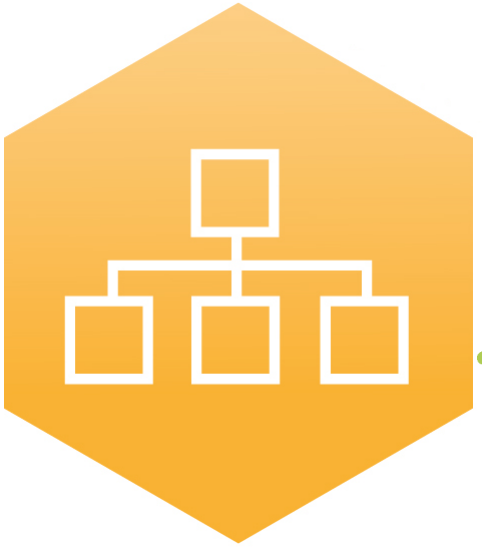
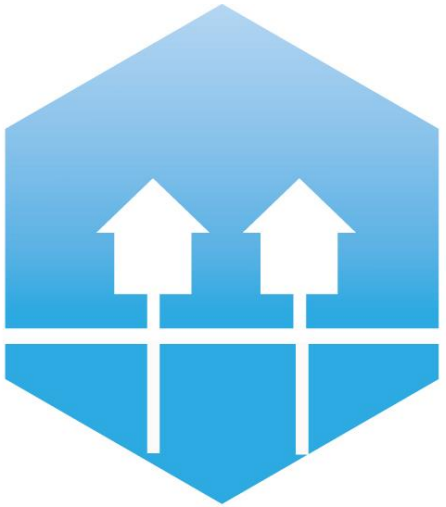
International Conference on Smart Energy Systems and 4th Generation District Heating
Copenhagen, 25-26 August 2015

District Energy in Cities: Unlocking the potential of Energy Efficiency and Renewable Energy





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SUSTAINABLE ENERGY FOR ALL

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4th Generation District Heating Technologies and Systems

Copenhagen Centre on Energy Efficiency

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Sustainable Energy for All

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One Goal:

Achieving Sustainable Energy for All by 2030

Three Objectives:

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.

Global Energy Efficiency Accelerator Platform

The **Accelerator Platform** was established to support specific sector-based energy efficiency accelerators

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Transport and Motor Fuel Efficiency

Improve the fuel economy capacity of the global car fleet

GFEI
GLOBAL FUEL ECONOMY INITIATIVE

Lighting

Global market transformation to efficient lighting

en.lighten

Appliances & Equipment

Global market transformation to efficient appliances & equipment

U4E United for Efficiency
UNEP

Building Efficiency

Promote sustainable building policies & practices worldwide

District Energy

Support national & municipal governments to develop or scale-up district energy systems

DISTRICT ENERGY IN CITIES

Industrial Energy Efficiency

Implementing Energy Management Systems, technologies & practices

Power Sector

Improving the efficiency of generation, transmission, distribution & end-use

Finance

Accelerating investment in energy efficiency

Launch of the Global District Energy in Cities Initiative

DISTRICT ENERGY IN CITIES

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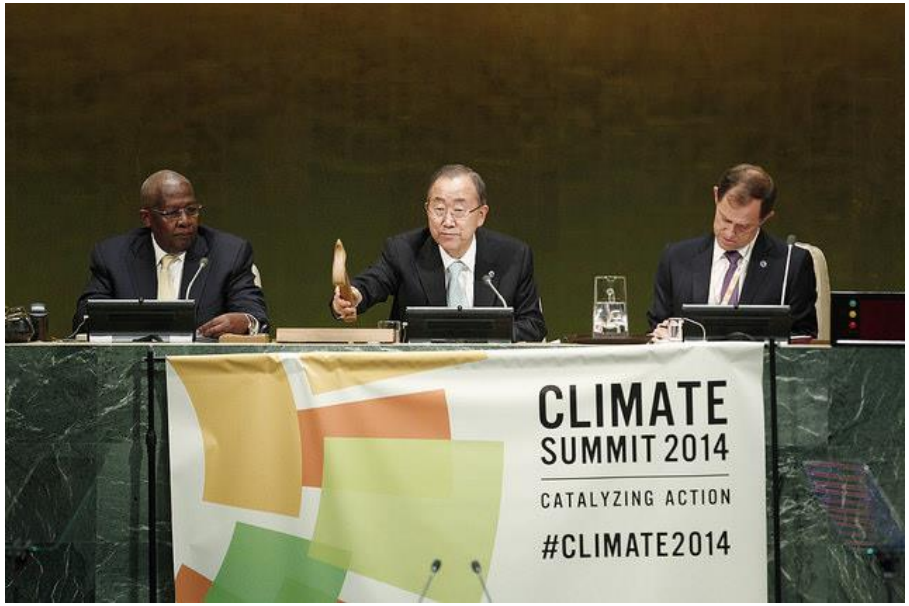
- **INCREASE** awareness on the potential of district energy and its role in achieving multiple benefits, showcase good practices and successful efforts globally;
- **PROMOTE** and strengthen local and national policies and enabling environments, including by identifying and overcoming barriers, enhancing capacity, and mobilizing support;
- **ENCOURAGE** the participation of private sector operators and investors to take a lead role in the shift towards modern district energy systems.



GLOBAL ENERGY EFFICIENCY ACCELERATOR PLATFORM

Partners and supporters of the Initiative

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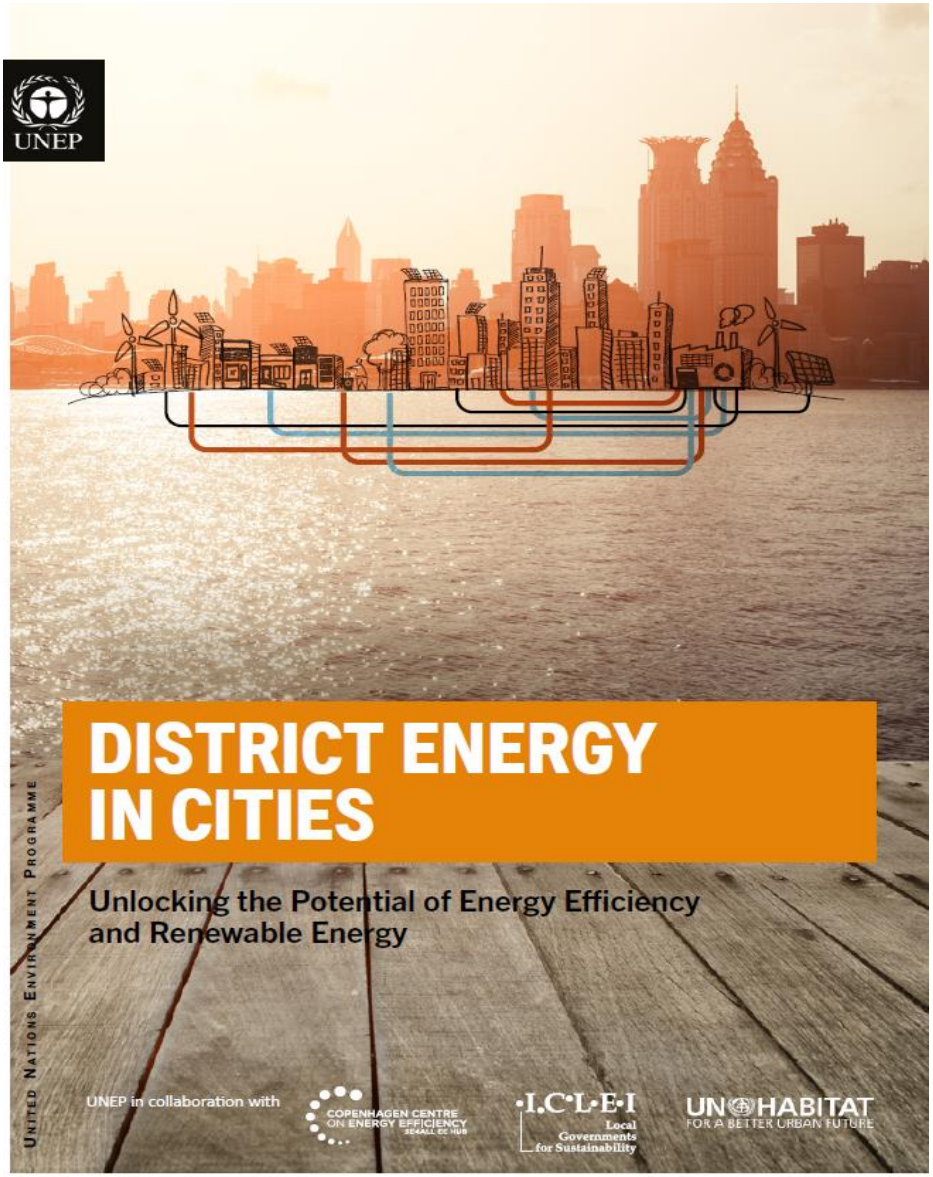
Launch of Publication: An Address from Achim Steiner



"In launching this report we want to draw the attention of the world's decision makers, mayors and leaders at the community level to the importance of district energy systems."

Achim Steiner, UN Environment Programme Executive Director. Launch of the District Energy in Cities Report

- Paris, 25 February 2015

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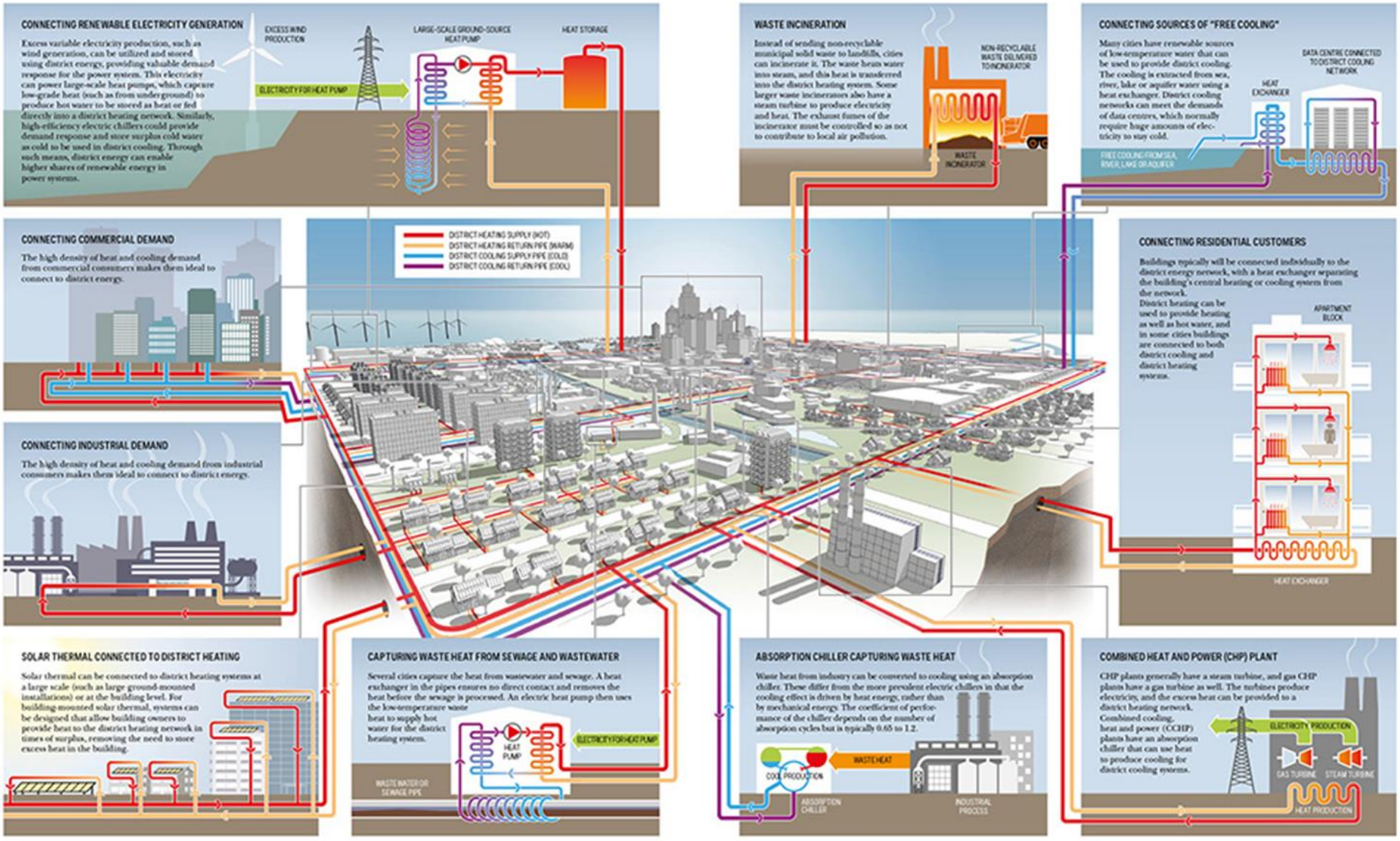
An analysis of **45 cities** leading on district energy, covering policy, technology and finance/business models applications, and highlighting the steps needed for successful planning and implementation.

www.unep.org/energy/des

Many Technical Options to Consider



District energy is the only way to use large scale renewable heat and cool sources

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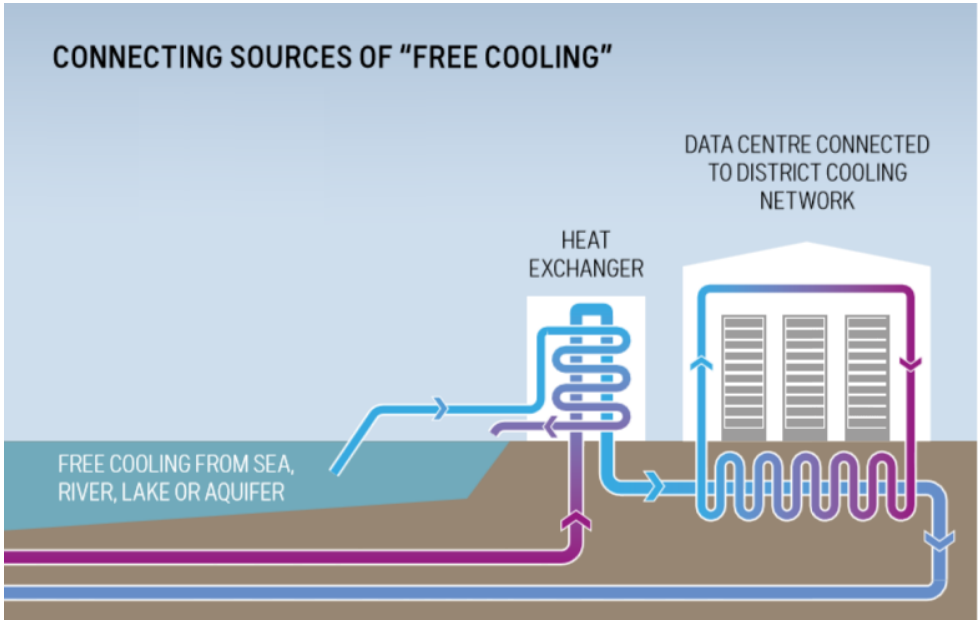
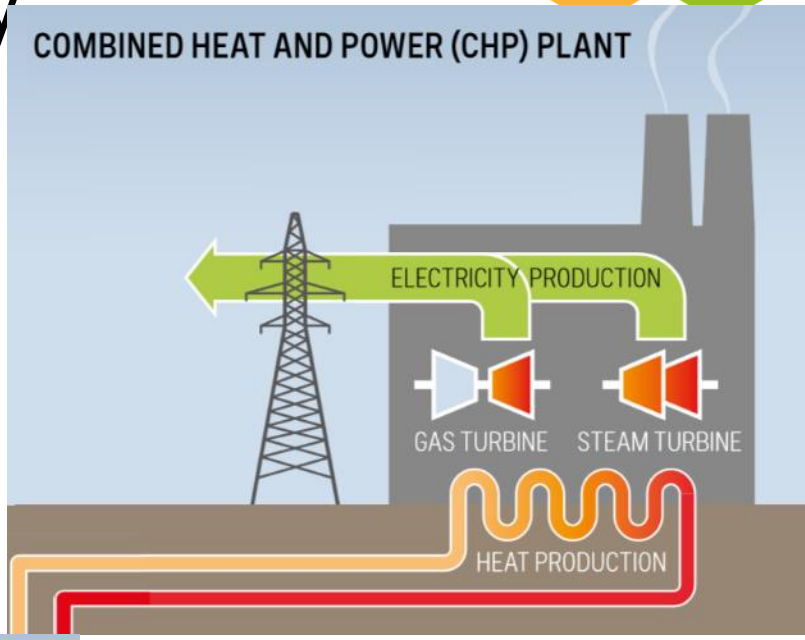
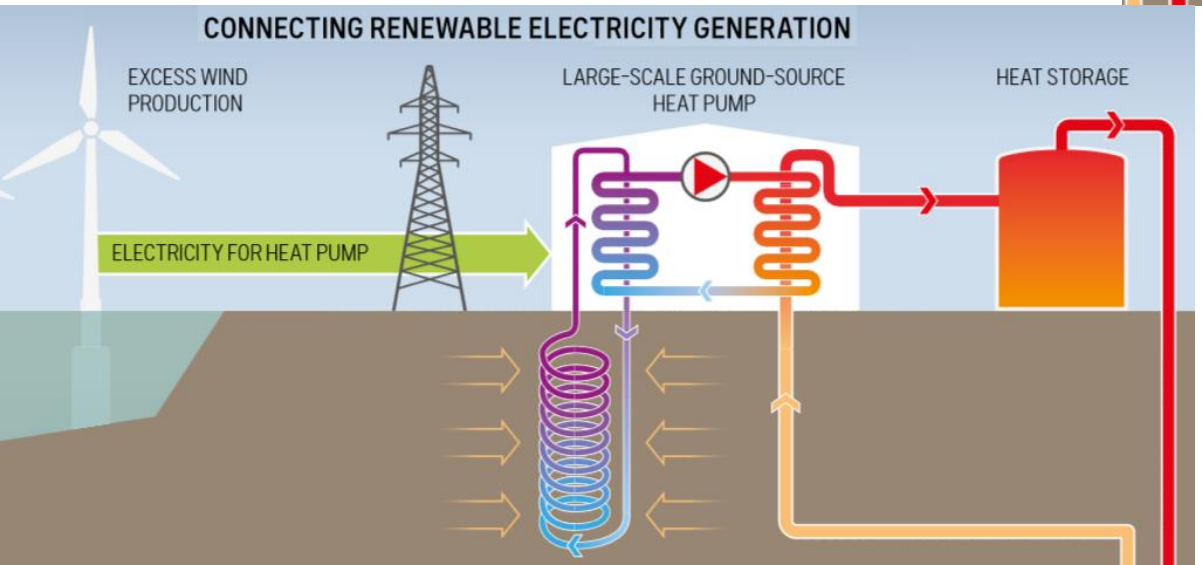
- District cooling and heating networks enable the connection of renewable heat or cool that cannot otherwise be used on an individual building level for example:
  - waste heat from industry, power plants, waste incinerators, metro systems or data centres;
  - geothermal;
  - large scale biomass;
  - large scale heat pumps;
  - free cool from rivers, lakes, seas and aquifers;
  - large scale solar thermal; and
  - sewage and wastewater heat.
- By connecting heat or cool storage district energy networks can maximise the use of these renewable resources



District energy provides important electricity balancing services enabling higher shares of renewable electricity

- The combination of CHP or CCHP and heat/cool storage can allow district energy networks to balance renewables such as wind and PV on the electricity network.
- This is how Denmark is reaching such high shares of wind and Germany such high levels of solar PV.





Key Findings: The importance of local governments

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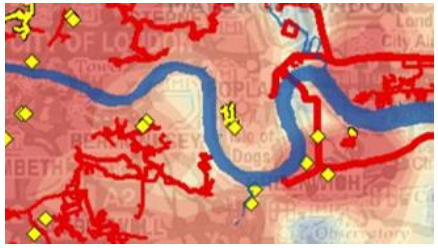
Strategy and Targets

Integrated energy planning and mapping



Local governments

$ € £ ¥

Facilitating Finance

Consumers and Providers

Key Findings: Multiple Benefits and Policy Objectives

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Energy Efficiency and Access

Local and Renewable Sources

Meet Tomorrow's Energy Needs by Leapfrogging to Modern District Energy Systems Today!

GHG Mitigation Improved Air Quality

Green Economy Resilience

Key Findings: Piloting Policies

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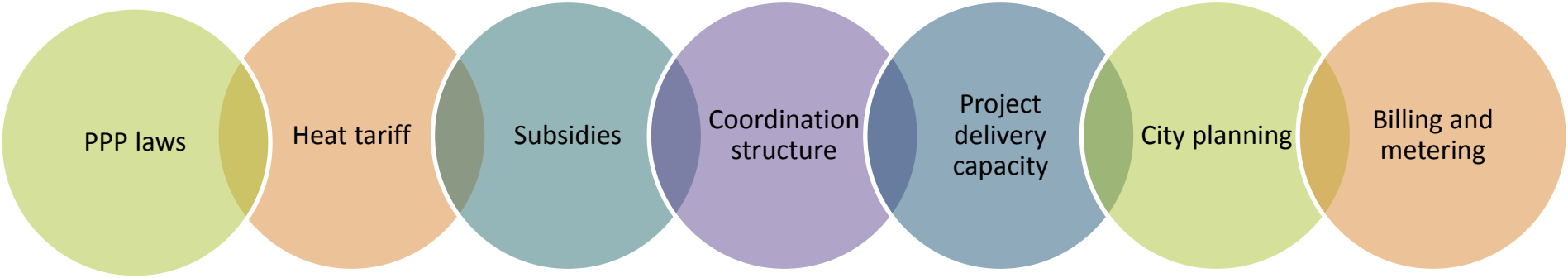
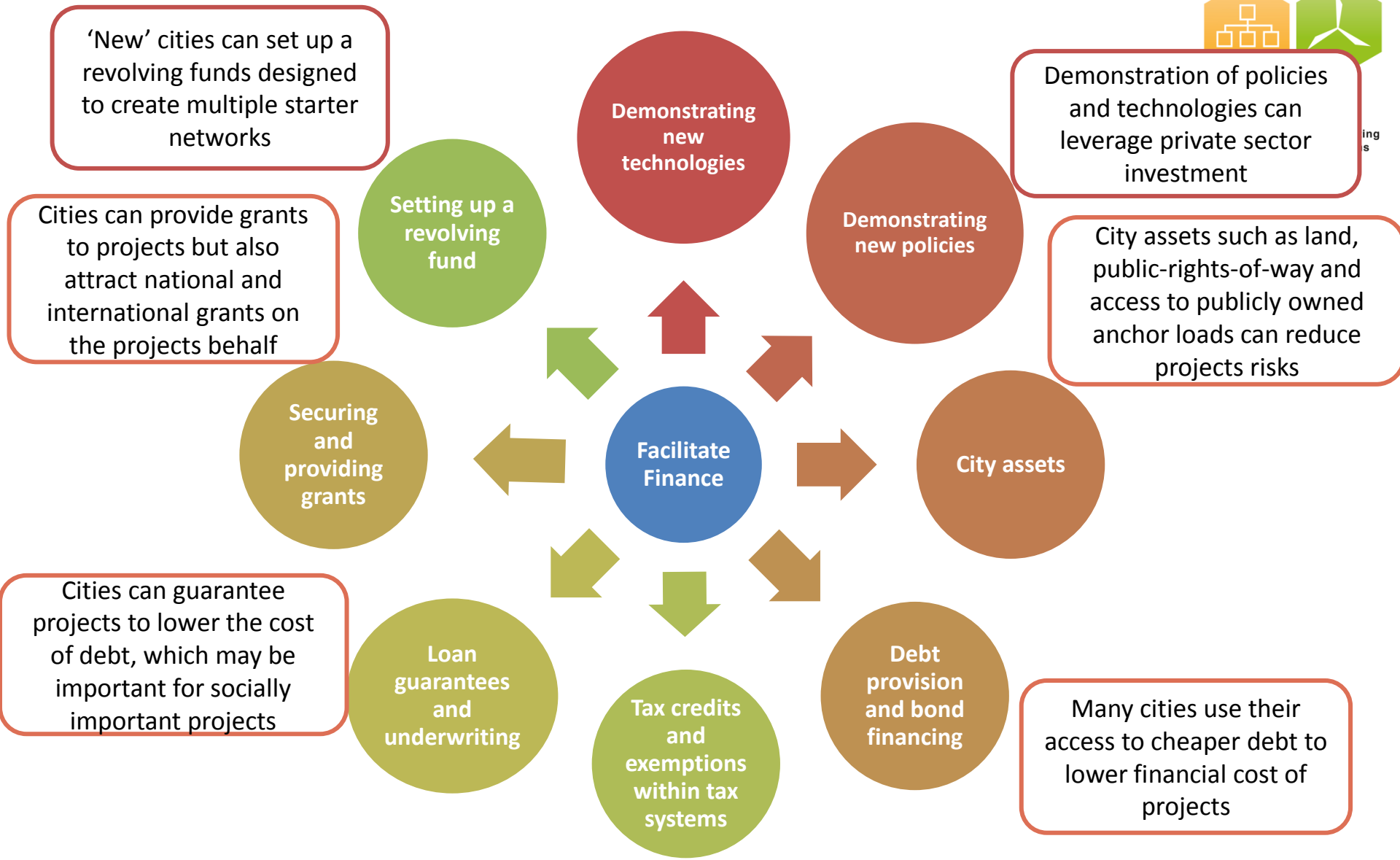
- Coordination between national and local government is key to ensuring replicable projects.
- Support from national governments is key.
- Pilot projects can provide lessons for national policy and local lessons for replication in cities.



Local Governments can Facilitate Finance



Izmir, Turkey has developed large scale district heating system based on geothermal

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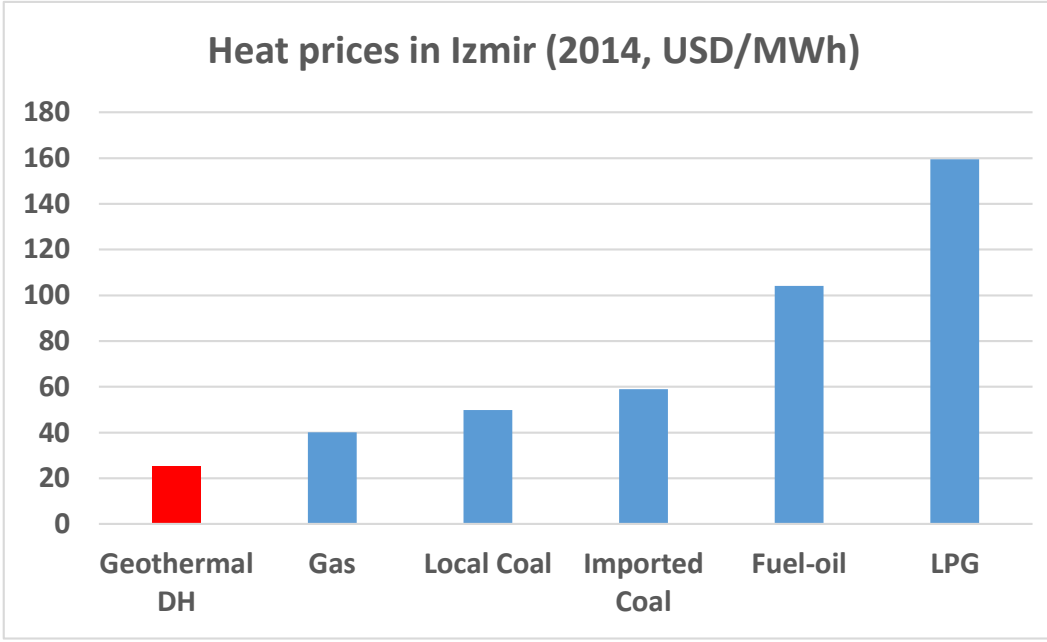
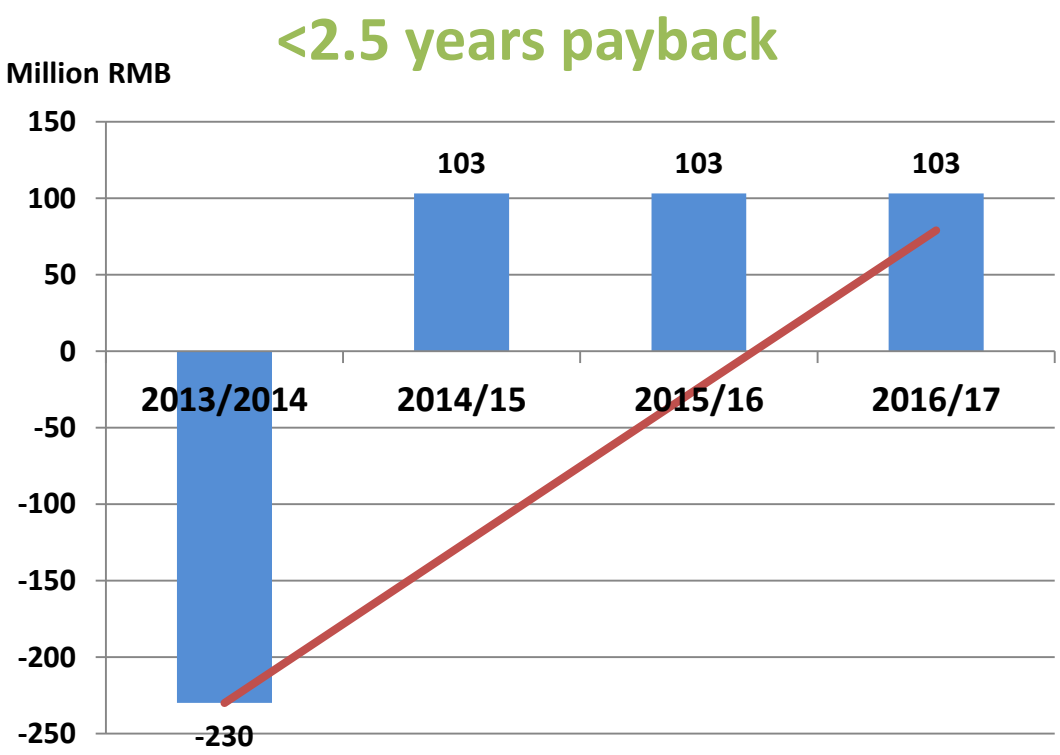
Izmir Geothermal Company

- 3.3 million square metres connected, 4,400 buildings
- Heat demand approximately 46kWh/msq/year
- Uses 100% Geothermal through 20 geothermal wells with power of 160MW
- Geothermal has a 67% load factor
- System prevents 68,000 t CO_2 emissions (compared with natural gas)
- Out of heating season, hot water is still provided.
- The city is now looking to produce power from the geothermal resource outside of the heating season.
- Very low heat prices.



Anshan, China: Investing in waste heat



220 MW available surplus heat (1st phase)

Yearly energy saving	**830,000 MWh**
Coal savings	**173,000 tons**
CO_2 emission savings	**290,000 tons**
Yearly savings	103 million RMB (**15 million euros**)
Investment	200-230 million RMB (**30 – 35 million euros**)

Source: Danfoss

Paris ownership structure and control

- City of Paris owns the network
- Production facilities mostly owned by CPCU except 3 waste-to-energy plants
- CPCU does all maintenance, investment and customer interactions.
- 4 of 10 directors on CPCU's Board of Directors nominated by City of Paris.
- Concession contract specifies maximum heat tariff indexed by percentage of renewable energy sources used to encourage renewables.
- City of Paris can control the production mix of heat and target higher renewable shares.

Today district heating is nearly 50% renewable and supplies equivalent of 500,000 households including 100% of hospitals, 50% of social housings, and 50% of public buildings.

Paris: Local government impact

Planner and Regulator

Urban Development Zones

Will develop mandatory connection once more than 50% renewable (2015)

Strategy and targets: 60% renewable by 2020.

Facilitator of Finance

Enables cheap loans for CPCU

Direct loans.

Sometimes pays for extending the network inside the new zone

Pools investment with other municipalities

Provider and Consumer

Anchor loads (public buildings, hospitals, social housing).

Network runs through parts of the metro system

Direct ownership of network in the city.

Sets maximum heat tariffs and sets a special low tariff for social housing

Coordinator and Advocate

Coordinate with other cities to interconnect networks and jointly develop heat production facilities.

Coordination across: Waste collection, metro, tram and road development, building efficiency programmes, new building developers

Key steps in developing a district energy system

- Ten key steps that cities can take to support the development of district energy systems
- These steps can be taken individually or packaged to meet specific city conditions and needs.
- Depending on city type some steps may have already been completed

1.	**ASSESS** existing energy and climate policy objectives, strategies and targets, and identify catalysts
2.	**STRENGTHEN** or develop the institutional multi-stakeholder coordination framework
3.	**INTEGRATE** district energy into national and/or local energy strategy and planning
4.	**MAP** local energy demand and evaluate local energy resources
5.	**DETERMINE** relevant policy design considerations
6.	**CARRY OUT** project pre-feasibility and viability
7.	**DEVELOP** business plan
8.	**ANALYSE** procurement options
9.	**FACILITATE** finance
10.	**SET** measurable, reportable and verifiable project indicators

Realising the Initiative's full potential

Business as Usual

- New cities without heat/cool planning
- Abandoned refurbishment systems
- European best practice not shifting abroad
- DHC mostly confined to Nordics and EU

Funded Initiative Activities

- 3 pilot cities in India, China and Eastern Europe
- State/Provincial replication
- Global training and decision tools for local governments
- City-twinning

- Initial funding of Initiative
- In-kind support from existing partners

Potential Initiative Activities

- Multiple pilot cities builds to national momentum and replication
- New markets emerge for best practices transfer
- DES becomes status-quo in new city design
- Energy transition

- More funds to Initiative
- Universities, cities and private sector contribute expertise

'City Energy Efficiency Support Office'

- Proposal to consider the establishment of a 'City Energy Efficiency Support Office'.
- Danfoss Foundation providing funding.
- Will be linked to the CLEAN business network and focus on the District Energy Accelerator.
- Opportunities exist for other donors and partners.
- Initially, 3 District Energy experts would be recruited to provide technical support to cities initiating or expanding District Energy.
- Office activities could be expanded to in the future e.g. building efficiency

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Thank you

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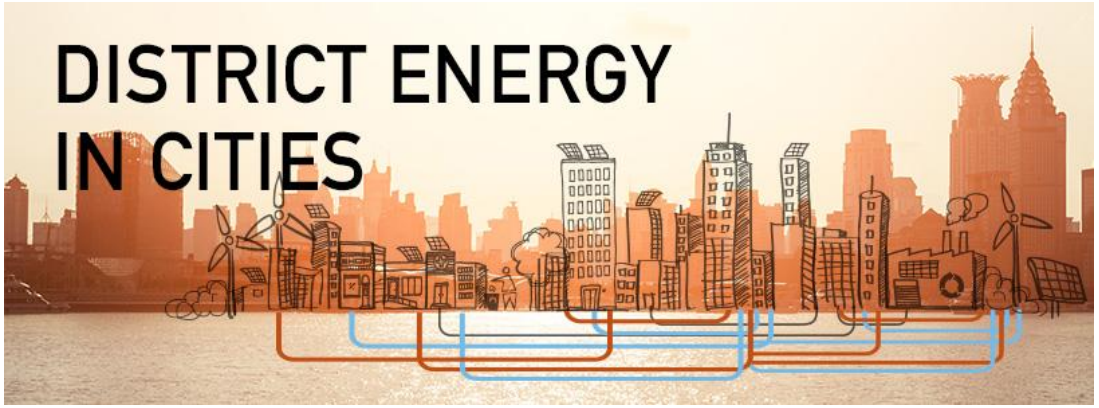

For more information on the **Global District Energy in Cities Initiative**, to join the Initiative and to become a partner, please visit the website or contact:

- Ms. Djaheezah SUBRATTY, Head, Policy Unit, Energy, Climate and Technology Branch, UNEP, djaheezah.subratty@unep.org
- Ms. Lily RIAHI, Advisor on Sustainable Energy in Cities, Policy Unit, Energy, Climate, and Technology Branch, UNEP lily.riahi@unep.org

unep.org/energy/des des@unep.org

Combining Building Efficiency and District Energy for More Sustainable Cities: A Sustainable Energy for All webinar
10:00-11:30 Tuesday, 1 September 2015
www.energyefficiencycentre.org/

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