OPERATION OF DISTRICT COOLING SYSTEM IN COLD CLIMATES WITH EXISTING DISTRICT HEATING

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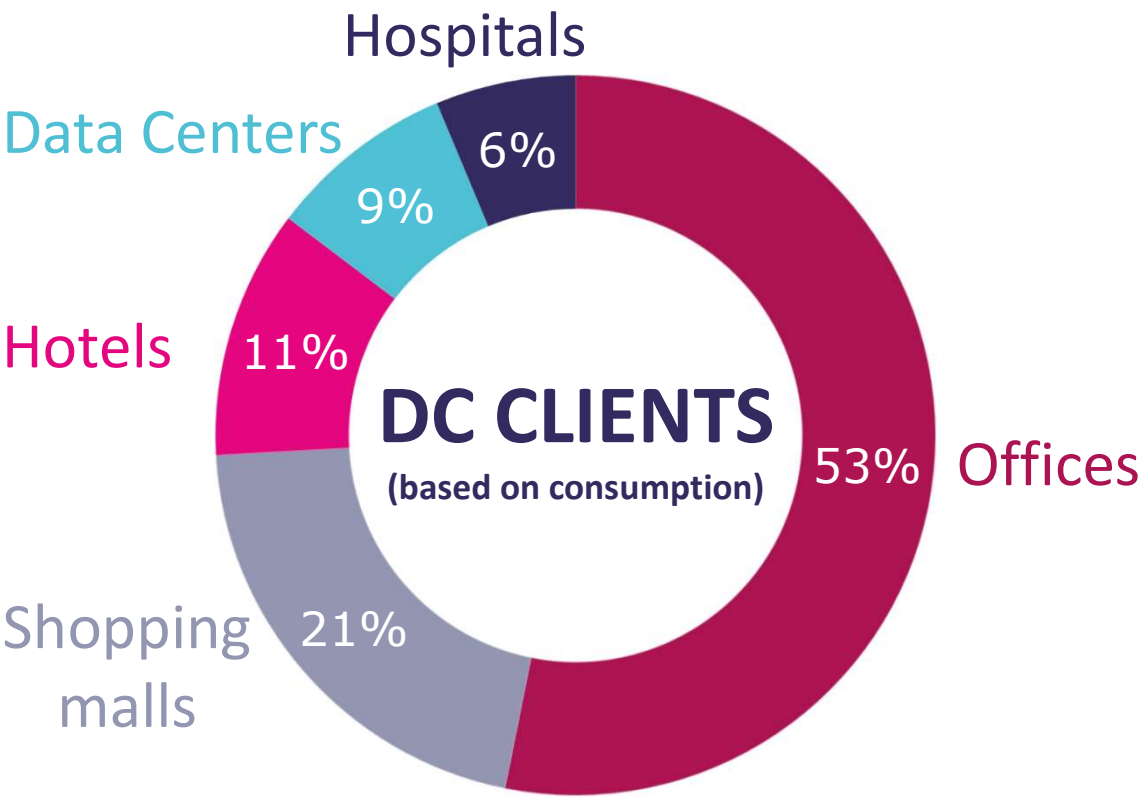
DISTRICT COOLING IN ESTONIA

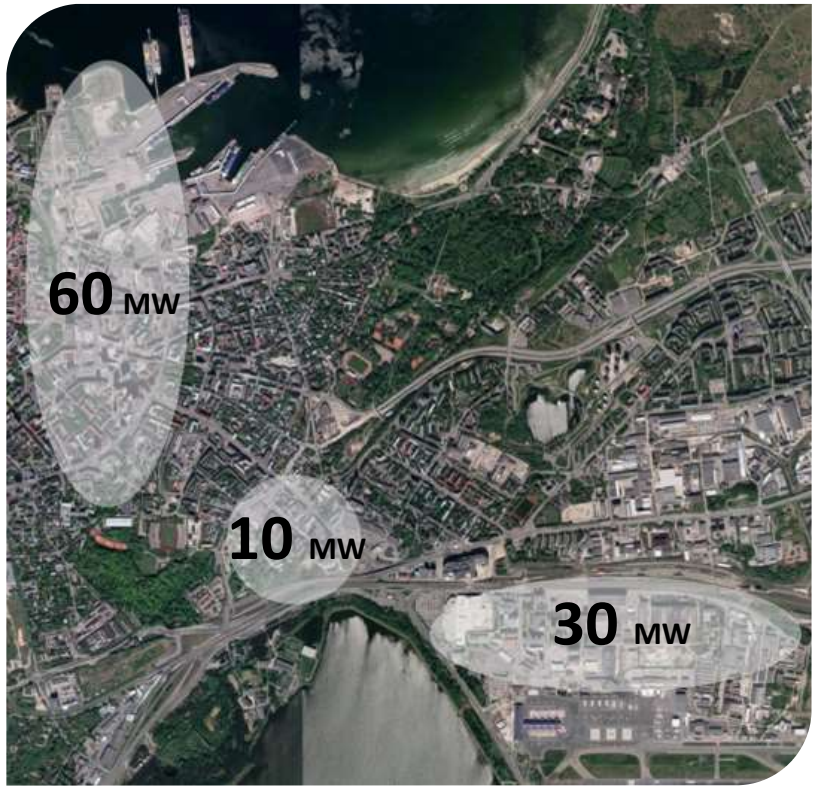
Tartu

Pärnu

Tallinn

3 DC REGIONS IN TALLINN





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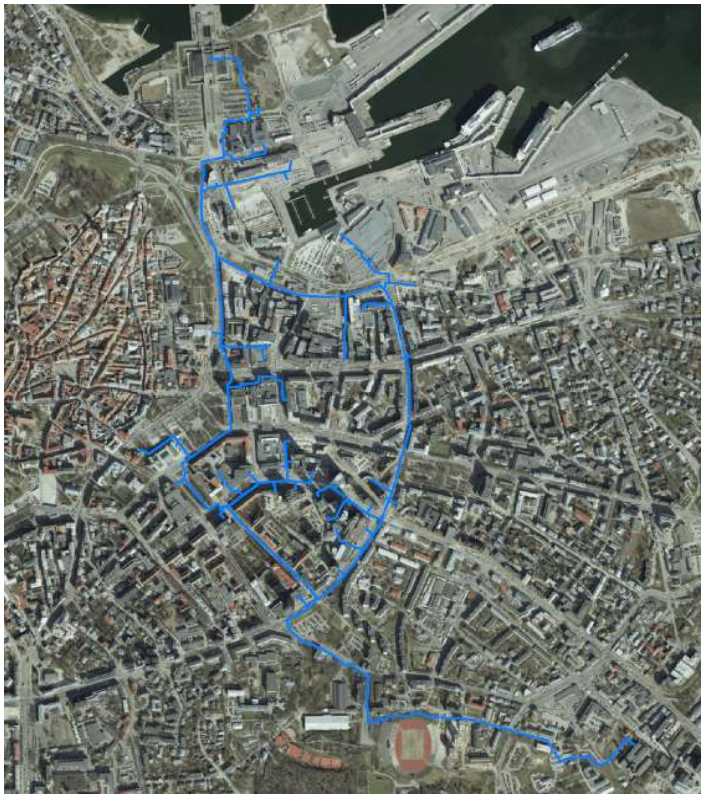
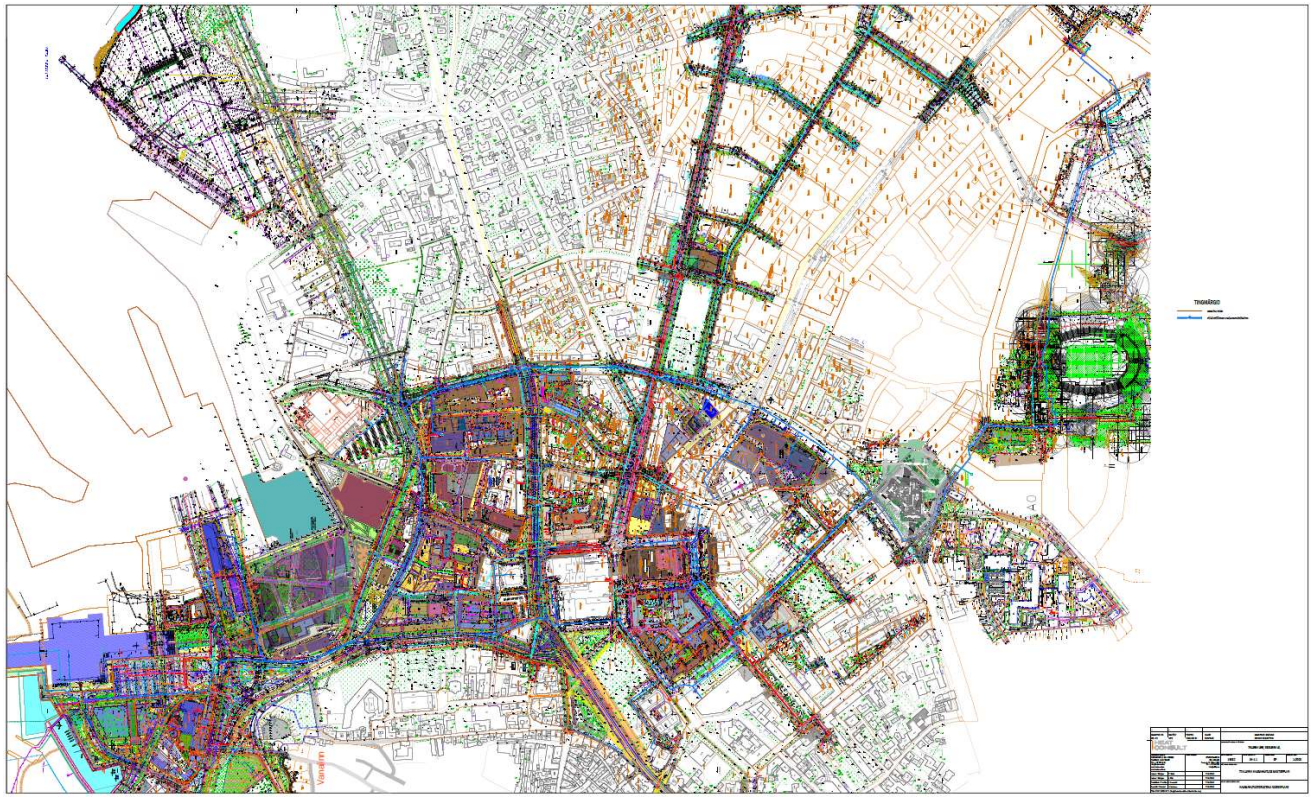
MASTERPLANS FOR ALL REGIONS

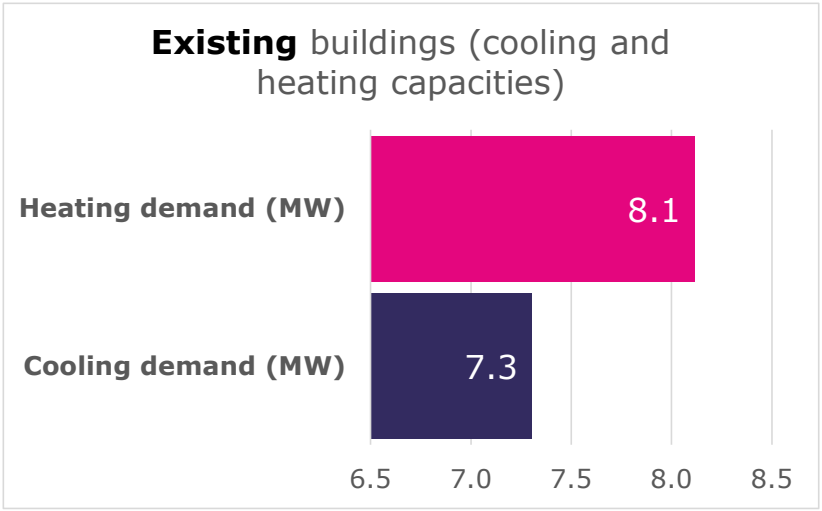


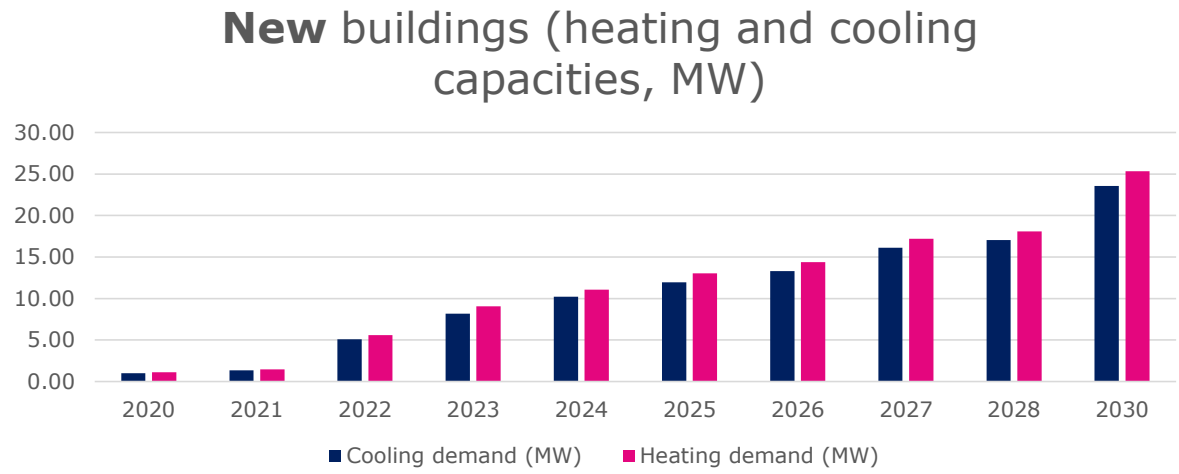


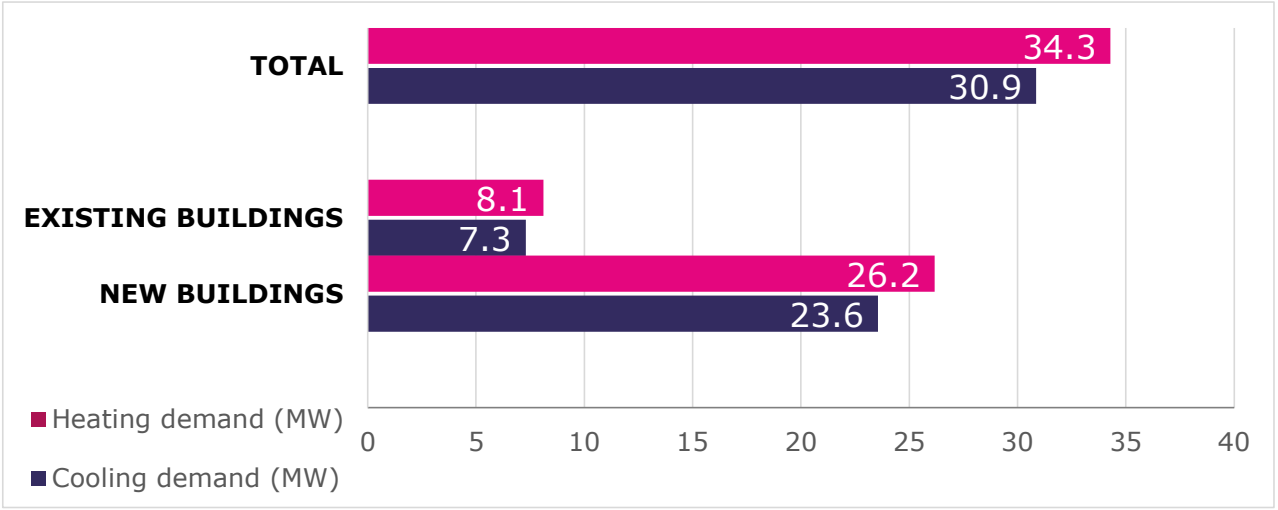
ÜLEMISTE CITY

Smart City – District Heating and District Cooling

CAPACITIES (EXISTING + NEW BUILDINGS)







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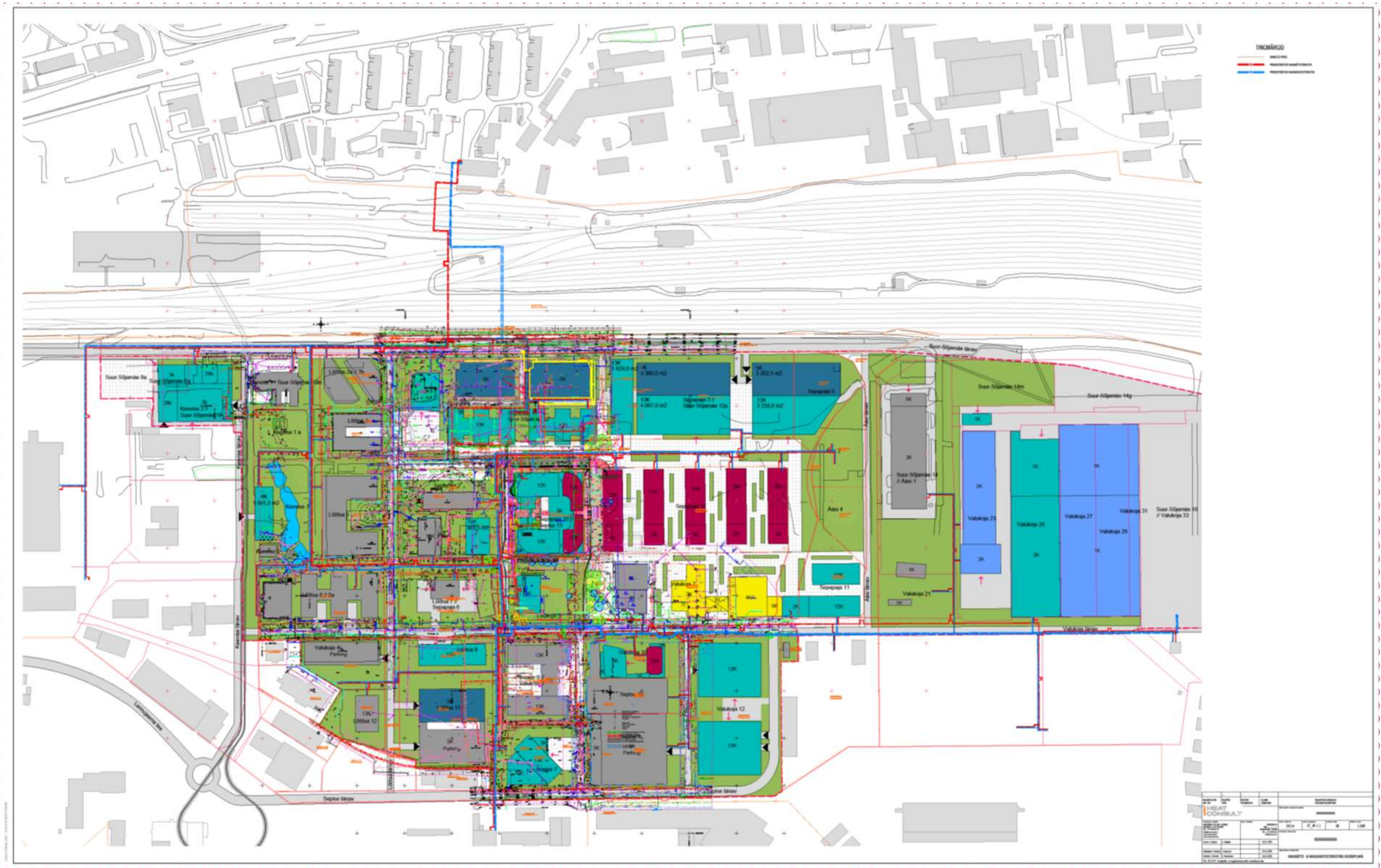
DESIGN PROJECT FOR HEATING AND COOLING



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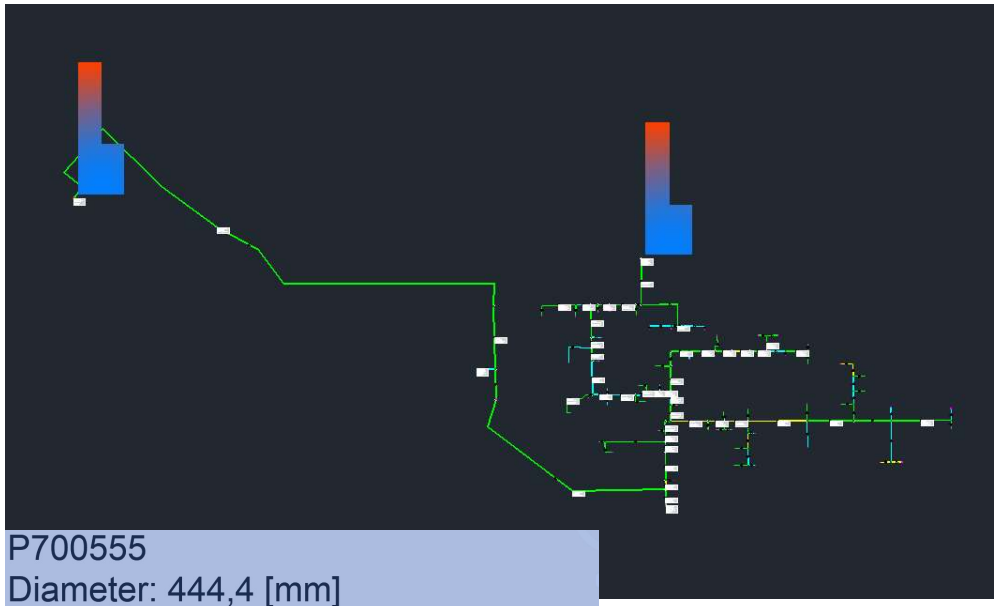
HYDRAULIC CALCULATSION FOR NETWORK PERFORMED



P700555
Diameter: 444,4 [mm]
Pressure gradient, supply: 39 [Pa/m]
Velocity, supply: 1,418 [m/s]
Flow, supply: 219,934 [kg/s]
Heat loss factor, supply: 0,52 [W/m/C]
Pressure loss, supply: 1,15 [kPa]

Cooling energy production:

Plant **nr 1** (total: **15** MW):

1. Heat Pump: 3,9 MW
2. Absorbtion Units: 11,1 MW

Plant **nr 2** (total: **75** MW):

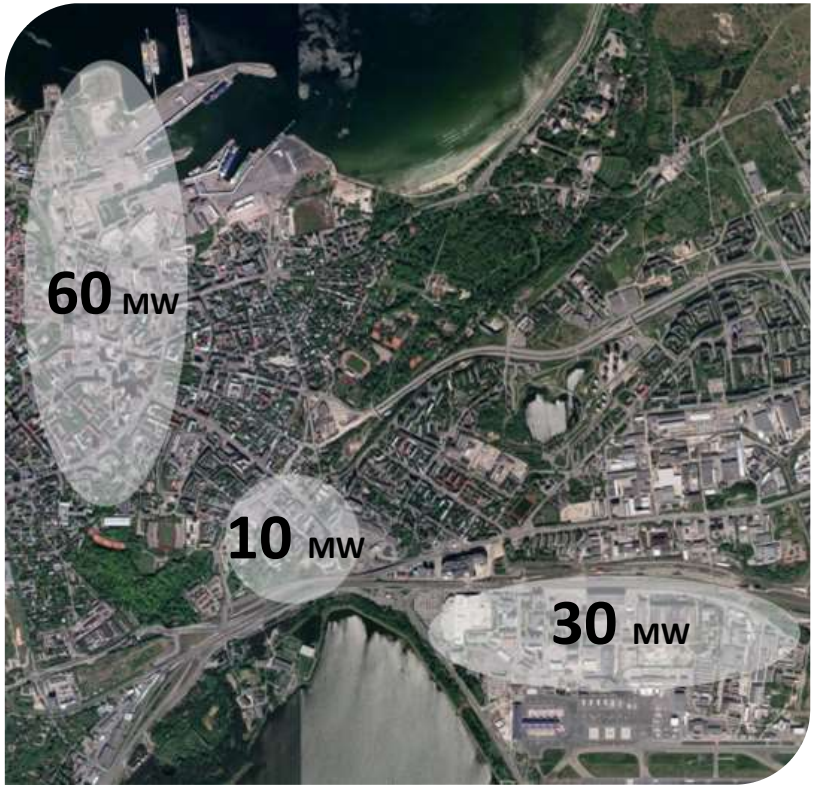
1. Chillers: 10 MW
2. Absorbtion Units: 65 MW

Future: interconnection with free cooling network

NB! For absorbtion devices heating energy is used which otherwise will be wasted (there are 3 CHP-s in Tallinn which use RES – biomass). CHP-s get subsides for RES electricity production

DIFFERENT SUPPLY SOURCES

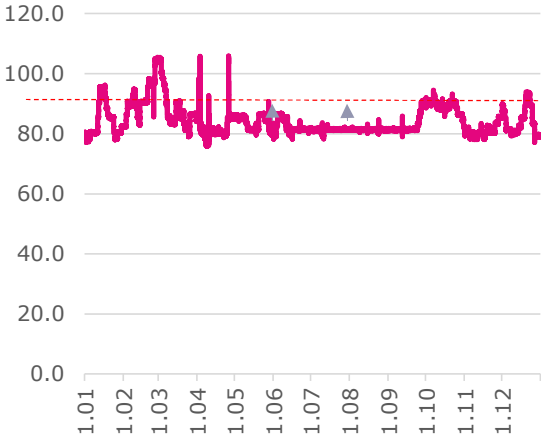
- **Absorption** devices **from existing HTDH network**;
- **Free cooling** from **Baltic Sea, Pae Lake, Ülemiste Lake**;
- **Heat Pumps**
- **Compressor Cooling**



MAJOR IMPACTS RELATED OF DC FOR ÜLEMISTE CITY

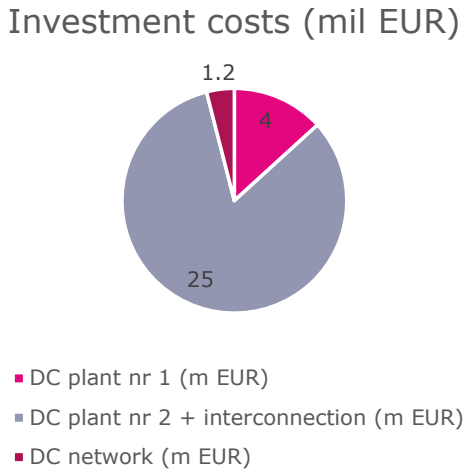
Heat losses in DH network will increase:

- Existing temperature in Tallinn DH network during the summer time: 70 ^{0}C
- Due to implementation of absorption devices the temperature should be increased up to 90 ^{0}C. Additional heating losses due to increased temperature: **4000 MWh** / month (price for DH production in Tallinn: 30 EUR/MWh)



Economics:

- DC plant nr 1: **4** mil EUR
- DC network (length 3 km): **1,2** mil EUR
- DC plant nr 2 + interconnection pipeline: **25** mil EUR
- DC price for the clients: energy ca **35** EUR/MWh + power fee + connection fee
- Payback time for the project: ca **10** years



2,5 times better primary energy efficiency

- Calculation assumptions: PEF for electricity: **2,0**, SEER for local cooling production devices is 4, so DC PEF is 0,5) and PEF for efficient district cooling is **0,2**.

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THANK YOU FOR YOUR ATTENTION!

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