



III CONGRESO INTERNACIONAL DE DISTRITOS TÉRMICOS

Una alternativa ambiental y de desarrollo sostenible 17,18 y 19 de noviembre 2021 -Virtual











PARA EL DESARROLLO INDUSTRIAL

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Ciudades sostenibles y Distritos Energéticos

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Short bio: Reto Dettli



Partner / Member of the Executive Board Vice President of the Board of Directors

Dip. Mechanical Engineering ETH / Degree in Management Science from ETH/NDS

Reto Dettli is co-founder of econcept AG and has been working for the company since 1994. His project work revolves mainly around issues relating to energy economics and climate policies. He has developed energy policy strategies, instruments and programmes at national, cantonal and municipal government level and managed Energieforschung Stadt Zürich – an agency for social science-oriented energy research. He provides support for energy supply companies in strategic matters relating to enterprise and infrastructure development and advises its owners on governance and risk management. Both at home and abroad, he provides support to cities in the field of climate protection and adaptation to climate change. He is member of the Board of Directors of two energy utility companies.



Content

Introduction

- Why District Energy Systems?
- How realising District Energy Systems?
 - The role of the people
 - The role of public institutions
 - The role of risk and risk management
 - The role of utilities / investors
- Good practices: District Energy Systems for heating and cooling
- Outlook



Climate Change requires solutions based on renewable energies.





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- Climate resilience is one of the main challenges for cities worldwide:
 - An increasing number of inhabitants is living in cities
 - Rising comfort needs and increasing temperatures due to climate change boost the demand of cooling



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- Net-Zero means «Zero»-emissions originating from heating and cooling
- District Energy Systems are a part of the solution

Bogotá and Zurich





Bogotá and Zurich



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Why District Energy?

There are only **two** reasons for realising District Energy Systems:

1. Availability of a localised energy resource

A thermal network **is mandatory** for using the (renewable) energy from point sources .



2. Economy of scale

A thermal network **enables** the implementation of sustainable technologies (technical or financial reasons, time of use).



Examples of different types of District Energy Systems



District Energy System «Coté Parc» with commercial and residential buildings

Project: 2024 Investor: Public utility company

Photovoltaic 290 kW

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- Cooling 220 kW
- Heating 600 kW

Type 2: Economy of scale

Examples of different types of District Energy Systems





Energy Sources:

- Water (waste water treatment)
- 15'000 MWh Oil/Gas
- 13'000 MWh Electricity

District Energy System Schlieren: Combined heating and cooling services

Realisation: 2006-2009 Investor: Public utility company

- Heating: 44'000 MWh/year
- Cooling: 30'000 MWh/year

Type 2: Economy of scale

Examples of different types of District Energy Systems



District Energy System for heating and cooling in the city centre around the Lake of Zurich

Investor: Public utility company of the city of Zurich (ewz)

Heating: 11'000 MWh/year

Cooling: 6'300 MWh/year

Type 1: Availability of a localised energy resource

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The role of the people



Wood incineration for district heating in Ukraine (supported by SECO)

Different actors are involved (view of project owner / developer)



The role of the people: Stakeholder analysis



- Stakeholders depend on the type of a project (e.g. energy source, private/ public etc.)
- Slide shows view of project owner / developer

Numerous actors are involved. Identify and manage closely the key actors for building up District Energy Systems!

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The role of public institutions

Different possible roles of public institutions:

- Legal execution: Construction permit, construction supervision (e.g. security), technical inspection, permit for using energy resource (e.g. lake, groundwater)
- Enabler: City planning, energy coordination, supporter
- Investor/Owner of energy utility: Developer and owner of District Energy Systems (infrastructure, energy generation)

The role of public institutions: Enabler

The inclusion of energy coordination in the city planning is key for a sustainable city development

Sources of renewable energies / waste energy are limited:

→ Lake, groundwater, waste water treatment, waste incineration, industrial waste heat

- Demand of energy which fits to the local sources of renewable energy is as well limited:
 - → Time of use, temperature level, season, cooling/heating, amount of energy

The instrument «Energy Plan» as part of the city planning identifies the potential of localised renewable energy sources and sets the necessary priorities in city planning to coordinate the **usage of these renewable energy sources** with the **demand of energy**.

The role of public institutions: Enabler

The **Energy Plan** coordinates the energy supply and demand

 Construction area for industries and greenhouse zone are located next to waste incineration.



Different **supporting measures** relay on the Energy Plan:

- Abandonment of gas supply in thermal network area
- Obligation for connection to District Energy Systems
- Energy requirements in construction permits (e.g. minimal quota of renewable energy)
- Promotion of energy intensive industry establishment (e.g. paper mill)
- Concession for usage of environmental energy resources (lake, groundwater)
- Concession for energy supply monopoly in a designed area
- Additional construction zone next to energy sources

Energy Plan of the City of Zurich



The Energy Plan of the City of Zurich is the basis for achieving the targets of Net-Zero until 2040

Energy Networks for heating and heating/cooling based on:



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The role of risk and risk management

The investment in District Energy Systemsis characterised by uncertainty:

- Energy supply
 - Uncertainty on resources (technical challenges, loss of waste energy)
 - Uncertainty on energy prices and systems (e.g. decreasing cost of decentralized systems)
- Network
 - Long depreciation duration of the thermal network (50 years)
- Energy demand
 - Uncertainty of demand (loss of key clients, new technologies, decreasing demand)

Typical mistakes

- Energy demand is overestimated
- Energy supply is not sustainable (loss of resources, e.g. waste energy)
- The risk of energy price changes is on the owner side (the business model depends on energy price development!)
- Contracts with clients are too short related to the depreciation duration of the investment
- No realisation in stages
- Additional clients will connect soon....

Hope is not a good adviser for building up District Energy Systems!

The role of risk and risk management

Key indicators for risk mitigation

Typical key indicators support the feasibility phase of the project and help to minimise risks:

- Energy density: Demand in kW per m length of network (heating: 1 or 1.5 kW/m)
- Financial stability: Degree of contracted energy demand at time of investment decision (75% of demand assured by signed contracts)

Business and price model



Shift energy price development risks to the clients

The role of utilities / investors



District Energy System based on wood incineration in the hospital area of the city of Uster. Investor: City owned energy utility «Energie Uster AG»

- District Energy Systems are an attractive and sustainable investment for utilities and other investors:
 - Long term financial benefit
 - Positive impact on the environment
- But:
 - Excellent preconditions are limited (fit of renewable energy source and energy demand).
 - Thoughtful planning is required.

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Best practice

District Energy Systems depend on

- Energy source
 - Environmental energy (air, lake/river, groundwater, waste water treatment)
 - Geothermal field (low temperature)
 - Waste energy (industrial process, waste incineration, Co-generation)
 - Geothermal (high temperature)
 - Combustion (Wood, fossil fuel)

- Energy demand
 - Cooling residential building
 - Cooling commercial (food industry, IT)
 - Warmwater
 - Heating
 - High temperature process energy (f.e. steam)

Various possibilities for District Energy Systems, depending on

- Temperature level (source and demand)
- Time of use (simultaneousness)
- Distance between source and demand



Best practice: Rotkreuz, Suurstoffi



- Target:
 - CO2-free heating and cooling of a new district with residential and commercial buildings
- Source of energy
 - Solar (PV) and environment (air)
- Technical aspects
 - Low temperature thermal network
 - Heatpump for cooling and heating
 - Storage of energy in the ground during sommer and recovery during winter (geothermal field)
 - Free cooling for regeneration of geothermal field (heating needs > cooling needs)
- Role of public institutions
 - Private investor, different building owners
- Special remarks

Best practice: City of Geneva



- Target
 - Heating and Cooling for public (f.e. United Nations), residential and commercial buildings
- Source of energy
 - Water from the lake (lower area; 8 degrees)
- Technical aspects
 - Non-isolated thermal network with cold water
 - Decentralized heatpumps for cooling and heating
- Role of public institutions
 - Owner of investor (SIG, city owned utility)
 - Energy plan for coordination and planning security
 - Construction permits with energy related requirments
- Special remarks
 - Realisation in stages over 10 to 15 years

Best practice: City of Zurich



- Target:
 - Heating (and cooling, 10%) for industries, commercial and residential buildings
- Source of energy
 - Waste heat from waste incineration
 - Wood incineration
- Technical aspects
 - Temperature of 110°
 - Cooling: possibility for decentralised use of hot water for cooling
- Role of public institutions
 - Owner: waste incinceration, energy utility
 - Coordinated planning
- Special remarks
 - Abandonment of gas supply in district heating areas within the next 15 years

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Investment based on public vote.

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Summary: Take home messages

- District Energy Systems with renewable energies are a precondition to achieve the Net-Zero emission target. There is no other choice than using renewable energies.
- Good opportunities for District Energy Systems are limited: Corresponding supply and demand of renewable energy / waste heat is a precondition. Take the existing chances!
- District Energy Systems should only be realised if there are advantages related to decentralized solutions.
- Numerous actors are involved (and depend on the energy resource of District Energy System): Identify and manage closely the key actors for building up Energy Networks.
- Public institutions are important enablers for District Energy Systems: An Energy Plan as
 planning instrument enables the use of localised energy resources and simultaneously assures
 planning certainty for public and private investors.
- Hope is not a good adviser for building up District Energy Systems: Risk management and a sustainable price / business model are key for the sustainability of investments. Thoughtful planning is required.
- Business opportunity: District Energy System are an attractive long term investment for public utilities and for private investors as well.



There is no other choice for our future than using renewable energies. District Energy Systems are an enabler for innovative

solutions based on

renewable energies.

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Impressum

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