

Kaugkütte valdkonna tulevikutrendid, uued tehnoloogiad ja lahendused kaugküttes

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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 - 8 tase

Muu tegevus



ESTIS-e kutsekomisjoni esimees, Eesti Gaasiliidu juhatuse liige, TalTech spordinõukogu liige, Eesti Maletõetusühingu nõukogu liige, EOK maletreenerite kutsekomisjoni esimees

Mis energialiike me kasutame?

Eesti / Euroopa Liit



Elektrienergia



Transport



Soojusenergia

Küte, soe vesi, tööstus

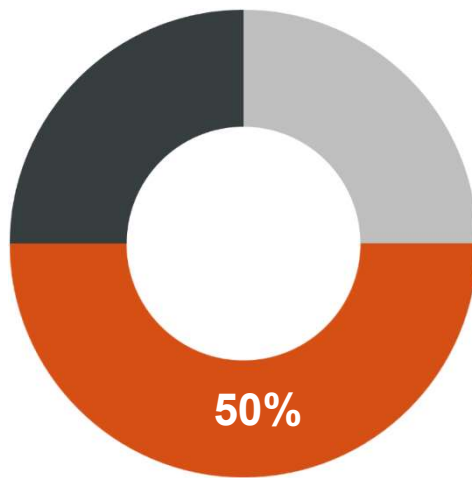


Jahutusenergia

Jahutus, tööstus

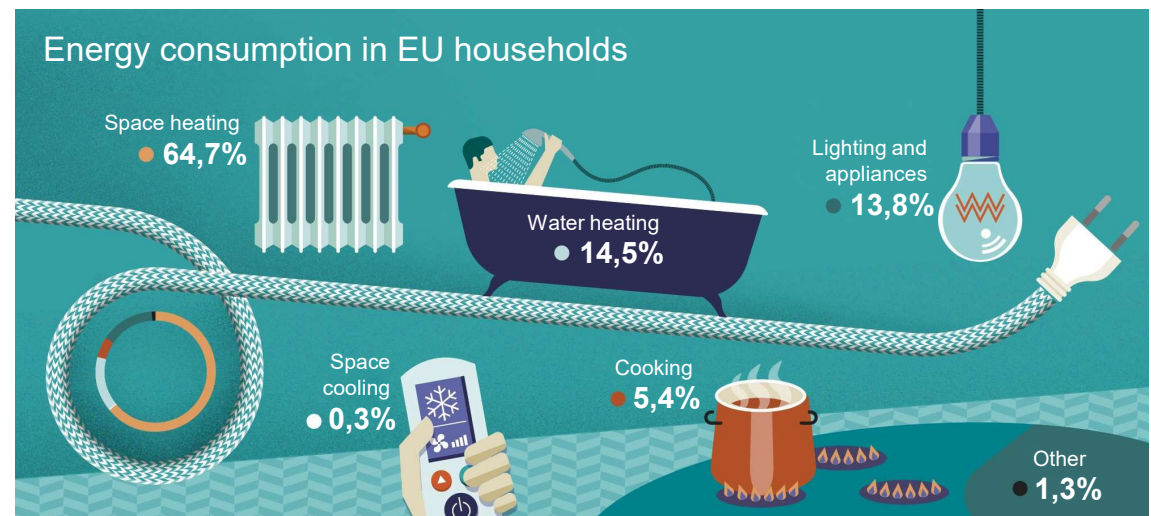
Energia kulu kodumajapidamistes

Heating & Cooling represents **50%** of the EU total annual energy consumption



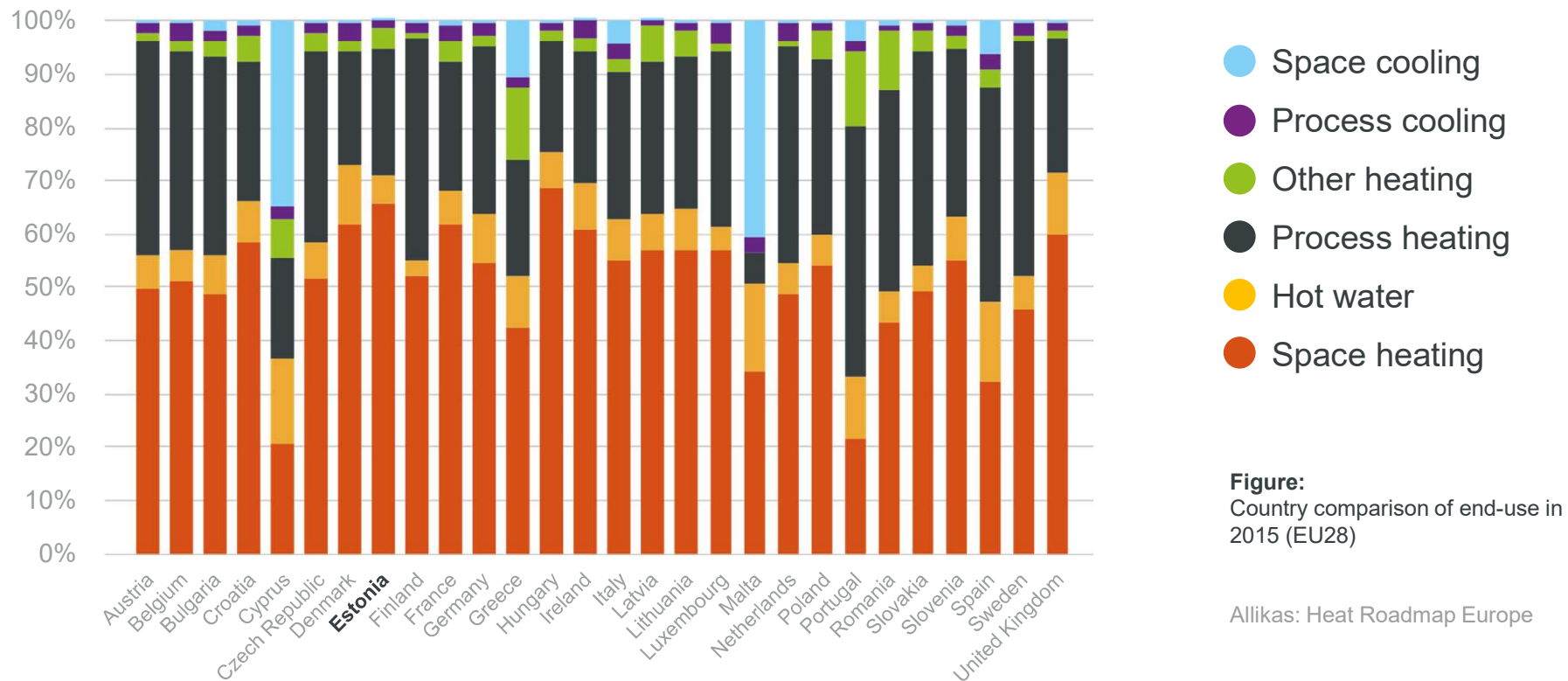
● Electricity ● Transport ● Heat

Heating & Hot water, in EU households account for **79%** of total final energy use



ec.europa.eu/eurostat

Vaid Malta ja Küpros omavad suure jahutusenergia osakaalu



EU planeeritud meetmed soojusenergia valdkonna dekarboniseerimiseks

Everywhere

Heat savings

Balance Savings
vs. Supply

30-50% of
Total Heat Demand

Urban Areas

District Heating
Networks

High Density Areas

40-70% of
Total Heat Demand

Rural Areas

Primarily Electric
Heat Pumps

Smaller Shares of Solar
Thermal & Biomass Boilers

30-60% of
Total Heat Demand

Allikas: Heat Roadmap Europe

EU suunad energiasektoris



At least 50% CO₂ reduction by 2030

Given energy production and use accounts for 75% of the EU's emissions, energy will have a central role to play in the European Green Deal.

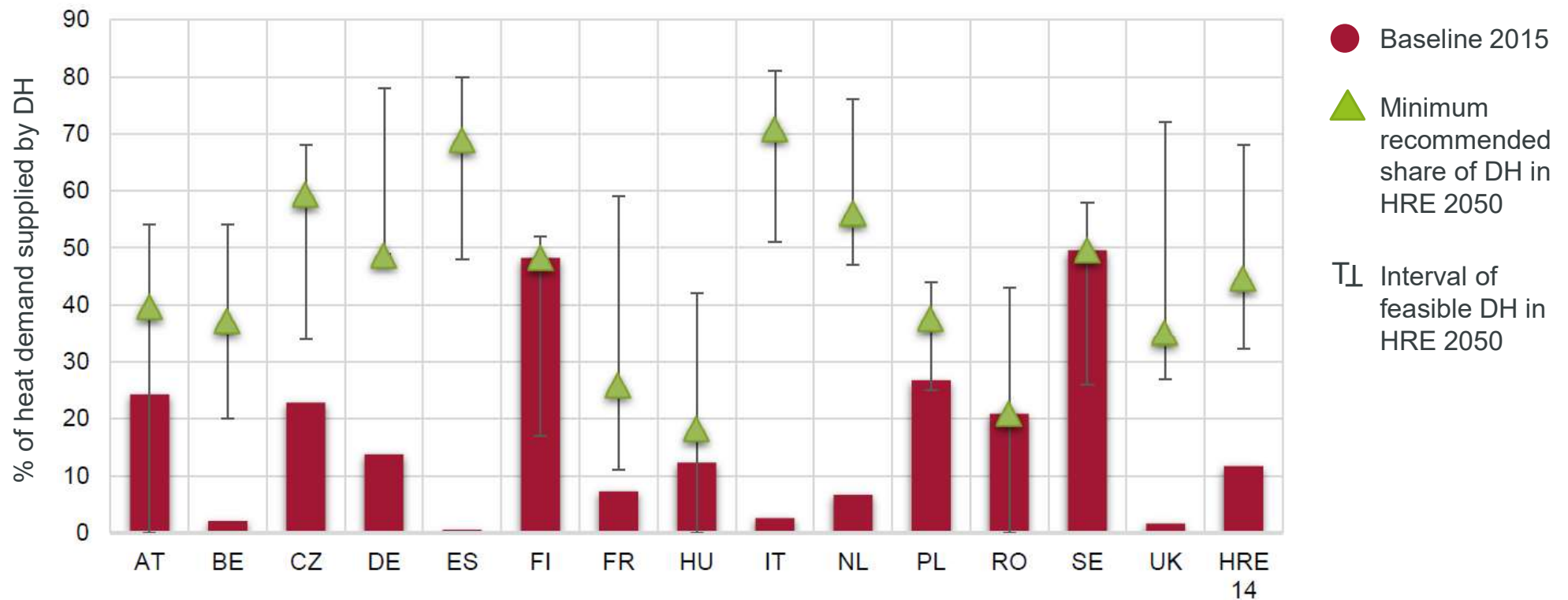
- Focus on the **rapid implementation** of energy-efficiency and renewable-energy legislation
- **Work closely with the Member States** to set out their National Energy and Climate Plans
- Given the increased ambition of the European Green Deal, there is a need to **review legislation**
- Ensure Europe follows the **energy-efficiency-first principle** across the board
- Look at how Europe can further **improve the energy performance of buildings and speed up renovation rates**



Kadri Simson
Commissioner-designate
for Energy

Allikas: EU

Kaugkütte võimalik osakaal EU riikides



Allikas: Heat Roadmap Europe

Kaugkütte suur areng 2025-2035

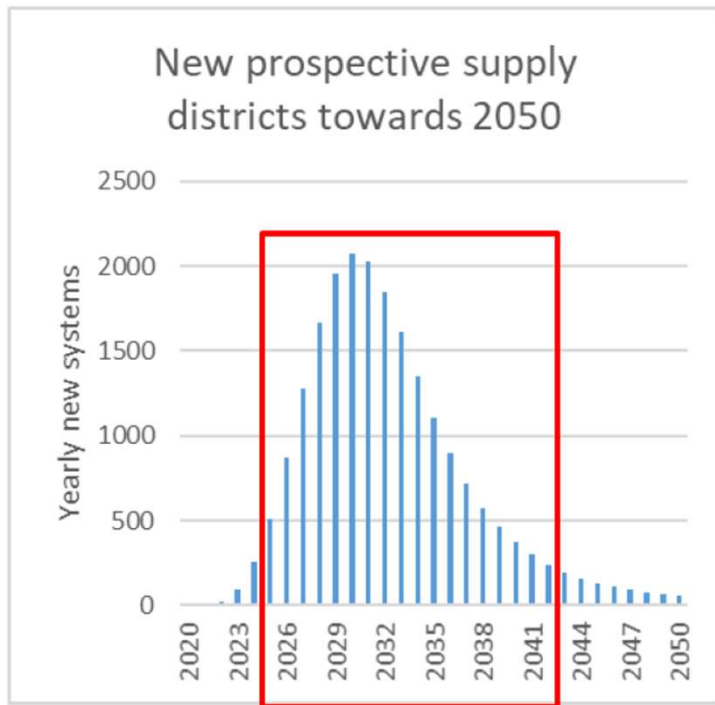


Figure 0-1. Approximate newly established and total amount of district heating systems in the 14 countries of HRE4 and Denmark needed for fulfilling the potential of distribution grid investments below 4 EUR/GJ.

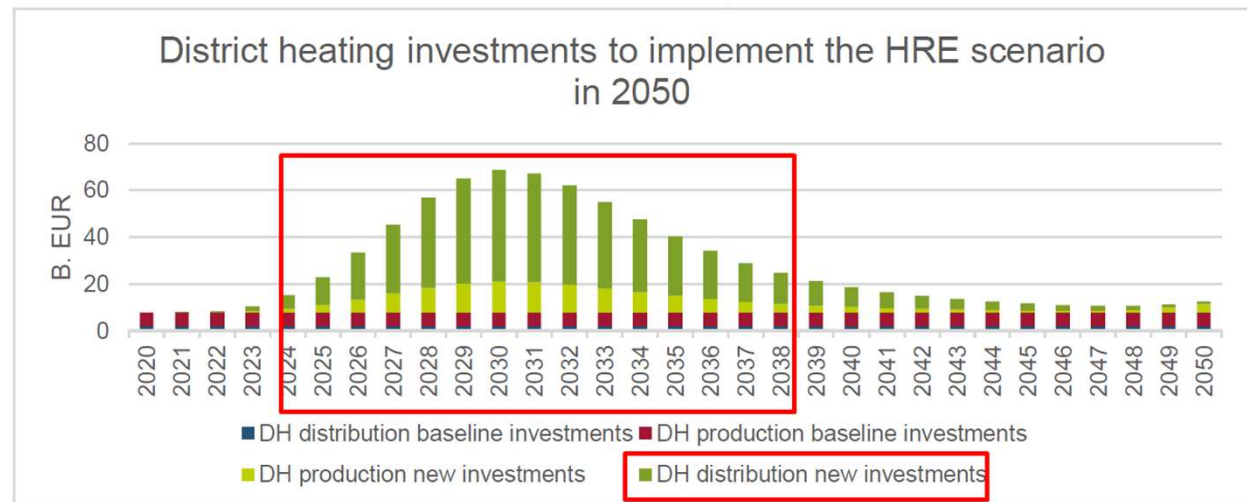


Figure 0-2 Estimation of distribution of district heating investments to reach the HRE 2050 scenario.

Allikas: Heat Roadmap Europe

Paekalda piirkond



17 ha

Arendus 180 000 m²
37 hoonet (korterelamud)

Põrandaküte + soe vesi
Soojuslik võimsus 15 MW

Tehniline lahendus

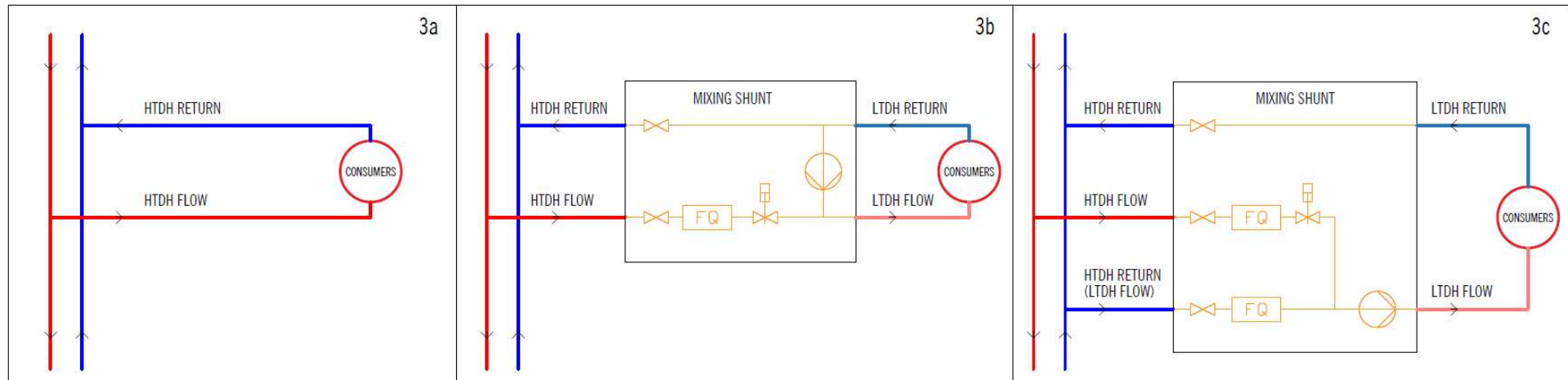


Table 4: Benefits due to 2nd option implementation

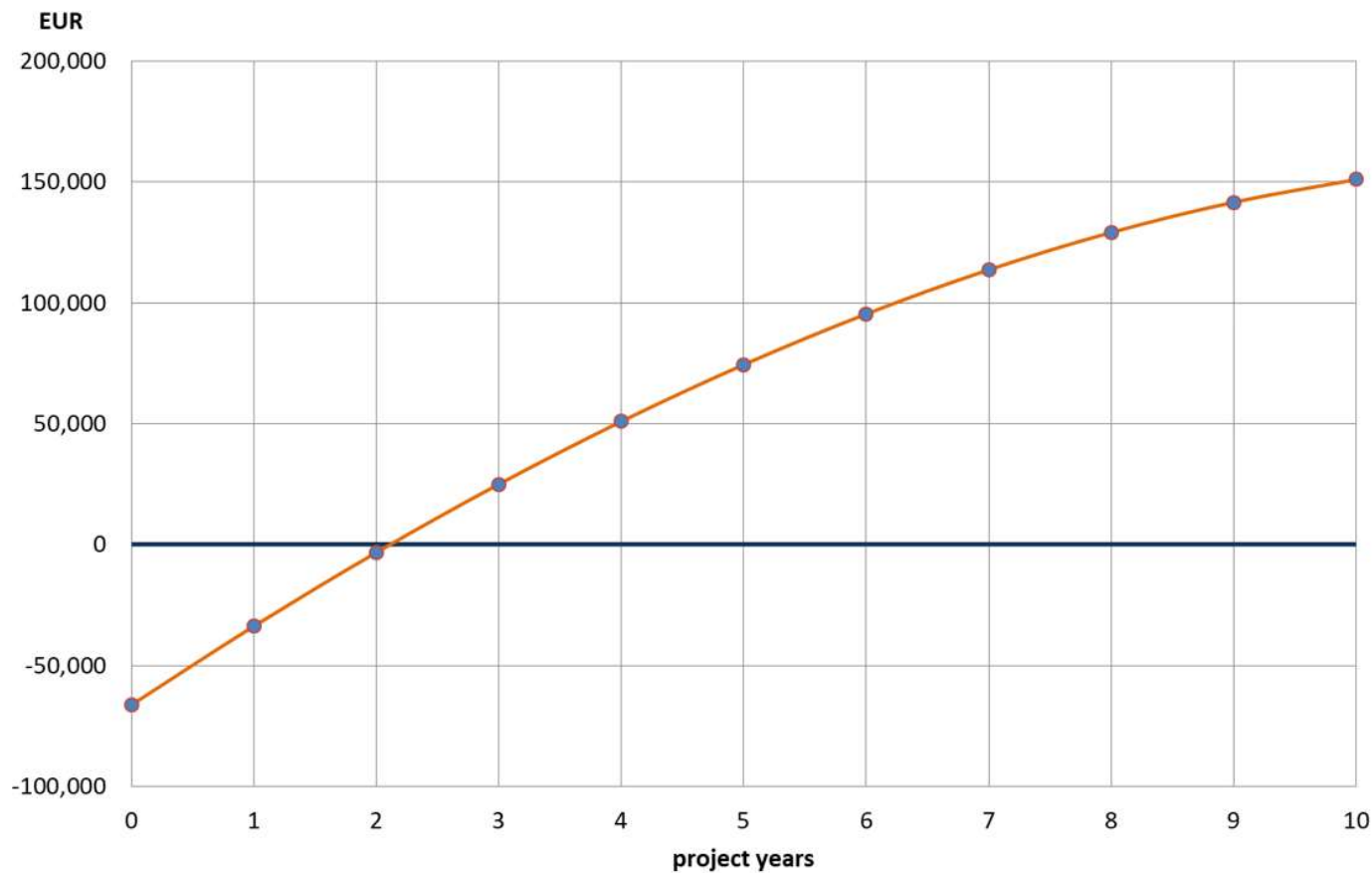
Benefit	Amount	Price	Income
Heat losses decrease in large DH networks	207 MWh	35 EUR/MWh	7 245 EUR
Electricity generation increase	400 MWh _{el}	90 EUR/MWh	36 000 EUR
Heat recovery increase in FGC	1015 MWh	35 EUR/MWh	35 525 EUR
Heat loss savings in new LTDHN sector	31 MWh	35 EUR/MWh	1 085 EUR
Total			79 855 EUR

HTDH: 115 / 70 °C

LTDH: 65 / 35 °C

Option	Piping without fittings (EUR)	Fittings (EUR)	Piping with fittings (EUR)	Pumping station (EUR)	Heat exchangers (EUR)	Total
1	200,246	103,922	304,168	0	41,050	345,218
2	228,488	56,396	284,884	49,100	77,514	411,498

Tulemused

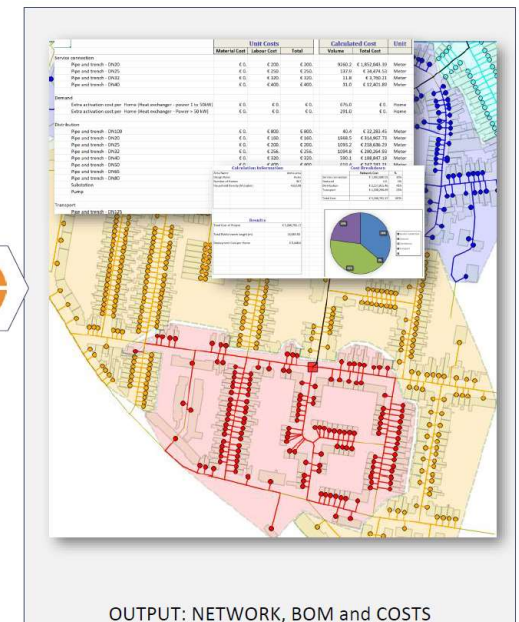
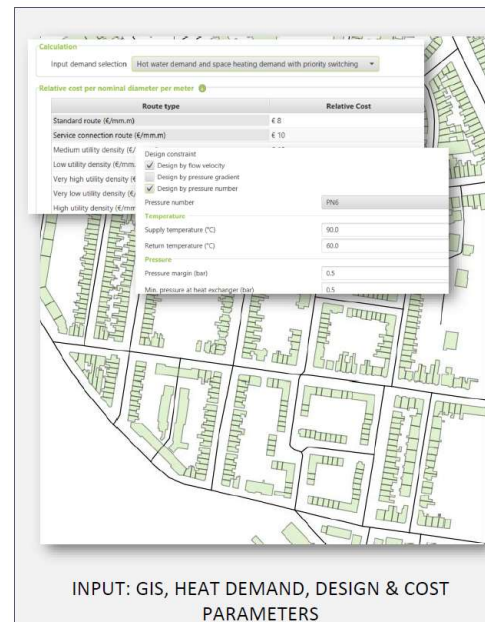


The return temperature of the main network will gradually decrease by approximately **0.39 °C** from 49.7°C to 49.31°C throughout the heating season

Kaugküttevõrgu planeerimine

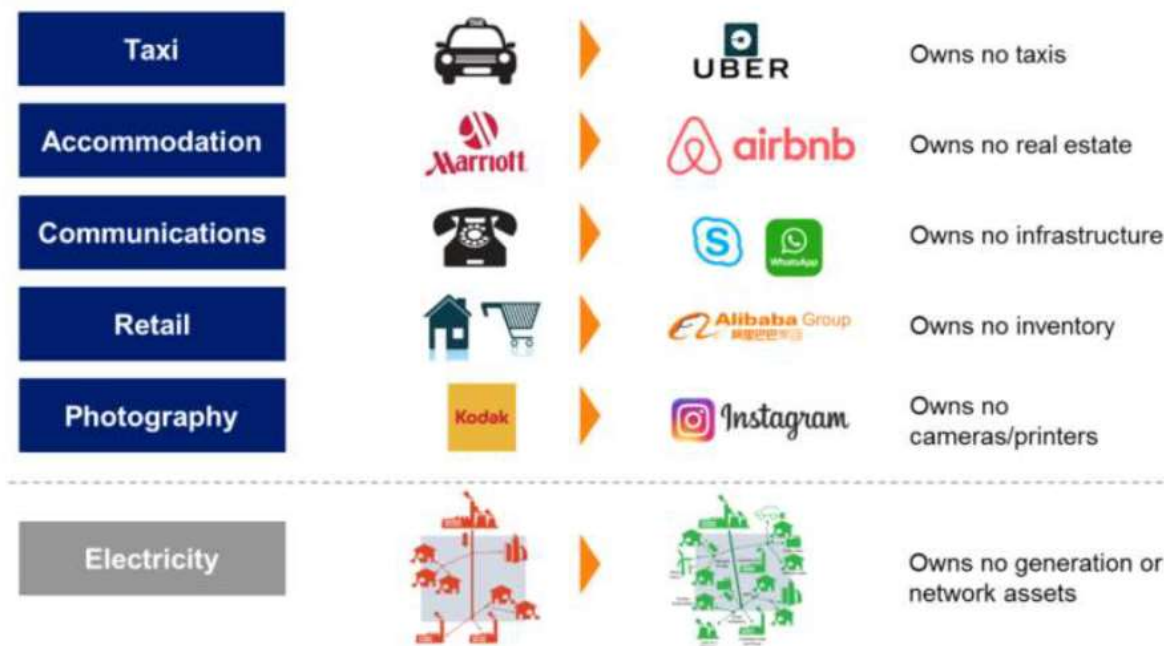


	Scenario 1	Scenario 2	Scenario 3
Nr of buildings	170	160	160
ΔT	30°C	30°C	40°C
Pipe length	4 km	2.8 km	2.8 km
Cost per building(€)	13800 €	9000 €	7900 €
Project cost (€)	2.3 M€	1.4 M€	1.25 M€



Energiasektori digitaliseerimine?

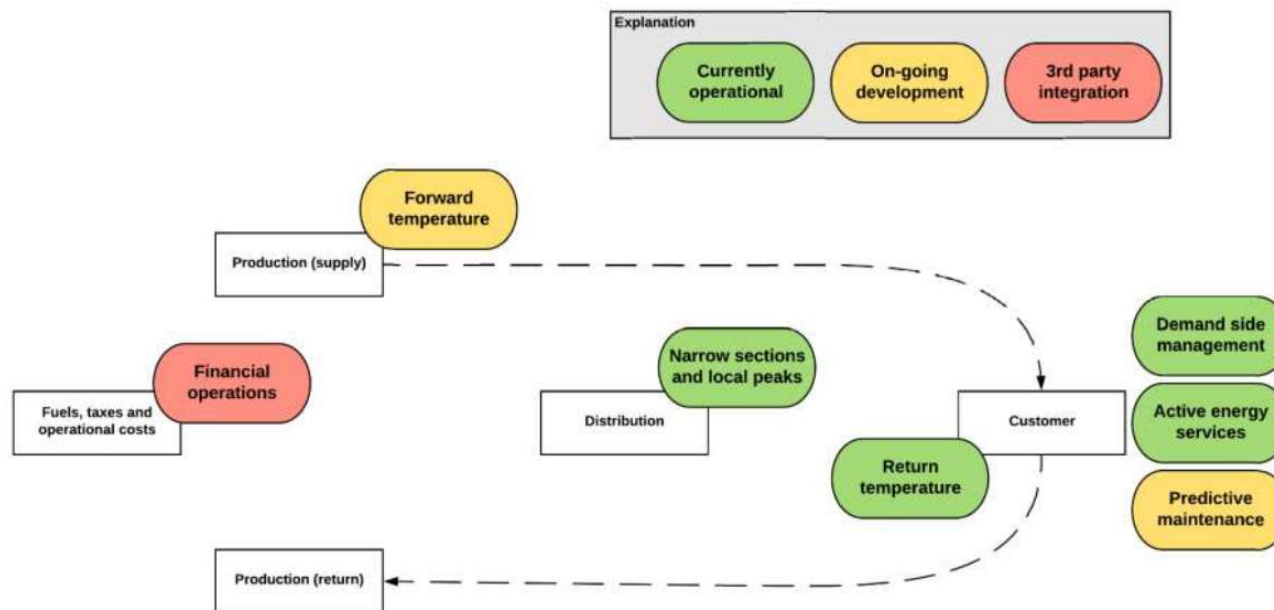
Digitalisation in energy - future



Allikas: Vito

Digitaliseerimine kaugküttes

System overview



Forecaster
Creates forecasts of heat demand and available thermal flexibility



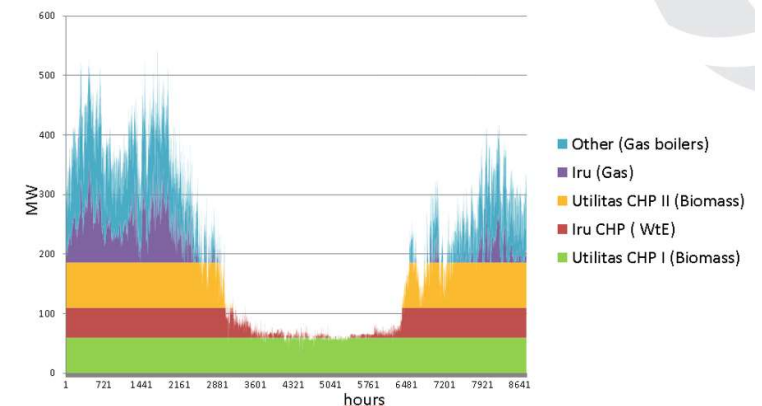
Planner
Creates control plans based on current forecasts and system constraints



Tracker
Distribute control actions among the connected buildings



Building
Software agent for each individual building or other flexibility source within the Smart Heat Grid



Alikas: Vito, HeatConsult, Utilitas

HeatConsult kaugkütte projektid Chiles

DISTRICT ENERGY
IN CITIES
INITIATIVE

CHILE

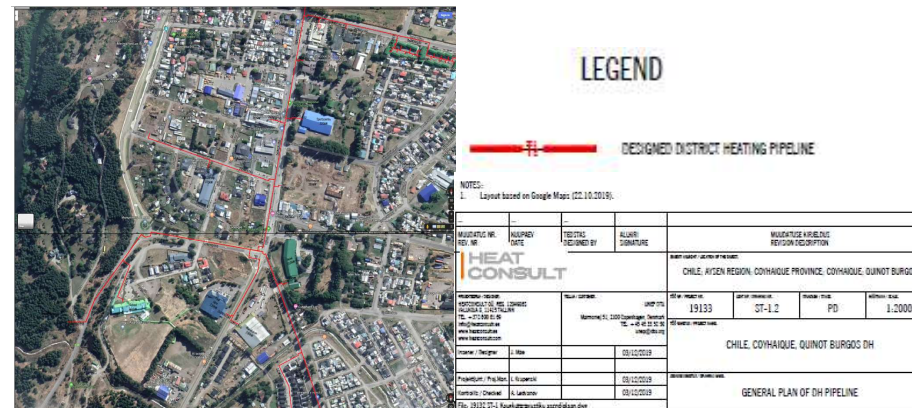
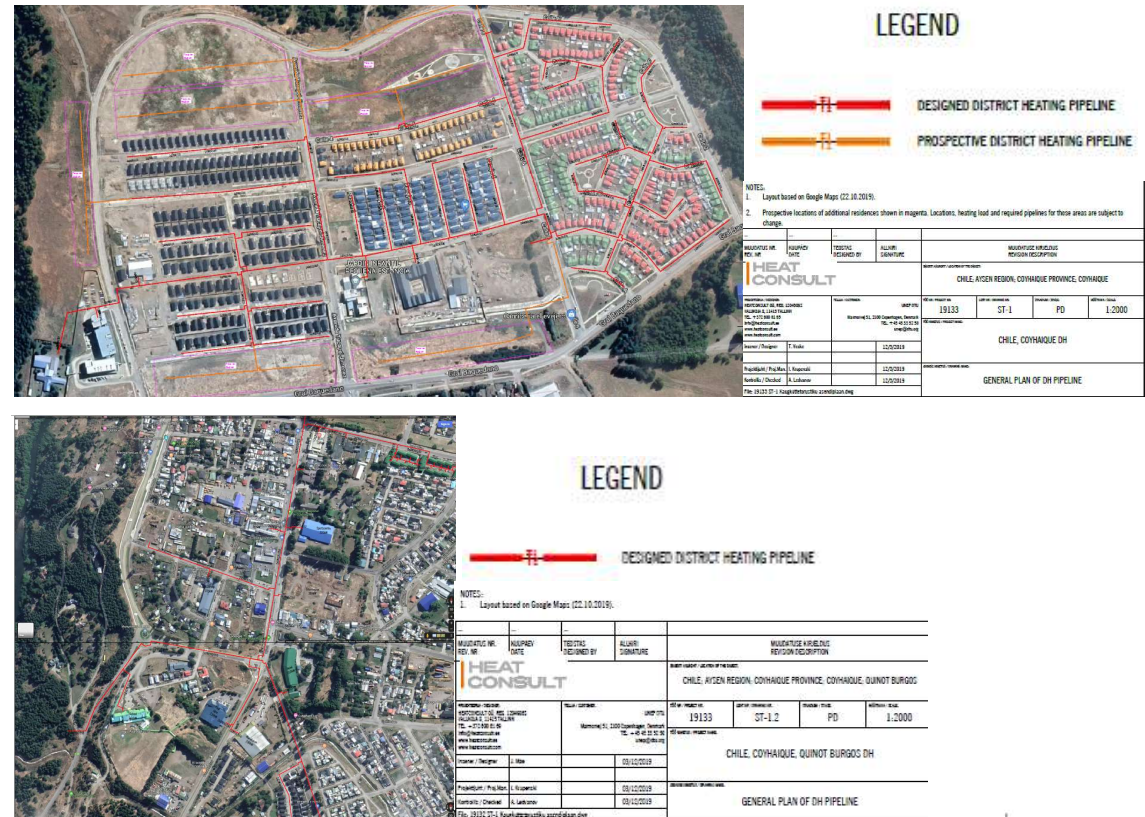
UNEP

WHY DISTRICT HEATING IN CHILE?

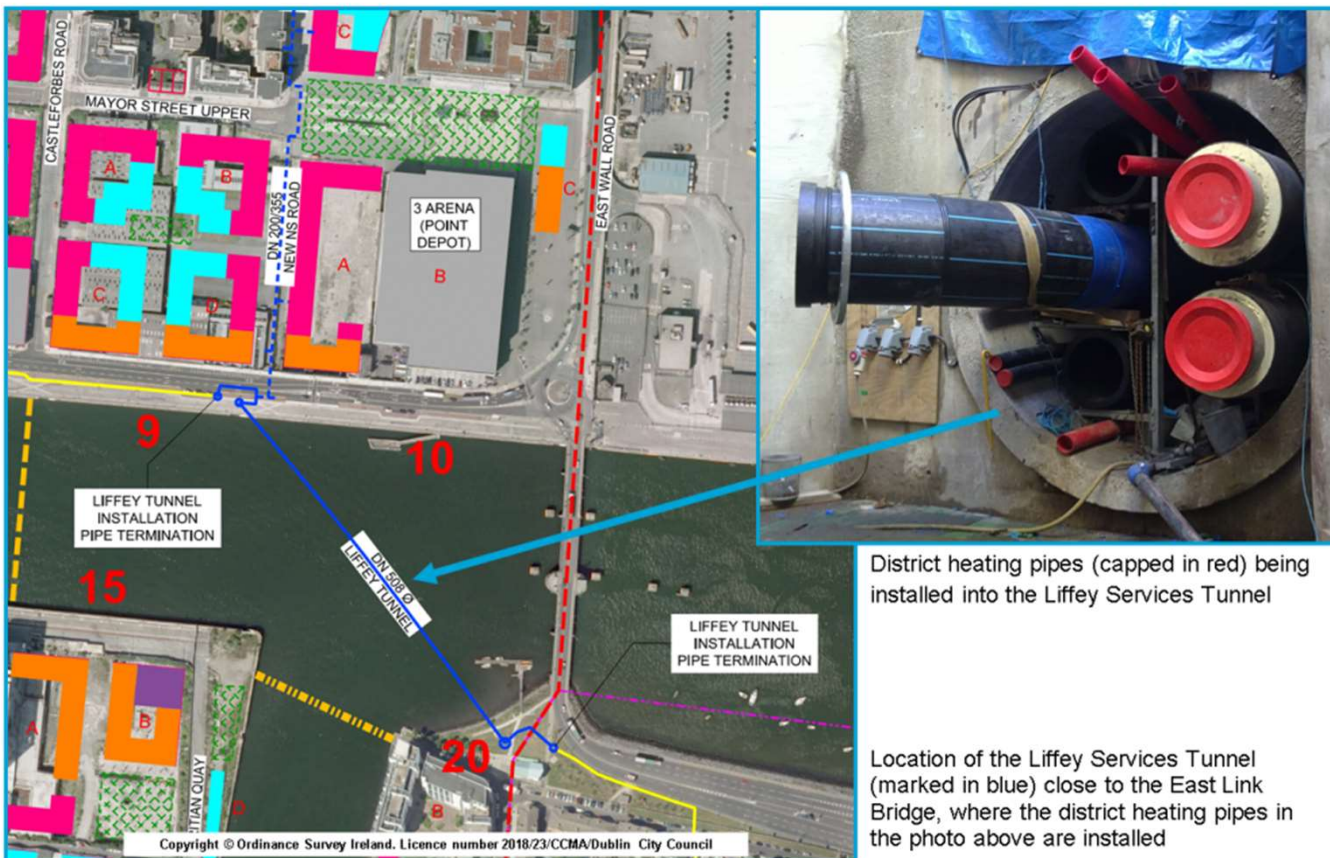
- The effects of **Air pollution** on **human health** have been well researched within internationally;
- The **Great Smog of London** of 5-9th December 1952, was a severe air-pollution event, reducing visibility and even penetrating indoor areas, caused **10'000 people die** and >100'000 were made ill;
- It is estimated that **93%** of the particulate matter in the winter months in Chile is caused by burning firewood in woodstoves in single homes;
- Inefficient burning of firewood produces contaminants such as **formaldehyde, methane, black carbon** which cause **effects on health**.

Dr. Romanas Savickas

Alikas: UN Environment



Kaugküte arendamine lirimaal



Ireland

By Donna Gartland & John O'Shea
(2019)

11% Share of CHP in DH generation

19,205 GWh Total heat demand for space heating

<0.8% Estimated contribution of DH to total final thermal demand



Allikas: IrDea

Kaugküte arendamine Hamburgis (GER)

Price of Hamburgs central district heating

	Factor	unit
capacity price		7,006 €/l/h
energy price		Wh
emission price		Wh
Contribution to costs		
connection costs		

**Mixed heat price
~100 €/MWh***

*1.800 utilisation hours, 75K spread, Q3 2019, excl. VAT

Project specific drivers of investment costs

	Driver	Influencing factor	Range of additional costs
Pipeline construction	Surface condition	Asphalt paving	0 - 1.100 €/m
Pipeline construction			300 €/m
Pipeline construction			200 €/m
Pipeline construction			100 €/m detection costs for disposal
Pipeline construction	Piping Material	Temperature level, longevity, project size, power	150 - 800 €/m

150-2.500 €/m

Project-specific drivers of investment costs

	Driver	Influencing factor	Range of additional costs
Energy Supply			0 - 60.000 € p.a. ~ 200.000 € cash value
Energy Supply			- 500.000 €
Energy Supply			- 100.000 €
Energy Supply			- 500.000 €

**2.300.000 €
460 €/kW***

*for a 5 MW plant

Conclusions

- Calculation of heat prices is very project-specific for existing building areas
 - For a given project determined by energy supply concept, length of pipeline and heat demand prices can easily vary by 50 € / MWh
- Market is highly ready for clean, innovative, inexpensive, climate friendly heat supply in development areas
- Competition should take place in tenders for exclusive areas, not in door-to-door-competition to avoid inefficiencies
- Public requirements for the quality of heat should be higher in order to achieve climate goals

Allikas: HafenCity Universität

Kaugküte arendamine endistes NL riikides

- **Lai geograafia:** Ukraina, Valgevenemaa, Gruusia, Moldova, Kazakhstan
- **Kaugküttevõrk on olemas**, riigid ja inimesed on harjunud kaugküttega
- **Võrk on amortiseerunud ning vajab renoveerimist** (meil on olemas kogemus ja teadmised)
- **On olemas toetamise fondid ja mehhanismid** (läheb kasuks kui on kaasatud EU spetsialistid)
 - Maailmapank
 - UN Environment
 - NEFCO
 - EU fondid



Teeme koostööd kaugkütte ekspordiks

- **60-aastane kogemus** kaugkütte valdkonnas
- **Digitaliseerimine** väga kõrgel tasemel
- Meie **teadmisi** ja **oskusi** hinnatakse kõrgelt (Skandinaavia, Balti riigid)
- Lähiaastatel on oodata **kaugkütte valdkonna kasvu** EU-s, tuleb ka inseneride nappus
- **TalTech-i poolt teadustöö** / innovatiivsed lahendused mida saab rakendada praktikas

Küsimused?