DISTRICT ENERGY VENTURE

المؤتمر الدولي لتبريد وتدفئة المناطق

International District Cooling & Heating Conference

24th - 25th October 2017 | Ritz-Carlton Hotel - Doha, Qatar

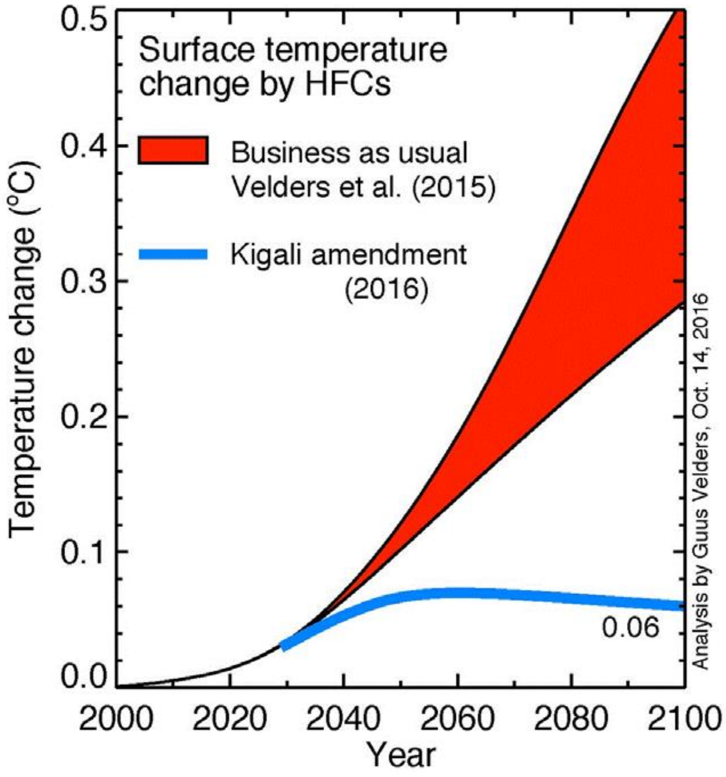
DISTRICT COOLING – BEST PRACTICE

Pär Dalin

President Devcco –District Energy Venture

Chairman of the Working Group District Cooling at Euroheat and Power

INTRODUCTION
-THE KIGALI AMENDMENT-



The Kigali amendment to the Montreal Protocol, November 2016:

-the global commitment to phase down HFC refrigerants-

1. Up to 0,5 °C from <u>HFC phase down</u> and
2. 0,5 °C due to <u>energy efficiency improvements</u>

- Total potential 0,5 – 1 degree C

District Cooling is recognized by UN to have a key role to meet both targets!

devcco™ DISTRICT ENERGY VENTURE

INTRO - THE DISTRICT COOLING IMPACT ON HFC PHASE DOWN

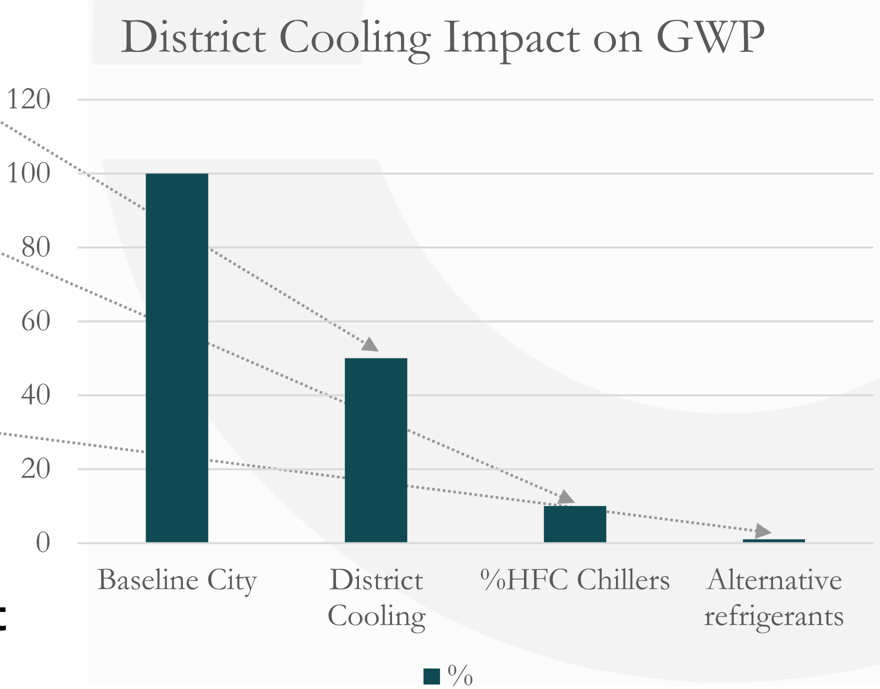
By introducing District Cooling in a city or a district with floor space of more that 500.000 sqm

- **Capacity reduction** with centralized system **-50%** due to; redundancy and simultaneously factor
- **Production mix**: Financially Optimized system

1. Free Cooling; non HFC base load
2. Heat driven absorption; non HFC base load
3. Large size chillers; 20-30% for peak capacity

- **Alternative refrigerant** with no or low GWP (ammonia, HFOs)
- **24/7 operation control** secure <2% annual leakage
- **Financially Feasible for >25% of AC market** in EU* , equal share for the global market, **WHY?**

1. 50% less investment in capacity
2. Additional investment in distribution grids (magnitude; equal to production)
3. 2-10 times more efficient than stand alone equipment



- ref. EHP-Ecoheatcool study

DISTRICT COOLING BEST CASE EUROPE

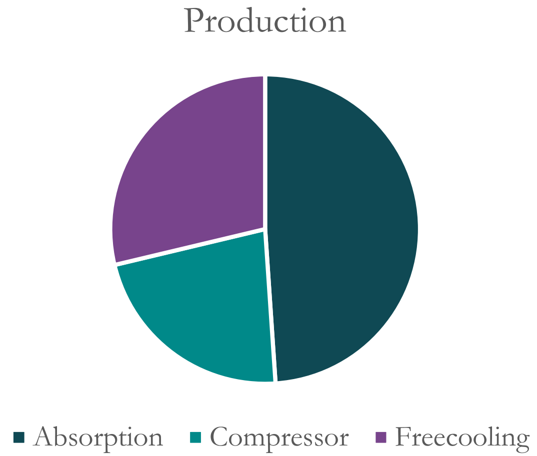
In 2017 Swedenergy (Swedish Energy Utility Association), DEVCCO (District Energy Venture) and Euroheat and Power has initiated a status survey of District Cooling in Europe with focus on energy efficiency performance and degree of HFC phase down.

Starting with Sweden, today the leading DC country in Europe with >25% market share

- 3 pilot best cases Sweden Q4-17
- EU - Key figure calculation models Q1,2 -18
- Europe best cases 2018
- Next step: extend to a Global survey with UN involvement

BEST PRACTICE– LINKÖPING, SWEDEN

Linköping



General Information

- Linköping is city in Sweden with 150.000 inhabitants.
- The first cooling delivery was made in 1997 in collaboration between the Tekniska Verken (the city energy utility) and Linköping University and triggered by the Swedish early phase out of R12&R22 (CFC&HCFC) and to make use of the summertime surplus heat
- In 2016 the network provided cooling solutions to 140 customers with a total demand of 55 MW (16.000 RT) with an output of total 100 GWh/year.
- Total investment is about 30 M€

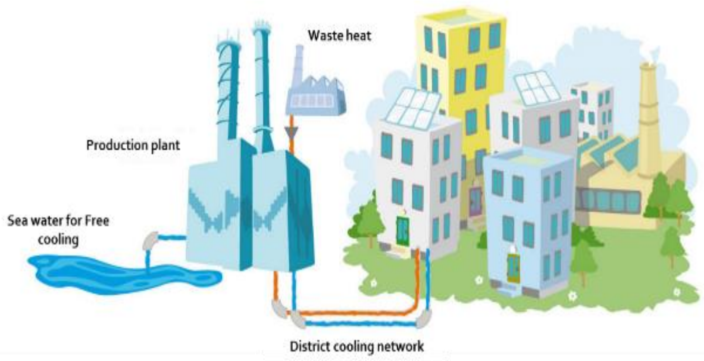
Key Figures

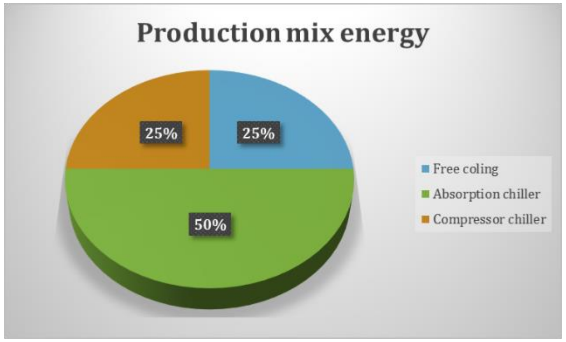
1. HFC phase down: 100%
2. Energy Efficiency: SSEER* = 10,7

*SSEER: Seasonal System Energy Efficiency Ratio

BEST PRACTICE– GOTHENBURG, SWEDEN

Gothenburg





General Information

- Gothenburg is city in Sweden with 570.000 inhabitants.
- The first decentralized cooling delivery was made in mid 90th triggered by the Swedish early phase out of CFC&HCFC and in 2007 these systems where integrated by a large-scale network in the entire centre of Gothenburg to improve efficiency and to be able to serve more customers
- In 2016 the network provided cooling solutions to 57 customers and 147 buildings with a total demand of 88 MW (25.000 RT) with an output of total 90 GWh/year.
- Total investment is about 80 M€

Key Figures

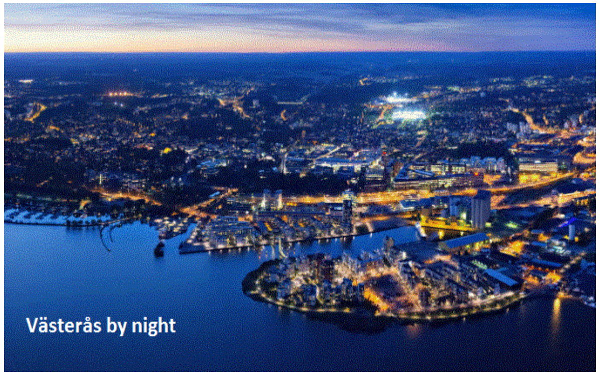
1. HFC phase down: >75%
2. Energy Efficiency: SSEER* = 9

*SSEER: Seasonal System Energy Efficiency Ratio

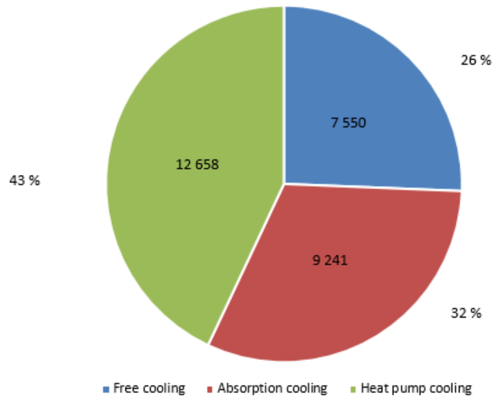
BEST PRACTICE– VÄSTERÅS, SWEDEN

MälarEnergi

Västerås



District cooling - Production mix MWh and %, 2013-2016



General Information

- Västerås is city in Sweden with 147.000 inhabitants.
- The first cooling delivery was made in 1992 and was initiated to take advantage of the cold waste water that is a byproduct of producing district heating from treated sewage and also triggered by the Swedish early phase out of CFC&HCFC and adding absorption chillers in 2002 to make use of the summertime surplus heat
- In 2016 the network provided cooling solutions to 72 customers with a total demand of 20 MW (6.000 RT) with an output of total 28 GWh/year.

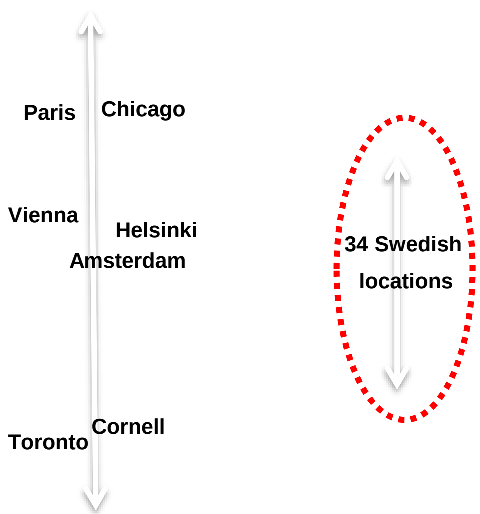
Key Figures

1. HFC phase down: >70%
2. Energy Efficiency: SSEER* = 6,5

*SSEER: Seasonal System Energy Efficiency Ratio

devcco™ DISTRICT ENERGY VENTURE

ENERGY EFFICIENCY MULTIPLES FOR DISTRICT COOLING/SWAC SYSTEMS



Project	Energy Efficiency multiple	Type
Reference	1	Conventional Chillers and Split systems
Lusail, Qatar	2	Centralised chillers
Västerås	3-4	MIX: heatpump cooling/absorption/lake free cooling
Gothenburg	4-5	MIX: chillers/absorption/sea water free cooling
Linköping	5-6	MIX: NH3 chillers/absorption/river free cooling
Stockholm, Sweden	5-6	MIX: heatpump cooling/sea water free cooling
	7-10	
Maldives	>10	SWAC (deep sea water cooling)

Thank You!

par.dalin@devcco.se