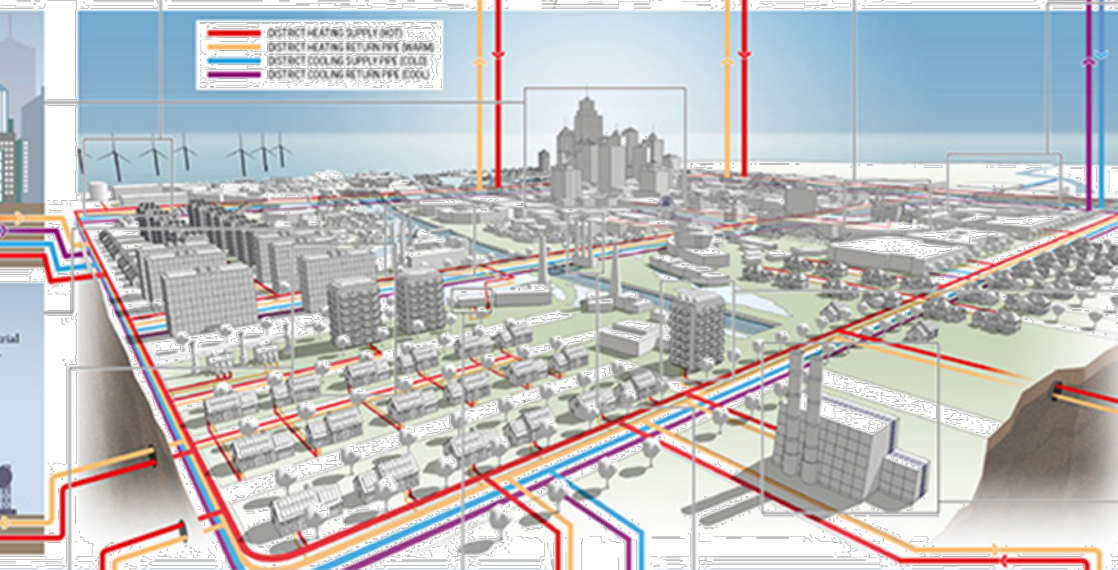
CONNECTING SOURCES OF "FREE COOLING"

Many cities have renewable sources of low-temperature water that can be used to provide district cooling. The cooling is extracted from sea, river, lake or aquifer water using a heat exchanger. District cooling networks can meet the demands of data centres, which normally require huge amounts of electricity to stay cold.



CONNECTING COMMERCIAL DEMAND

The high density of heat and cooling demand from commercial consumers makes them ideal to connect to district energy.



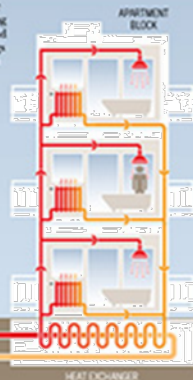
CONNECTING INDUSTRIAL DEMAND

The high density of heat and cooling demand from industrial consumers makes them ideal to connect to district energy.



CONNECTING RESIDENTIAL CUSTOMERS

Buildings typically will be connected individually to the district energy network, with a heat exchanger separating the building's central heating or cooling system from the network. District heating can be used to provide heating as well as hot water, and in some cities buildings are connected to both district cooling and district heating systems.



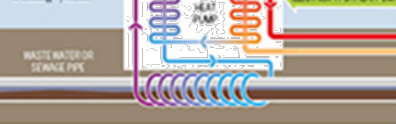
SOLAR THERMAL CONNECTED TO DISTRICT HEATING

Solar thermal can be connected to district heating systems at a large scale (such as large ground-mounted installations) or at the building level. For building-mounted solar thermal systems can be designed that allow building owners to provide heat to the district heating network in times of surplus, removing the need to store excess heat in the building.



CAPTURING WASTE HEAT FROM SEWAGE AND WASTEWATER

Several cities capture the heat from wastewater and sewage. A heat exchanger in the pipes ensures no direct contact and removes the heat before the sewage is processed. An electric heat pump then uses the low-temperature waste heat to supply hot water for the district heating system.



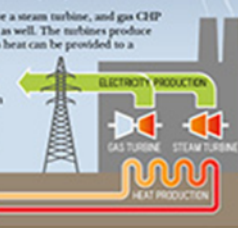
ABSORPTION CHILLER CAPTURING WASTE HEAT

Waste heat from industry can be converted to cooling using an absorption chiller. These differ from the more prevalent electric chillers in that the cooling effect is driven by heat energy, rather than by mechanical energy. The coefficient of performance of the chiller depends on the number of absorption cycles but is typically 0.65 to 1.2.



COMBINED HEAT AND POWER (CHP) PLANT

CHP plants generally have a steam turbine, and gas CHP plants have a gas turbine as well. The turbines produce electricity, and the excess heat can be provided to a district heating network. Combined cooling, heat and power (CCHP) plants have an absorption chiller that can use heat to produce cooling for district cooling systems.



MULTIPLE BENEFITS TO ACHIEVE

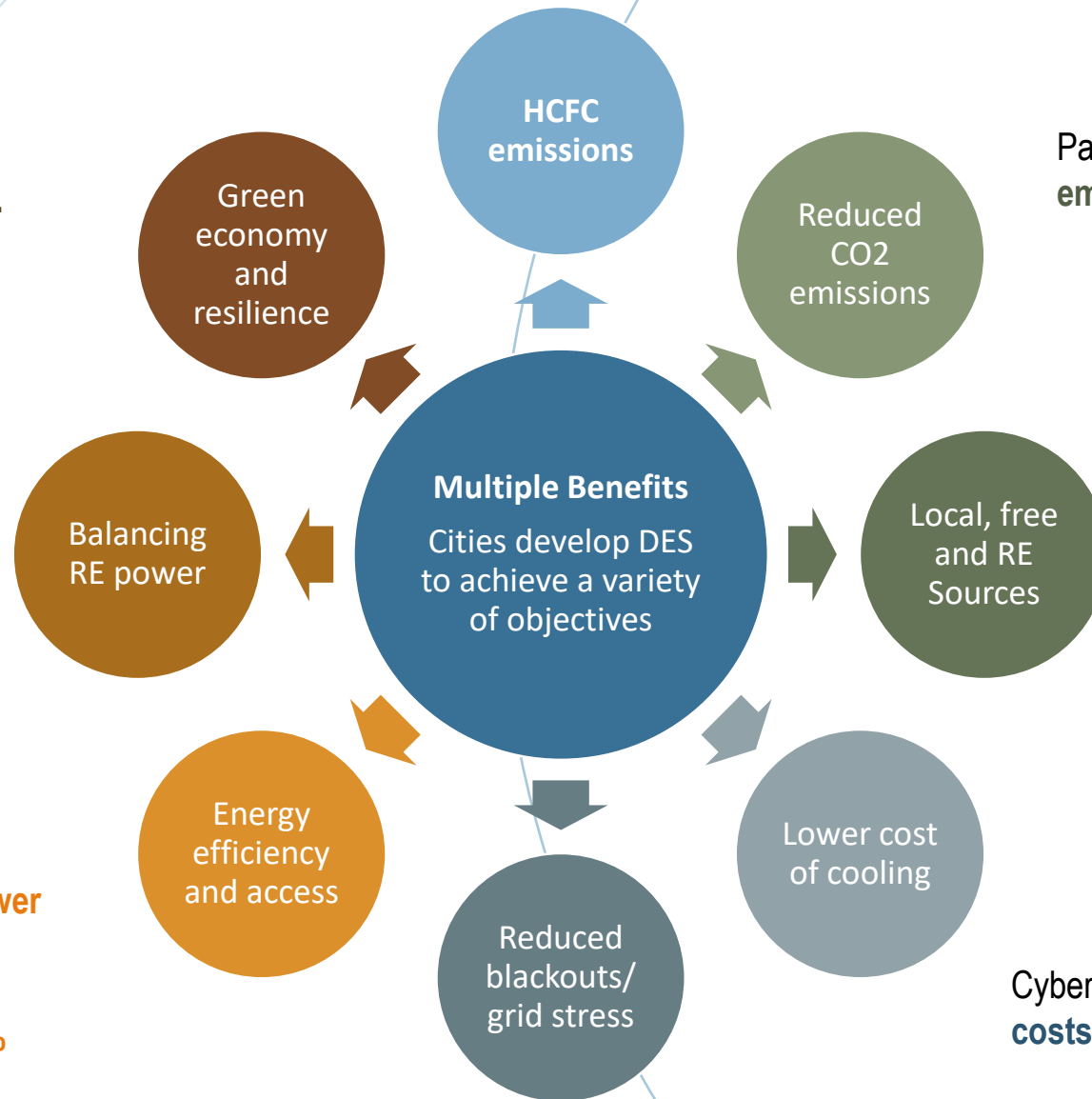
DIVERSE POLICY OBJECTIVES

Empower created
700 full-time jobs.

Paris reduced refrigerant
emissions by 90%

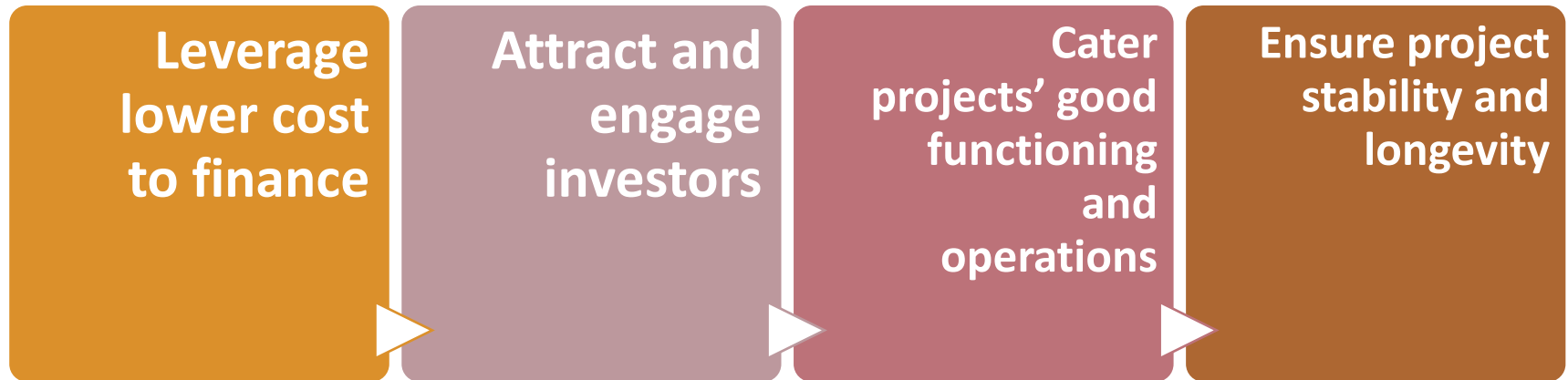
GIFT City could **lower
electricity
consumption for
cooling by 65-80%**

Cyberjaya **lowered cooling
costs by 39%**



WHY ARE BUSINESS MODELS IMPORTANT IN DISTRICT ENERGY

The role of a solid business model in district energy projects

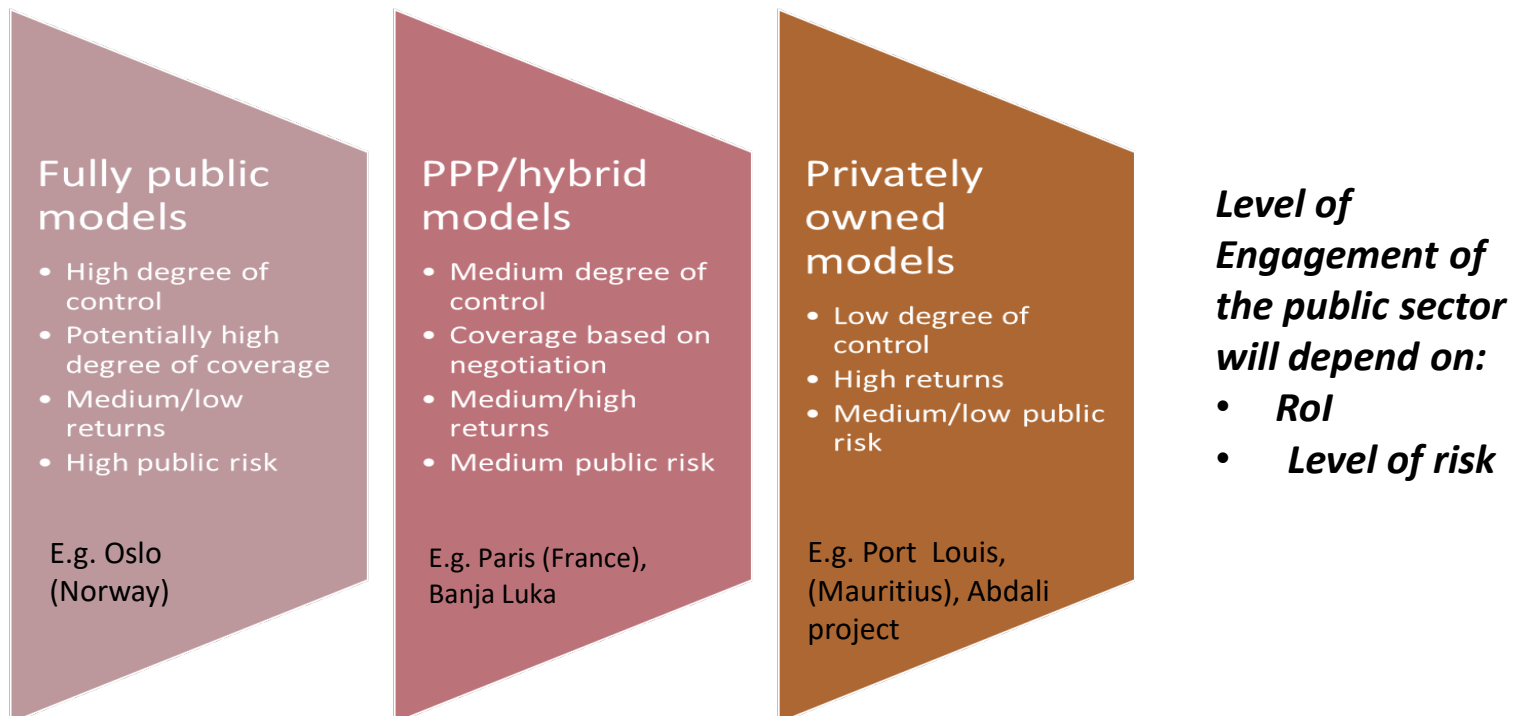


“A mediocre technology pursued within a great business model may be more valuable than a great technology exploited via a mediocre business model” (Chesbrough, 2009)



CHARACTERIZATION OF BUSINESS MODELS IN DES

Business models in DES based on ownership type



Source: District Energy in Cities, unlocking the potential of Energy Efficiency and Renewables (UNEP, 2015)



THANK YOU FOR YOUR ATTENTION

**For more information on:
the Global District Energy in Cities Initiative
the Copenhagen Center on Energy Efficiency (C2E)
please visit the website or contact:**



District Energy in Cities: <http://districtenergyinitiative.org>



Copenhagen Centre on Energy Efficiency: <https://c2e2.unepdtu.org/>



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