District heating in EU

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22.04.2019

Kes ma olen?

Haridus

2010 TTÜ, soojusenergeetika (doktorikraad)
2011 TTÜ, tehnikaõpetaja (magistrikraad)
2013 TTÜ, ärikorraldus MBA (magistrikraad)

Töökogemus

2003 - 2011 Eesti Energia, Eesti Gaas, K-Projekt
2011 - ... Tallinna Tehnikaülikooli lektor
Õppetöö, teadustöö, lõputööde juhendamine
2011 - ... HeatConsult OÜ
Insener-projekteerimisbüroo

Kutsetunnistused

2013 Euroopa Insener (EUR ING) - nr. 32181
2012 Rahvusvaheline insenerpedagoog (IGIP) - nr. EE-34
2010 Nominant Vabariigi Presidendi noore teadlase teaduspreemiaks
2009 Volitatud soojusenergeetikainsener - VIII tase, nr. 096048

Muu tegevus

Eesti Gaasiliidu juhatuse liige, TTÜ spordinõukogu liige, ESTISe hindamiskomisjoni liige, Eesti Maletoetusühingu nõukogu liige, Maleakadeemia Vabaettur juhatuse liige

Mis energialiike me kasutame?

Eesti / Euroopa Liit

- Elektrienergia
- Transport
- Soojusenergia
  Küte, soe vesi, tööstus
- Jahutusenergia
  Jahutus, tööstus

Soojusenergia osakaal on suurim

Europe consumes **half of it's energy** for heating and cooling puproses.
Most of this thermal energy is used in buildings and industry.

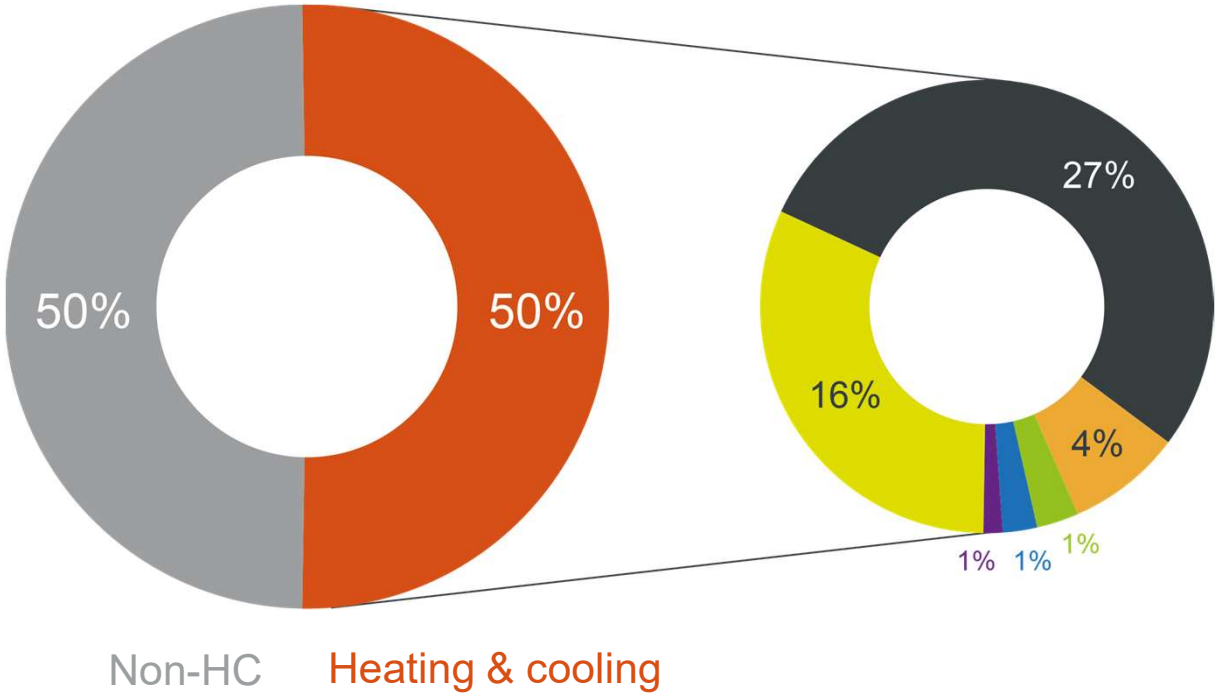
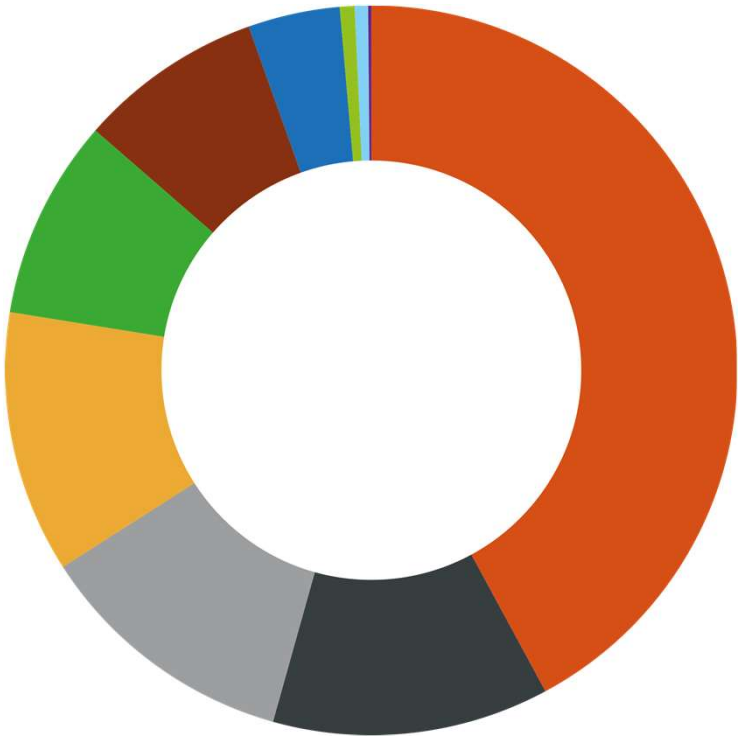


Figure 1:
Total final energy in 2015 (EU28)

Figure 2:
H&C final energy by end-use in 2015 (EU28)

Allikas: Heat Roadmap Europe

Kütuste jaotus soojusenergia tootmiseks



42%	Gas
12%	Oil
12%	Biomass
12%	Electricity
9%	District heating
8%	Coal
4%	Others (fossil)
1%	Solar thermal
0%	Heat pumps
0%	Others (RES)

Most of the thermal energy is produced from **fossil fuels (66%)** and **only 13%** comes from **renewable energies**. Electricity and district heat together suppy 21% of heat, which my or may not be renewable, depending on local circumstances.

Figure:
H&C final energy by energy carrier in 2015 (EU28)

Allikas: Heat Roadmap Europe

Vaid Malta ja Küpros omavad suure jahutusenergia osakaalu

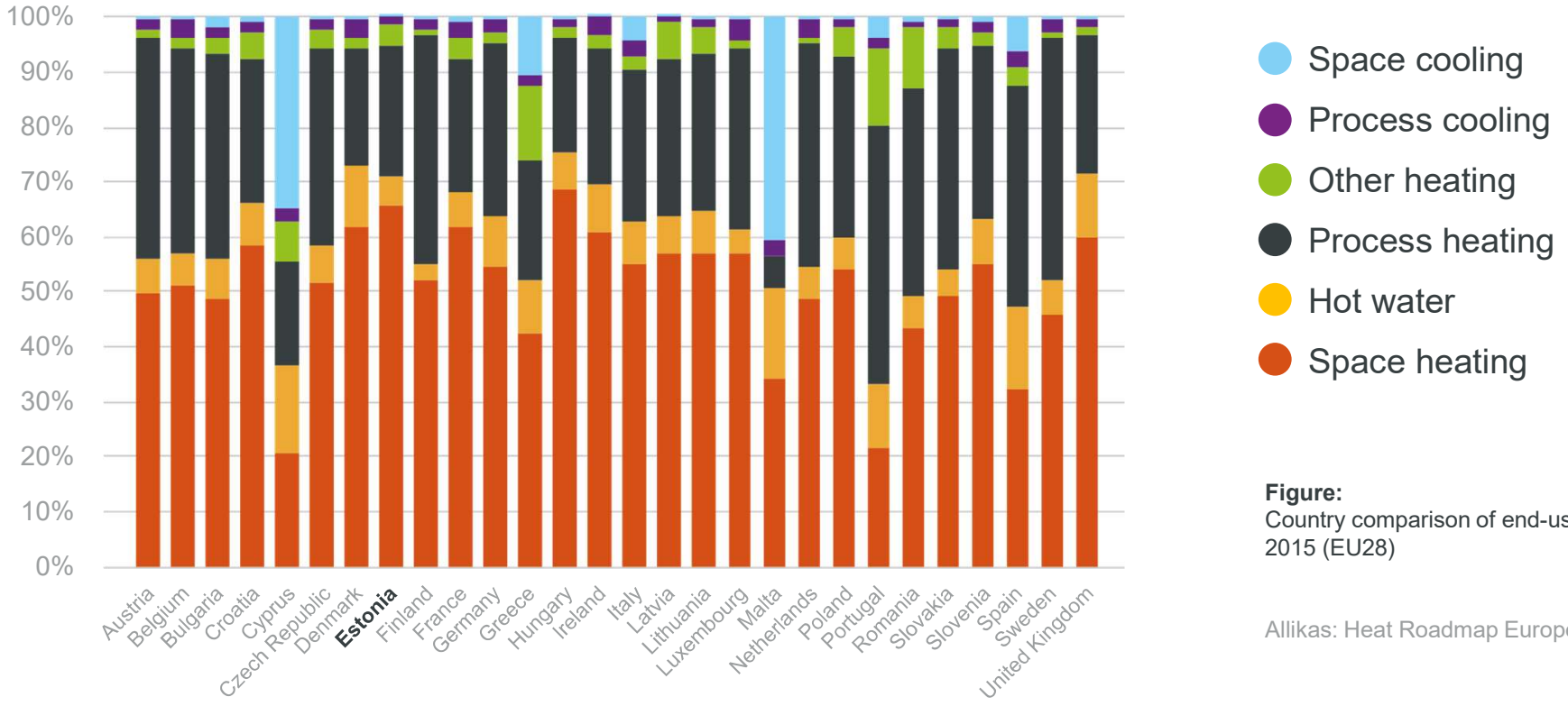


Figure:
Country comparison of end-use in 2015 (EU28)

Allikas: Heat Roadmap Europe

EU planeeritud meetmed soojusenergia valdkonna dekarboniseerimiseks

Everywhere	Urban Areas	Rural Areas
Heat savings	District Heating Networks	Primarily Electric Heat Pumps
Balance Savings vs. Supply	High Density Areas	Smaller Shares of Solar Thermal & Biomass Boilers
30-50% of Total Heat Demand	40-70% of Total Heat Demand	30-60% of Total Heat Demand

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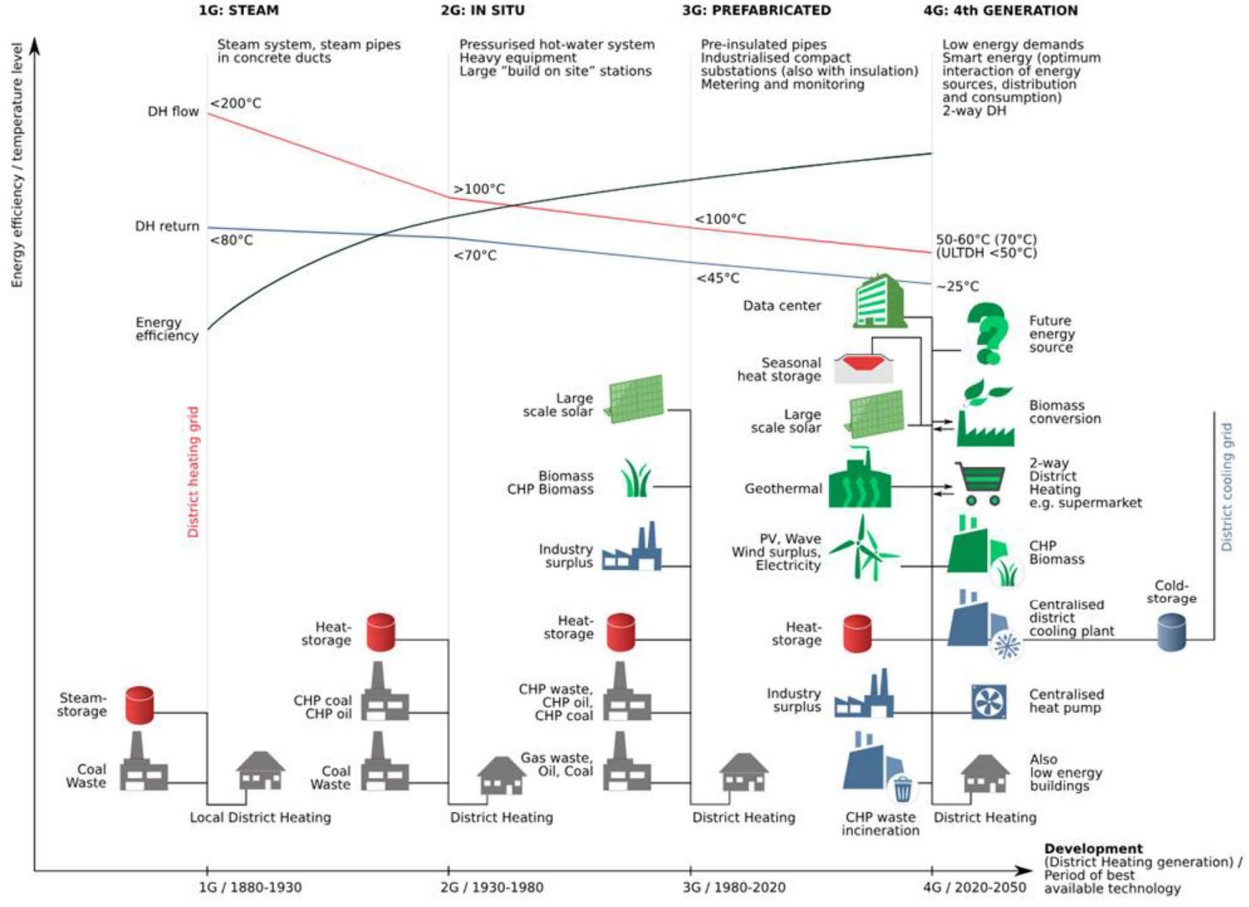
Kaugkütte põlvkonnad (1, 2, 3, 4)



Allikas: Ajakiri „Energies“

Kas 5 põlvkond on ka tulemas?

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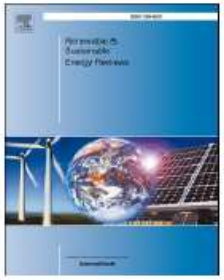

5th generation district heating and cooling systems: A review of existing cases in Europe

Simone Buffa[a,b,*], Marco Cozzini[a], Matteo D'Antoni[a], Marco Baratieri[b], Roberto Fedrizzi[a]

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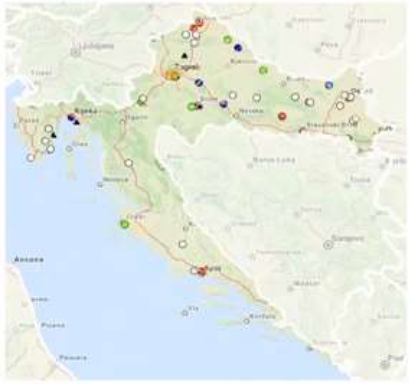
[b] Faculty of Science and Technology, Free University of Bolzano, Piazza Università 5, Bolzano 39100, Italy

Allikas: Ajakiri „Renewable & Sustainable Energy Reviews"

Kaugküte osakaal

Czech Republic 40% (15%)



Croatia 40% (25%)

Majanduslikult otstarbekas %
(olemasolev %)

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Italy 60% (<5%)

Romania 40% (20%)

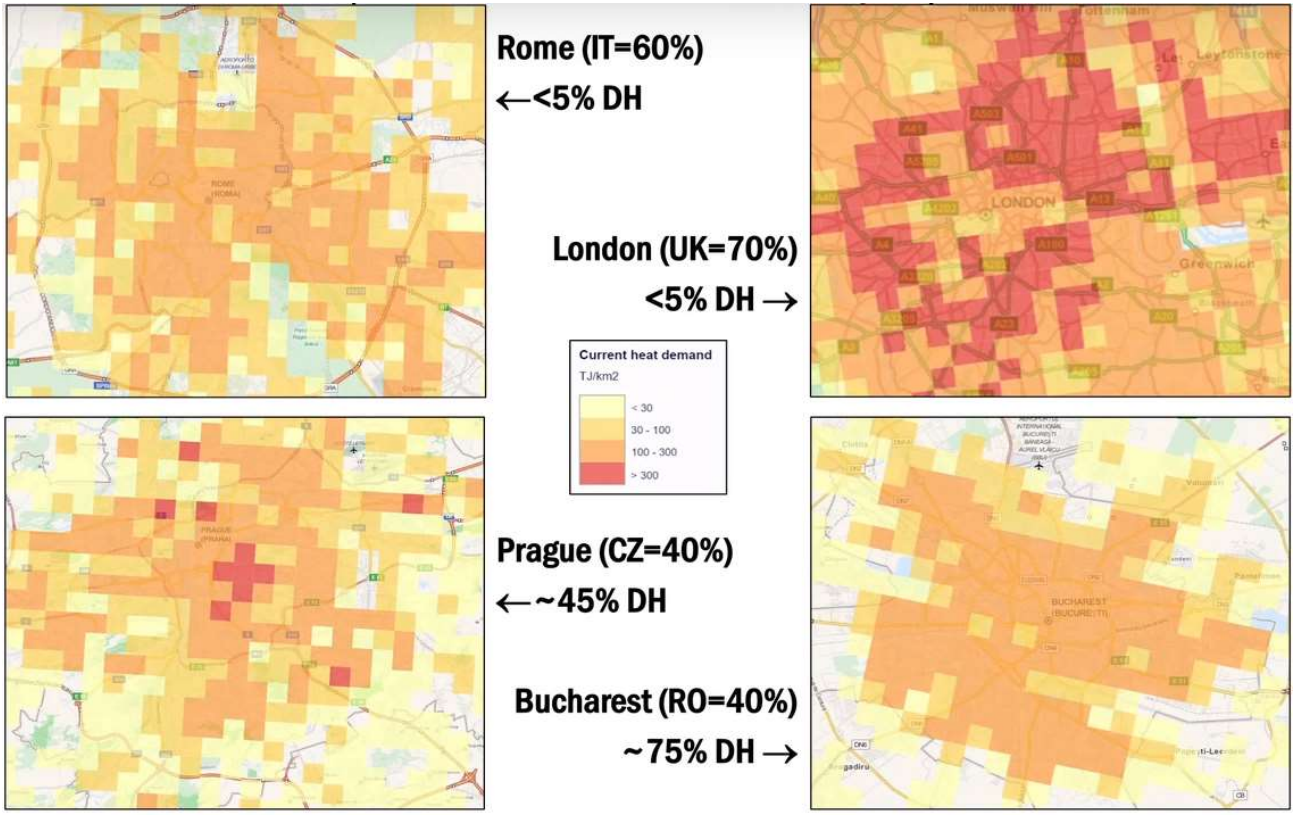
United Kingdom 70% (<5%)

Europa-Universität Flensburg

HALMSTAD UNIVERSITY

AALBORG UNIVERSITY
DENMARK

Kus on kaugkütte arendamise potentsiaal?

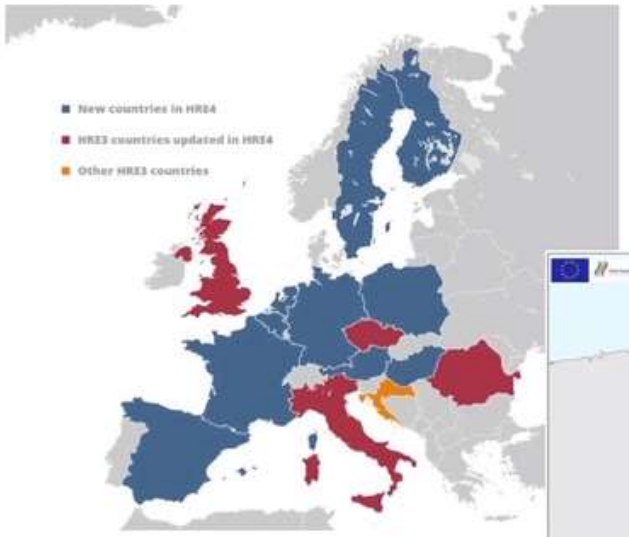


Allikas: Heat Roadmap Europe

www.heatroadmap.eu/peta4.php

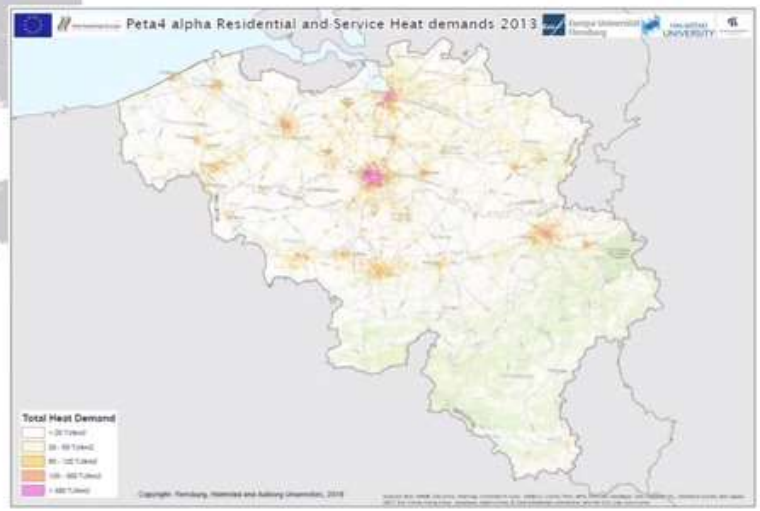
14 EU liikmeriiki on kaardistatud kaugküte potentsiaali osas

- Belgium
- Czech Republic
- Germany
- Spain
- France
- Italy
- Hungary
- Netherlands
- Austria
- Poland
- Romania
- Finland
- Sweden
- United Kingdom



14 Largest Countries by Heat Demand = 90% of EU Heat

www.heatroadmap.eu



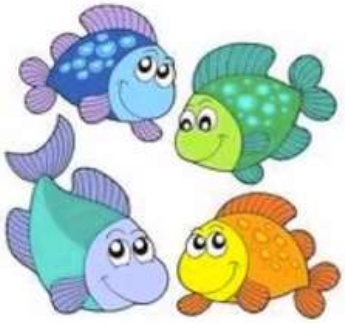
Allikas: Heat Roadmap Europe

Mis energia on väärtuslikum? Elekter / Soojus ?!

Current situation for Many EU Power Plants

Electricity Market
€40/Mwh

Fish Market
€0/Mwh



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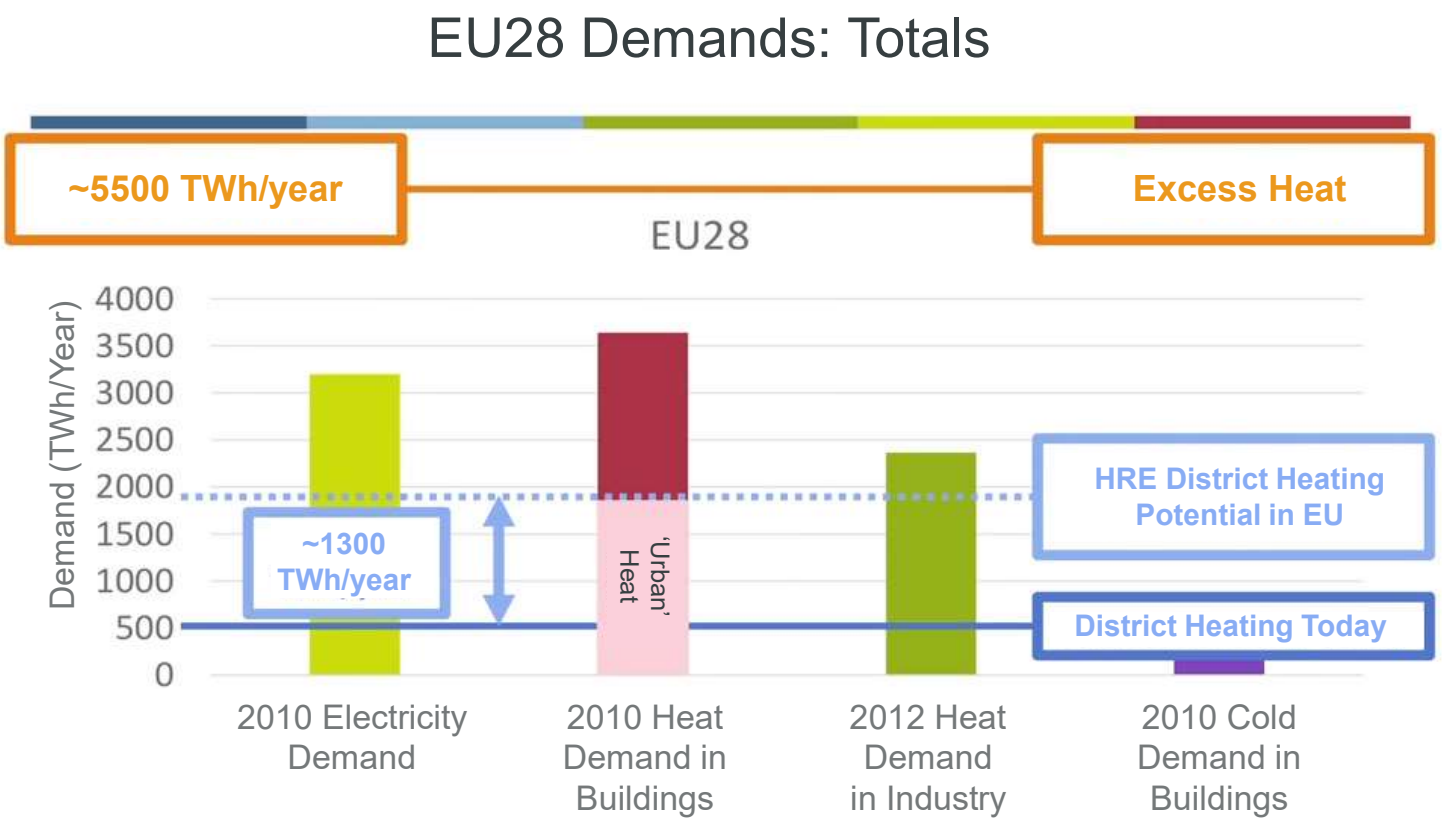
Jääksoojuse potentsiaal EU-s



Allikas: Heat Roadmap Europe

Elektrienergia / Soojusenergia maksumus

Electricity: Coal Power Plant **vs.** **Heat: Gas Boiler**

~€40/MWh

~€60/MWh

Allikas: Heat Roadmap Europe

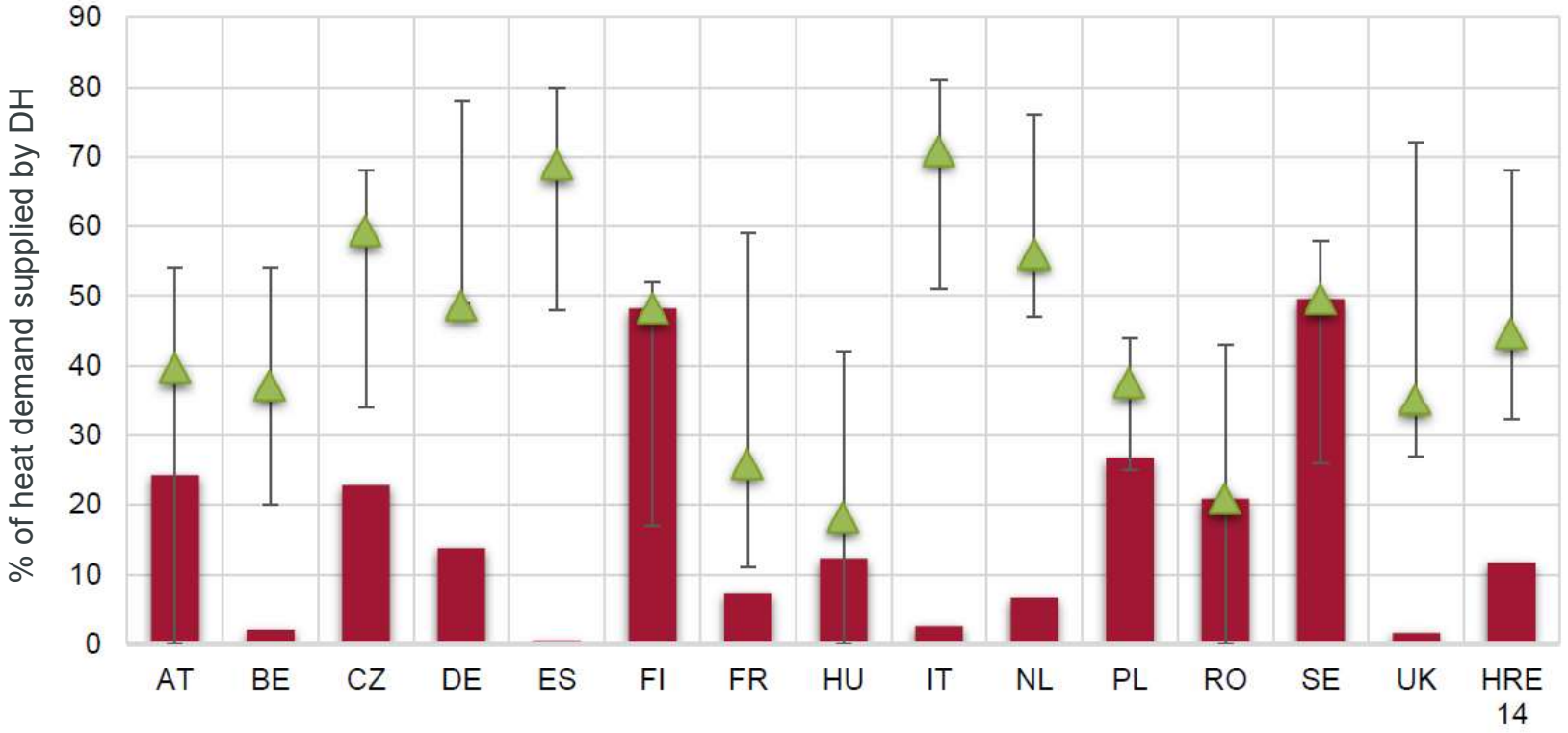
Meeletu potentsiaal kaugküte arendamiseks EU-s?!

Electricity Market
€40/Mwh

Heat Market
€30/Mwh

Allikas: Heat Roadmap Europe

Kaugkütte võimalik osakaal EU riikides

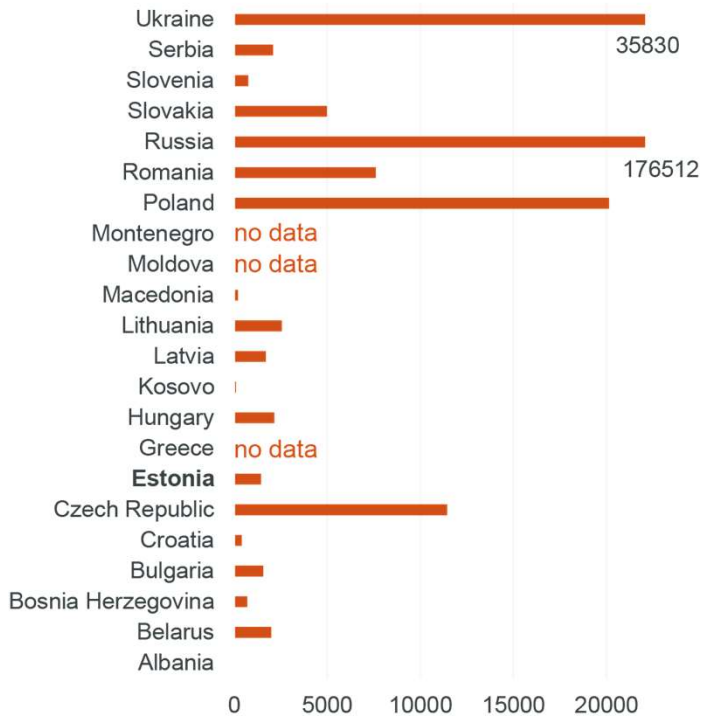


Allikas: Heat Roadmap Europe

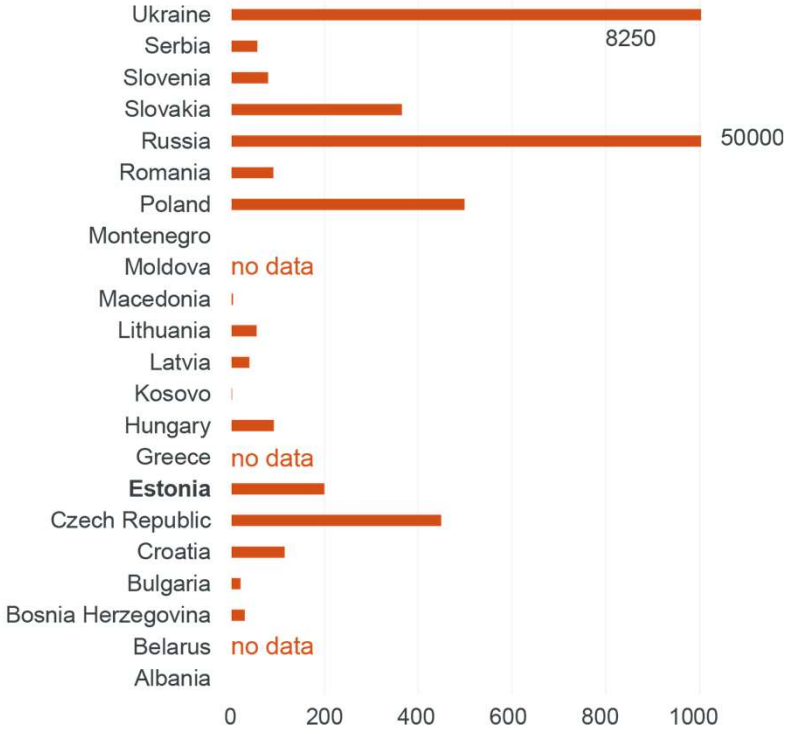
Kaugküte Ida Euroopas

Status of district heating in Eastern Europe

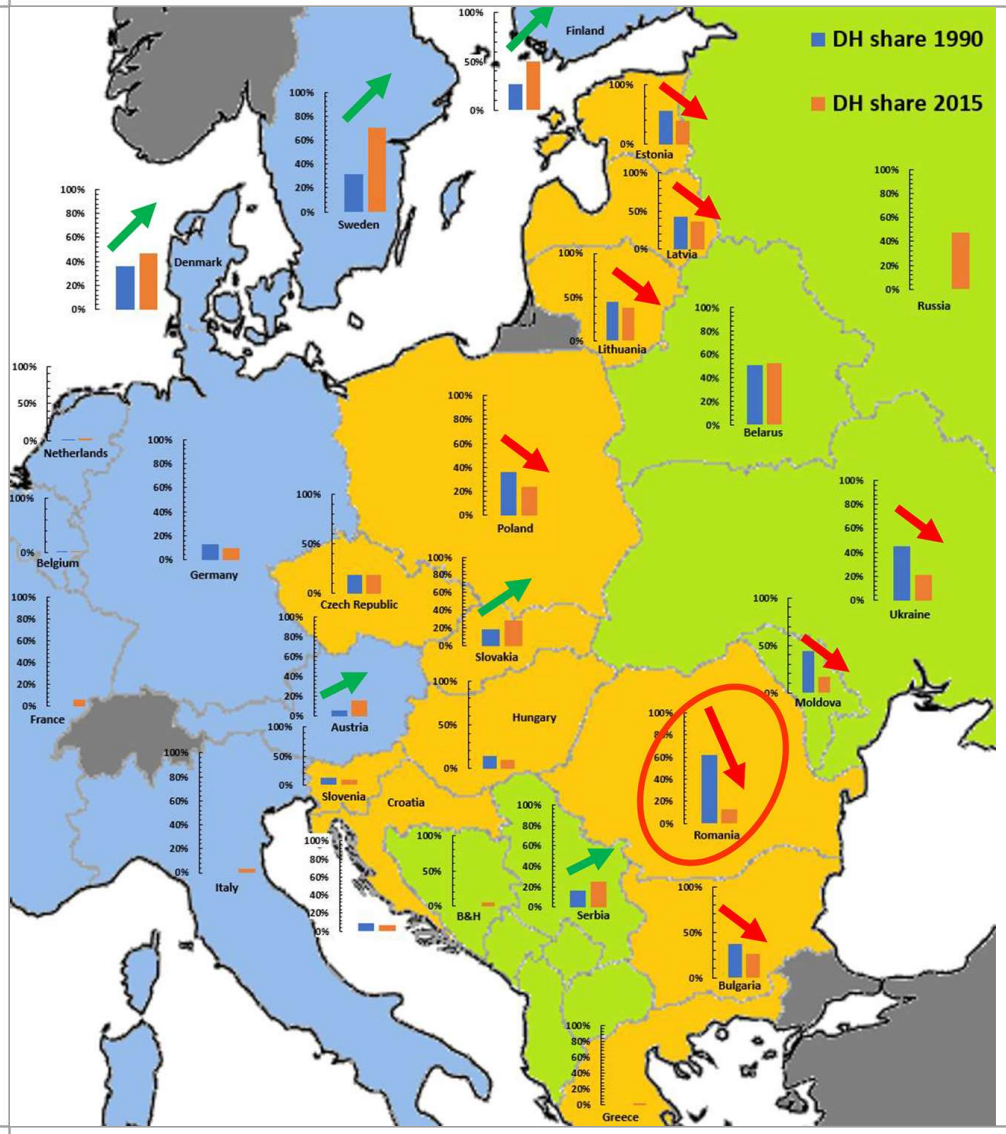
DH network length (km)



Number of DH systems



Allikas: 4th International Conference on Smart Energy Systems and 4th Generation District Heating



Kaugküte Euroopas 1990 vs 2015

Kaugküte osakaalu muudatus

- Ida Euroopa riikides suur kukkumine gaasi tõttu
- Rumeenia DH kaotus üks suuremaid

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Miks kaugküte (veel) ei arene EU-s?

- Heating is complex
- Heating is local
- Heating is long term
- Lack of knowledge
- Heat savings and district heating have large investment costs
- Heating is cultural, ownership problems and profit margins

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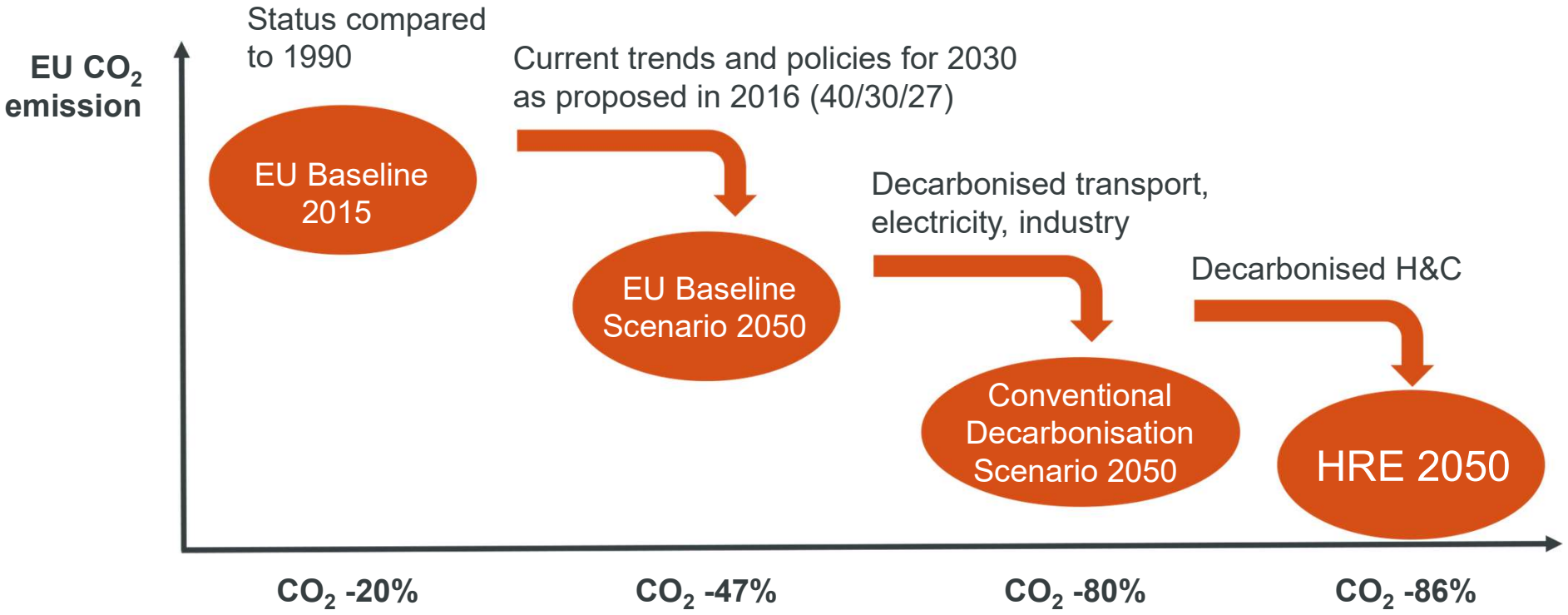
Kaugküte abiks CO_2 heitmete vähendamisel



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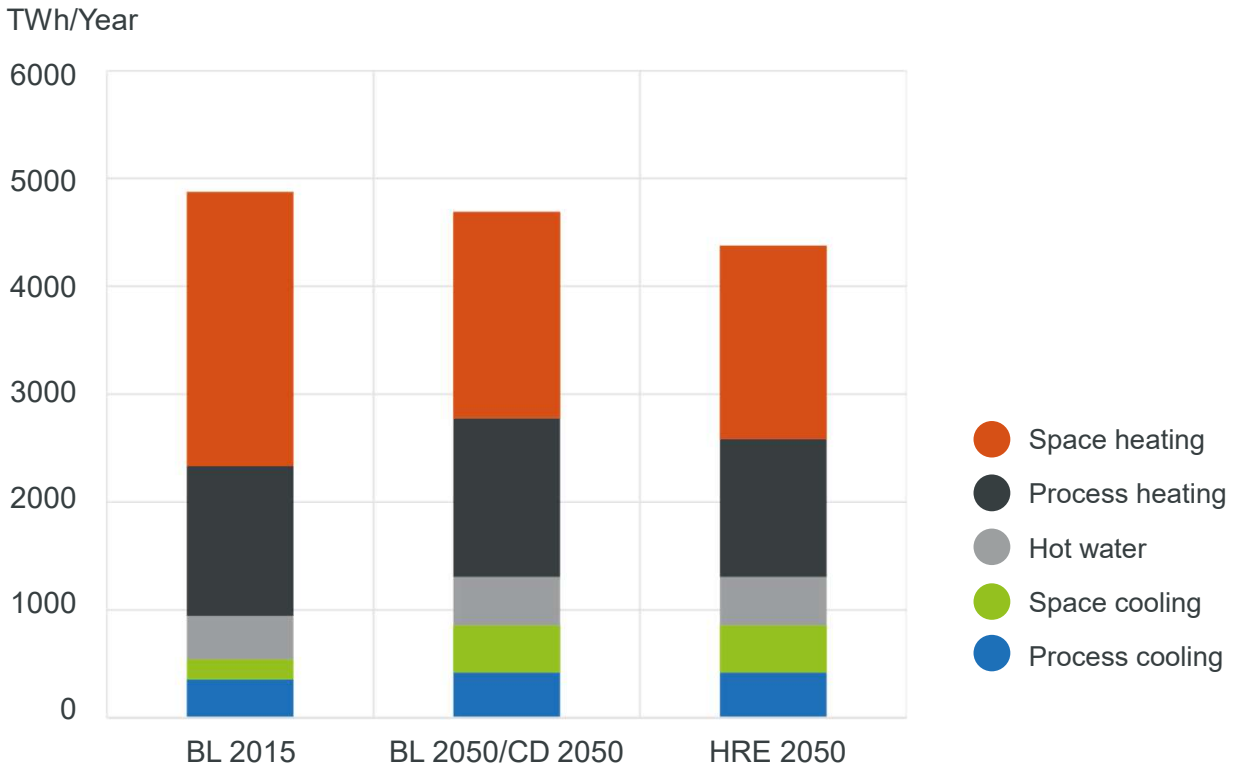
Soojusenergia vajadus 2050

Development of thermal demands

- Total of 30% reduction in space and hot water demand
- More than current EU policy
- Combining refurbishment and new efficient buildings
- Cooling demands expected to increase



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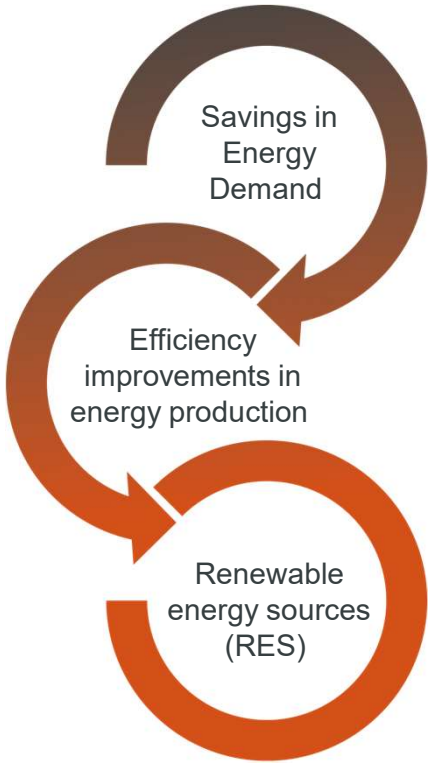
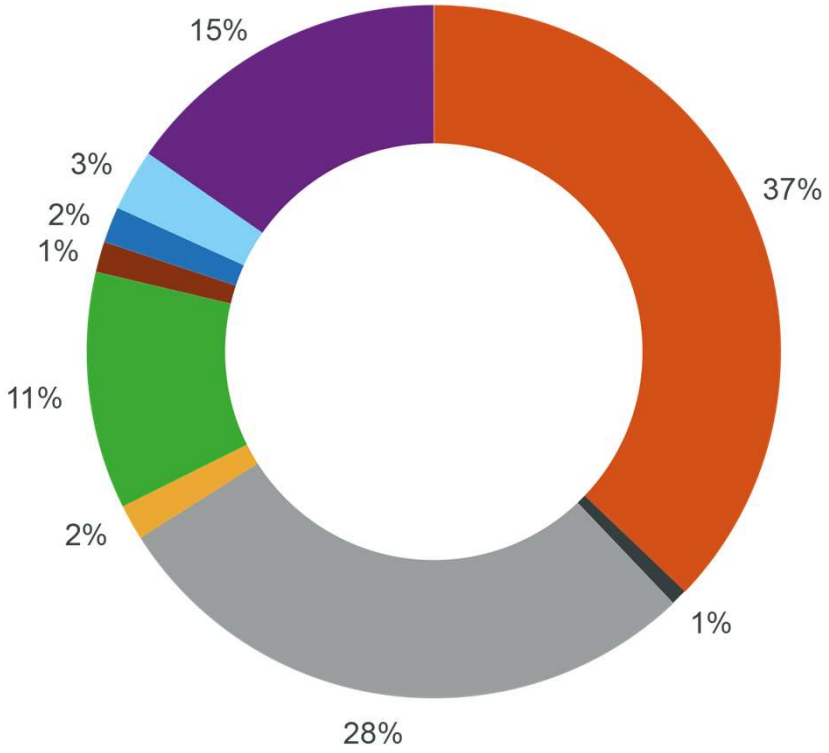
Kaugküte ja soojuspumbad (2050)

Heat pump & district heating shares of heat market

- Building HPs
  - Increase in share from 1% to about half of the heat market mainly in rural areas
- DH supply
  - Increase from 12% to cover the other half of the heat market mainly in urban areas
- Individual fuel boilers and electric heating for heating should be limited as far as possible
- All natural gas boilers are phased out

Kaugküte allikad aastal 2050





District heating source shares in HRE4 2050

37%	CHP plants
1%	Geothermal
28%	Heat pumps
2%	Solar thermal
11%	Industrial excess
1%	Electric boilers
2%	Fuel boilers
3%	Waste incineration
15%	Fuel production heat recovery

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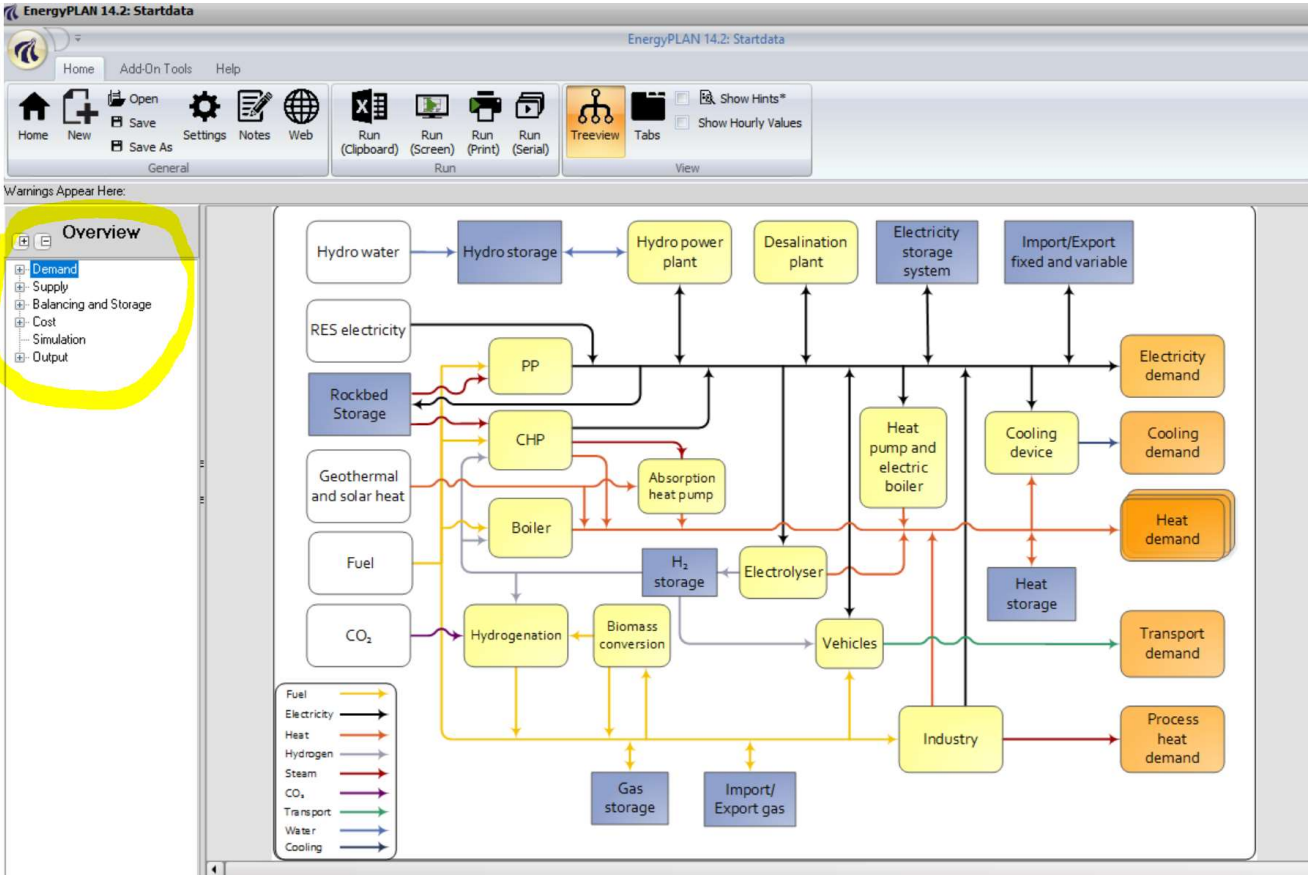
Kaugküte aitaks kaasa energiasüsteemi tasakaalustamiseks

Energy Storage Comparison

Allikas: Heat Roadmap Europe

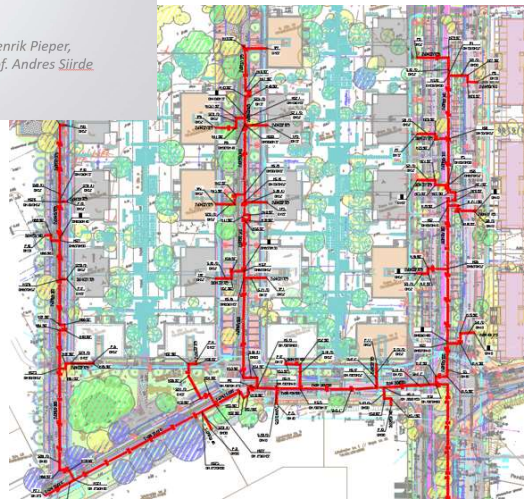
Tarkvara EnergyPLAN abiks

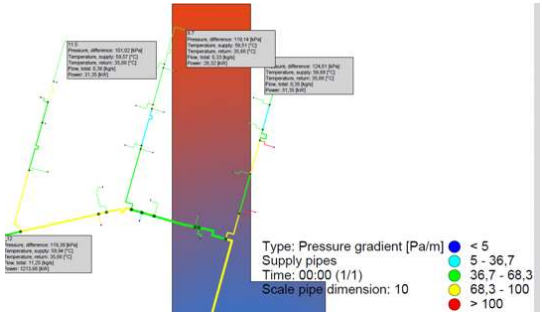


Allikas: EnergyPLAN

HeatConsult panus kaugkütte valdkonna arendamiseks

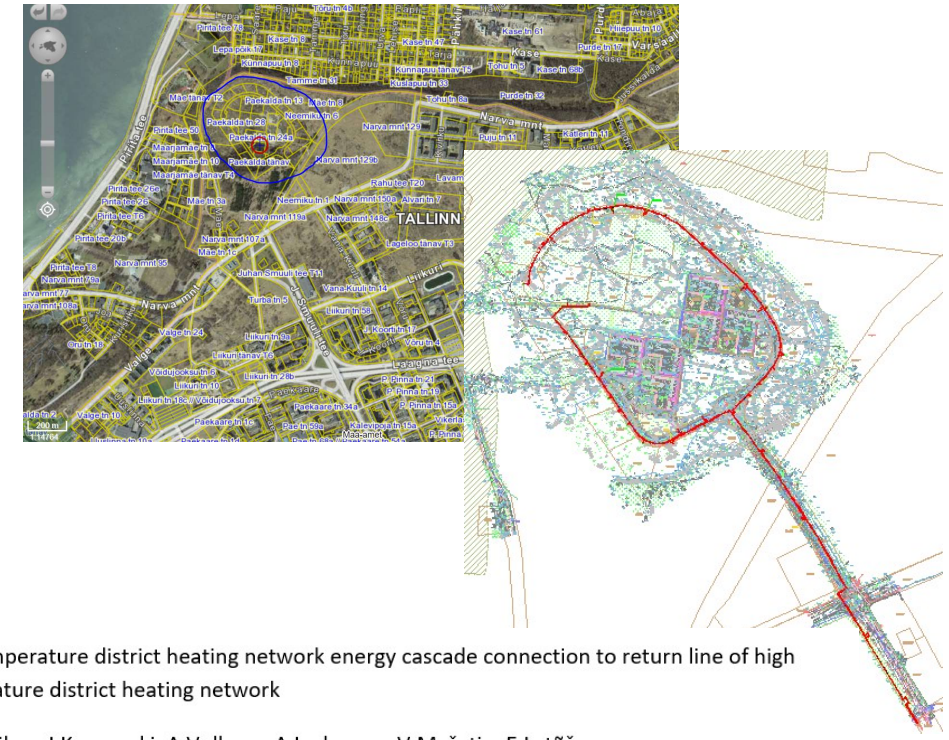
- Kopli liinide piirkonna kaugküttevõrk projekteeritud temperatuurigraafikule 60/35
- Soojusenergia allikaks: 1.etapp lokaalne gaasikatlamaja, 2.etapp merevee soojuspump
- Soojuskaod ca 40% väiksemad võrreldes kohaliku soojusvõrgu temperatuurigraafikuga 95/55





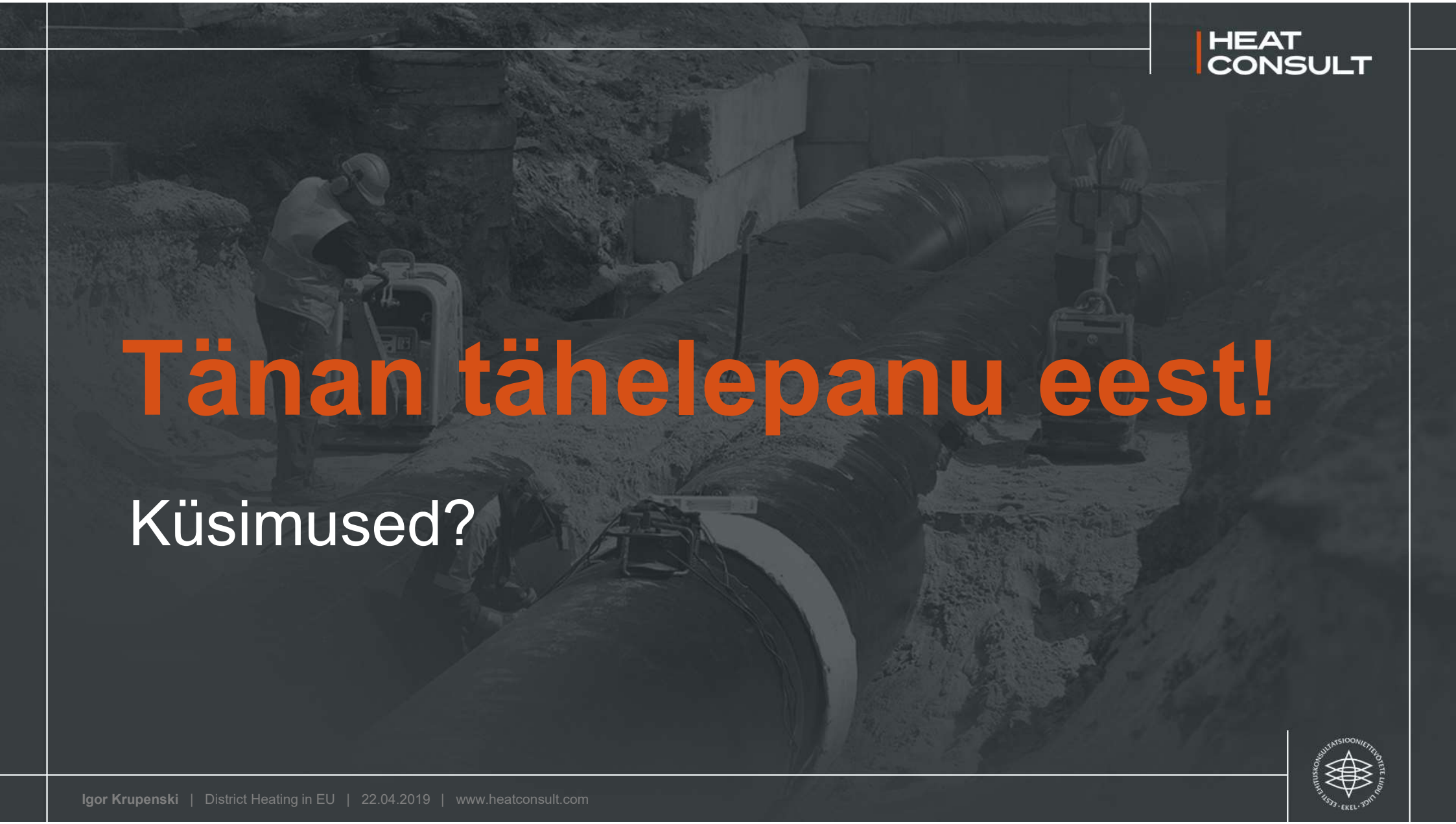
HeatConsult panus kaugkütte valdkonna arendamiseks

- Uus projekt: Paekalda piirkonna kaugküttevõrgu arendamine (60/35) tagasivoolu liinilt (118/70)
- Teadusartikkel „*Low temperature district heating network energy cascade connection to return line of high temperature district heating network*“



Low temperature district heating network energy cascade connection to return line of high temperature district heating network

A.Hlebnikov, I.Krupenski, A.Volkova, A.Ledvanov, V.Mašatin, E.Latõšov



Tänan tähelepanu eest!

Küsimused?