Best Practice In Heat Network Design

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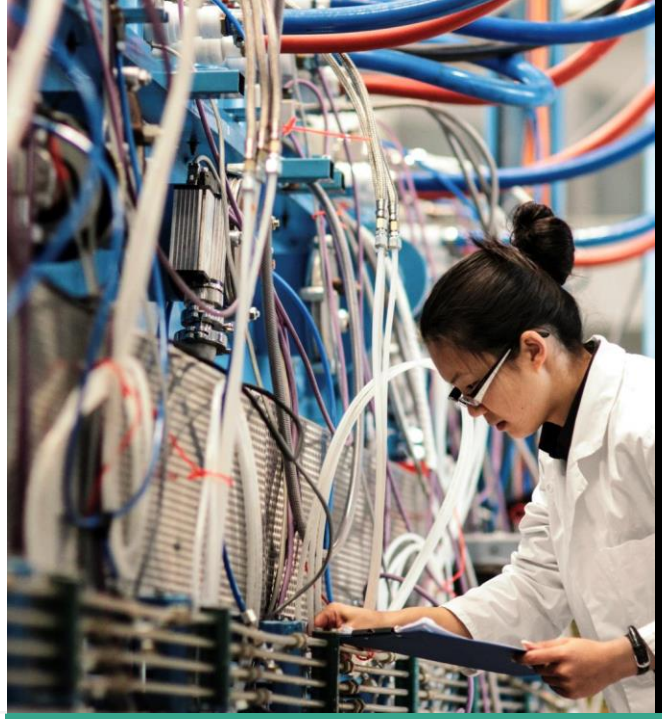
REHAU

REHAU in a nutshell



Operating globally but still family owned

Leading developer in polymer-based solutions

> Founded in 1948
~ 20,000 employees
> 50 countries
> 3.6 billion Euro annual revenue

Internally split into 5 divisions:

- Automotive
- Building Solutions
- Window Solutions
- Furniture Solutions
- Industrial Solutions

REHAU

Your district heating partner

Specialist sales & technical teams in the UK

Sales team who are focused 100% on district heating pipes. Technical team based across the UK providing quotes and designs on a fast turnaround.

Only UK manufacturer of PE-Xa district heating pipes

Producing RAUVITHERM in the UK since 2012. Estimated 29% CO_2 saving.

Largest UK stock of district heating pipes

Large quantities of pipe, fittings and accessories in the UK to ensure your project goes smoothly.

REHAU polymer district heating pipes

RAUTHERMEX

PE-Xa pipe with bonded PU foam

25-160mm = 3MW*

RAUVITHERM

PE-Xa pipe with PEX foam (non-bonded)

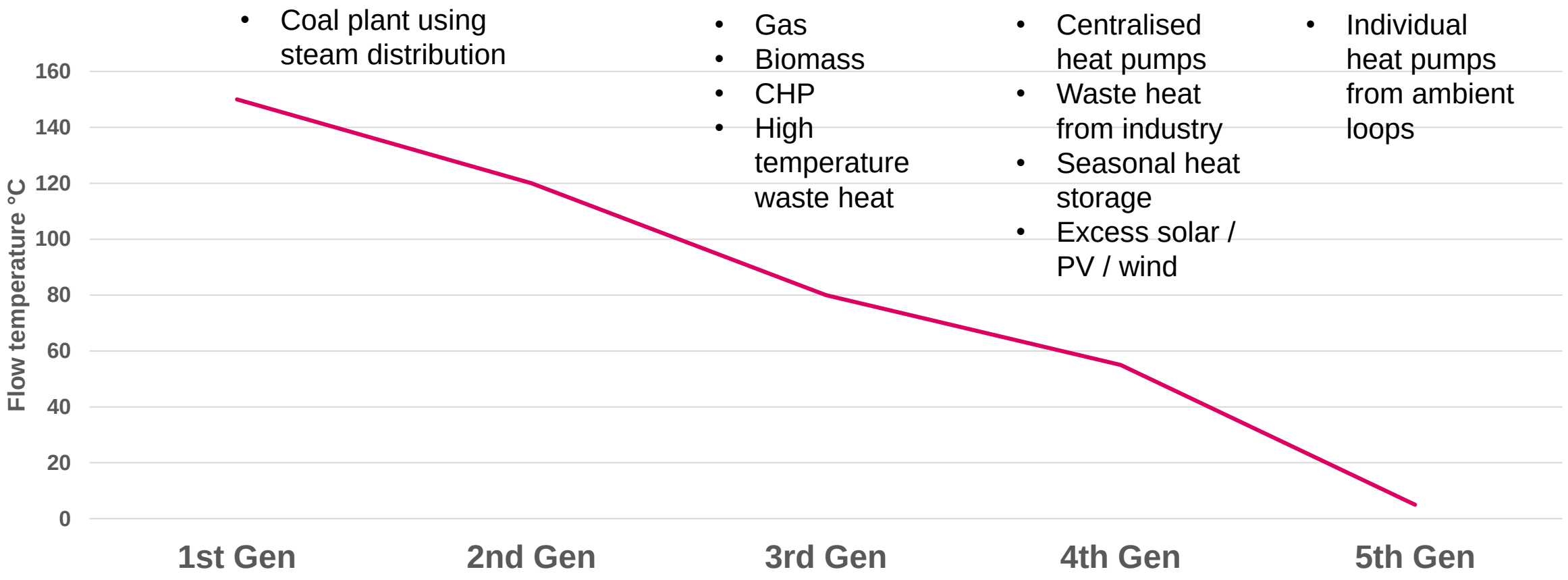
25-160mm = 3MW*

PP-R with PU foam (bonded)

160-315**mm = 13 MW*

**Based on Δ30K*
*** Larger sizes available on request*

Evolution of district heating flow temperatures



Trend to lower temperature heat networks (4th generation)

Carbon savings

Lower temperatures means lower heat losses

Incentives

GSHP/WSHP higher tariffs than ASHP / biomass

SAP 10

Heat pumps in DH more favourable than gas CHP

Future heat sources

Developers forced to look at alternatives to gas

Possible heat sources:

Gas / gas CHP
Heat pumps
Biomass
AD / biogas
Solar thermal
Deep geothermal
Waste heat

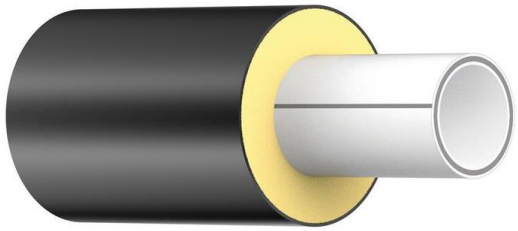
Pipe lifespan

PE-Xa

Flow temp °C	Maximum pressure	Minimum pipe lifespan
90°C	6 bar	10 years
80°C	6 bar	30 years
70°C	8.5 bar	50 years
60°C	9.5 bar	50 years
50°C	10.6 bar	50 years

Calculated using REHAU RAUTHERM-EX carrier pipes and using a pressure safety factor of 1.25

PP-R



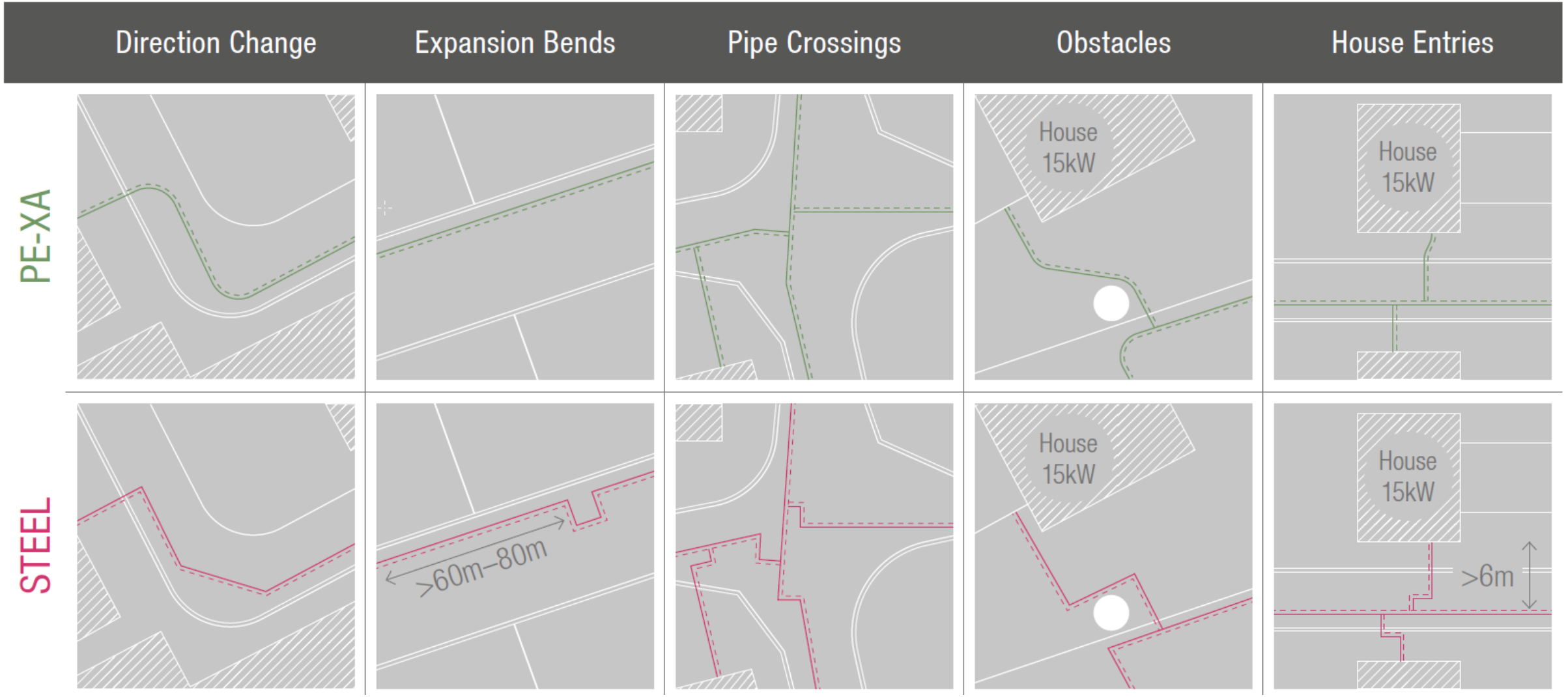
Flow temp °C	Maximum pressure	Minimum pipe lifespan
95°C	6.1 bar	10 years
80°C	8 bar	25 years
70°C	9.5 bar	50 years
60°C	11.7 bar	50 years
50°C	13.8 bar	50 years

Calculated using PP-R SDR 11 carrier pipes and using a pressure safety factor of 1.25

4G Network - Pipe Material Comparison

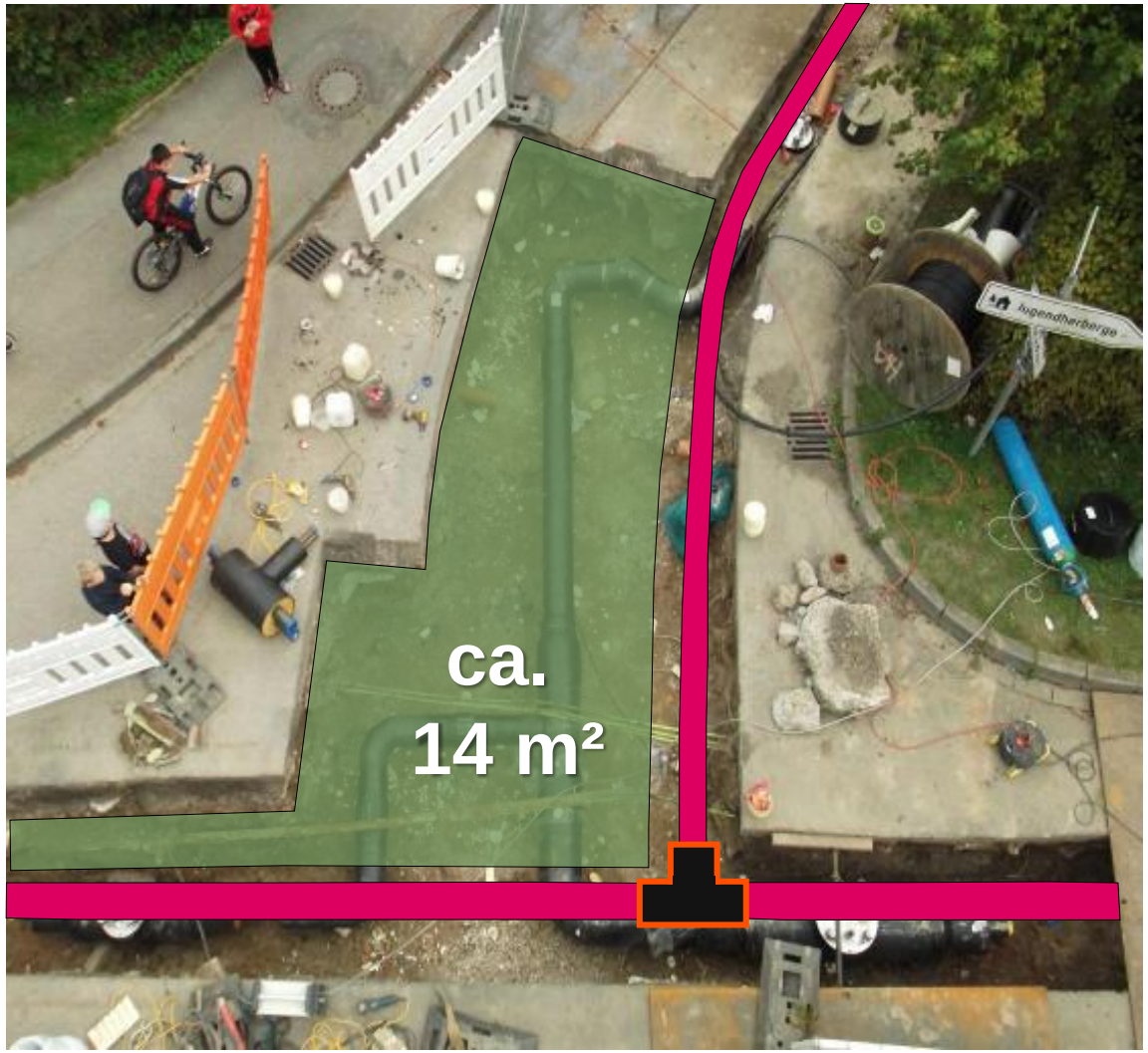
	Steel	PP-R	PE-Xa
Max pipe size	>DN1000	DN350 (400mm)	DN130 (160mm)
Pipe lifespan at 4G temps	>50 years	>50 years	>50 years
Coils / sticks	Sticks	Sticks	Coils
Complexity of install	Specialist steel welder	Civil contractor	Civil or mechanical contractor
Expansion loops needed	Yes	No	No
Leak detection required	Yes	No	No

Steel vs PE-Xa – route layout differences



Flexibility of 12m 160mm PE-Xa straight lengths

Steel vs polymer – space required on site



PP-R vs steel for main spine

Up to 19% lower pressure loss

For 250mm PP-R vs DN200 steel pipe. Less deposit build up > lower pumping costs.

No leak detection needed

Easier to install, high corrosion resistance

Expansion forces 100x less than steel

Less welds, pipe & bends > faster installation & less groundworks

Up to 37% lighter than steel

Faster and easier to install. Pipes can be welded outside of trench.

Design support

REHAU can optimise a heat network design by looking at:

- Pipe sizing / hydraulics
- Network heat losses
- Single / twin pipes
- Pipe routing
- Diversity

Using **in-house bespoke design software**

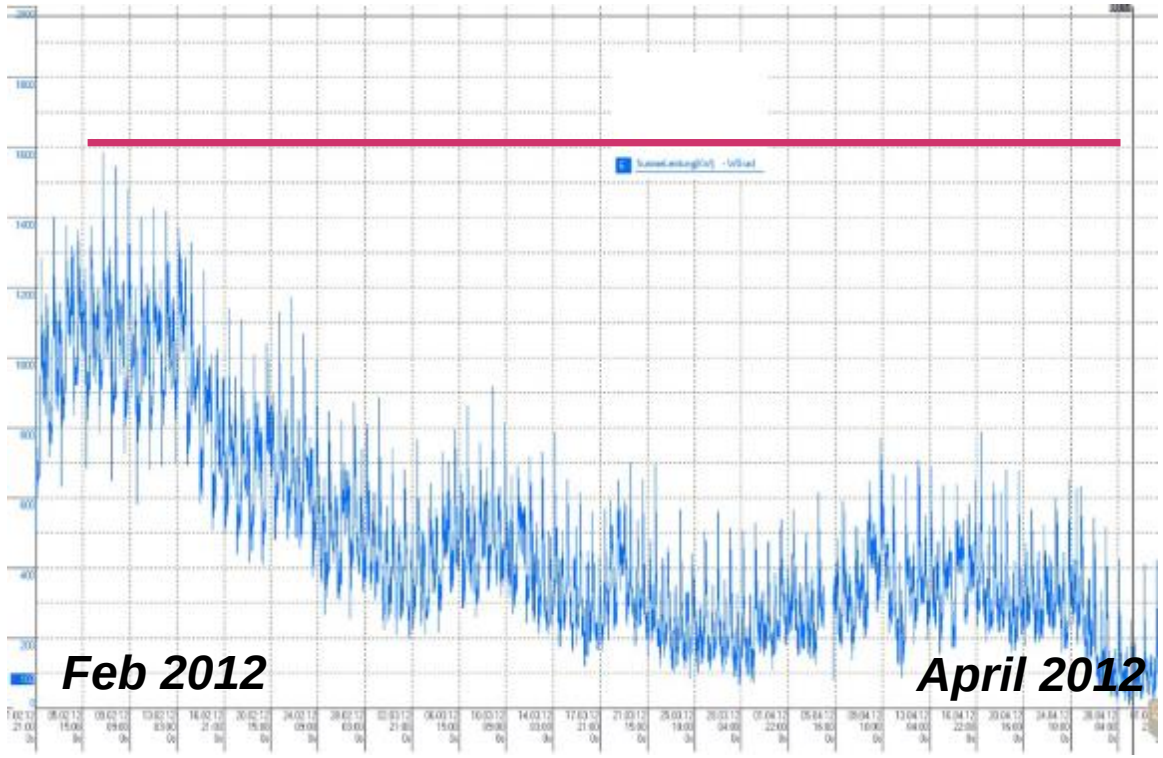
Diversity in heat networks

It is unlikely for every heat consumer to use their peak load at the same time. This is called diversity.

The diversity factor is the ratio of the peak load used. For example, for a peak load of 1MW and a diversity factor of 0.7 means you can resize the plant for 700kW.

<u>Example of 80 DH connections project:</u>

Original – no diversity	= 2,540kW
Designed diversity 0.85	= 2,160kW
Actual diversity 0.63	= 1,600kW



Engineering progress
Enhancing lives

Methods to reduce installation costs include using soft-dig areas, twin pipes, hot tapping and secondary spines

Twin pipes vs single pipes

2x UNO 25 = 10.9 W/m DUO 25 = 7.6 W/m

Heat loss reduction with DUO → 30%

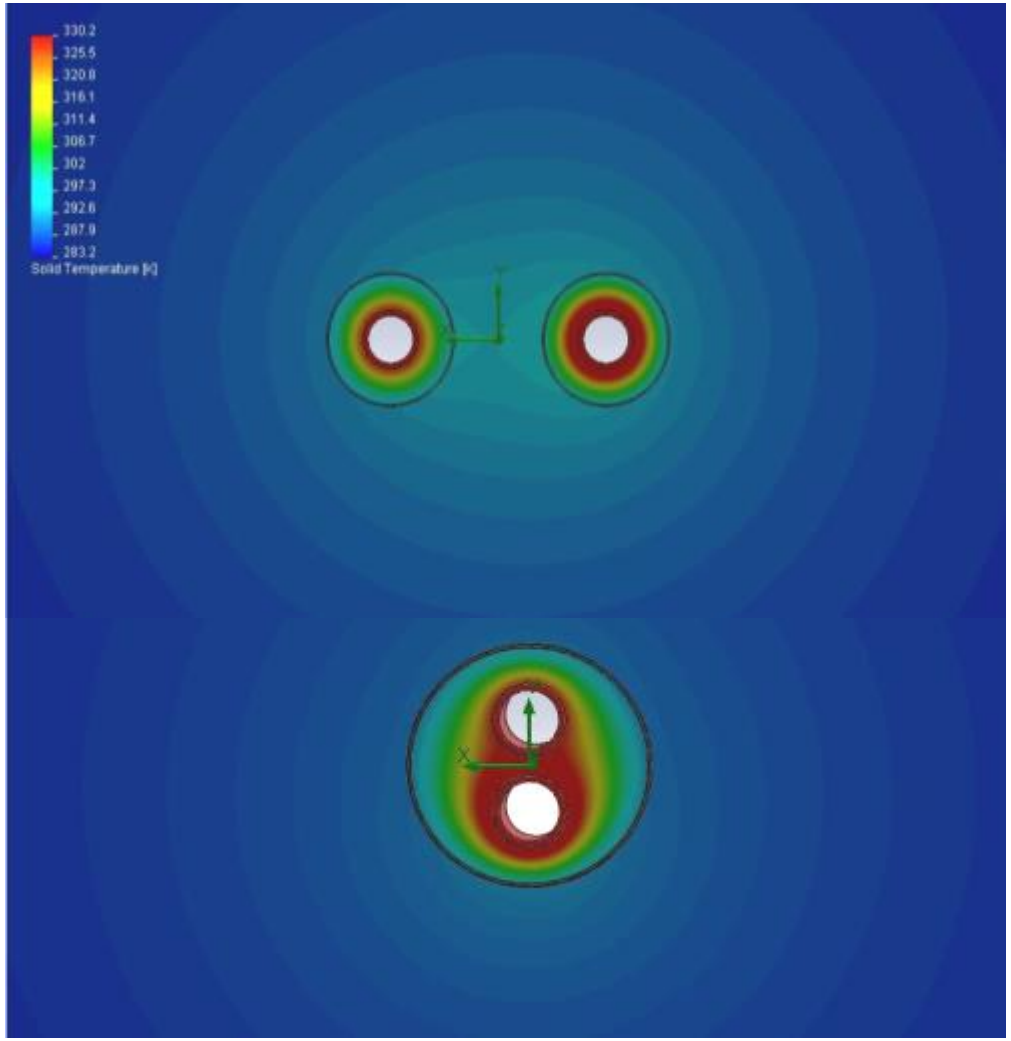
2x UNO 40 = 16.6 W/m DUO 40 = 11.6 W/m

Heat loss reduction with DUO → 30%

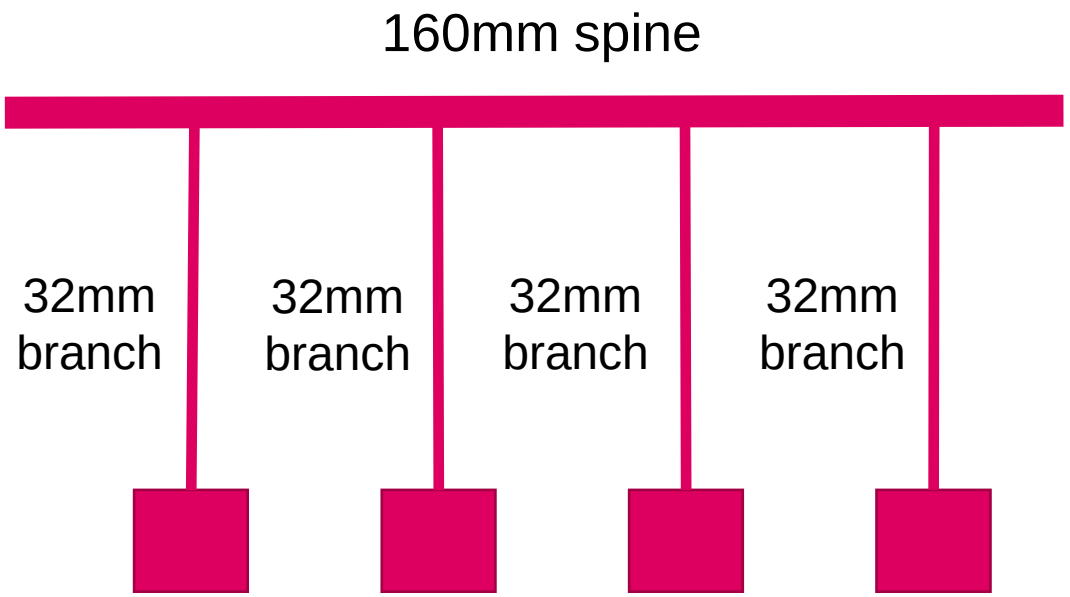
2x UNO 63 = 19.5 W/m DUO 63 = 13.1 W/m

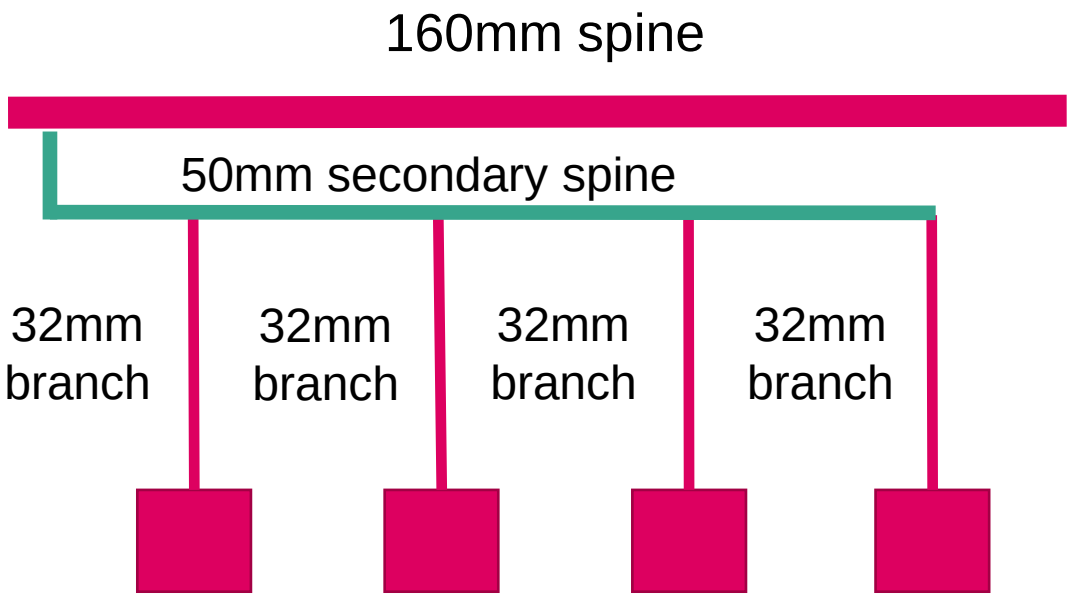
Heat loss reduction with DUO → 33%

Data taken at 80/50°C using RAUTHERMEX pipe.



Secondary spines





Design case study

10 blocks of flats

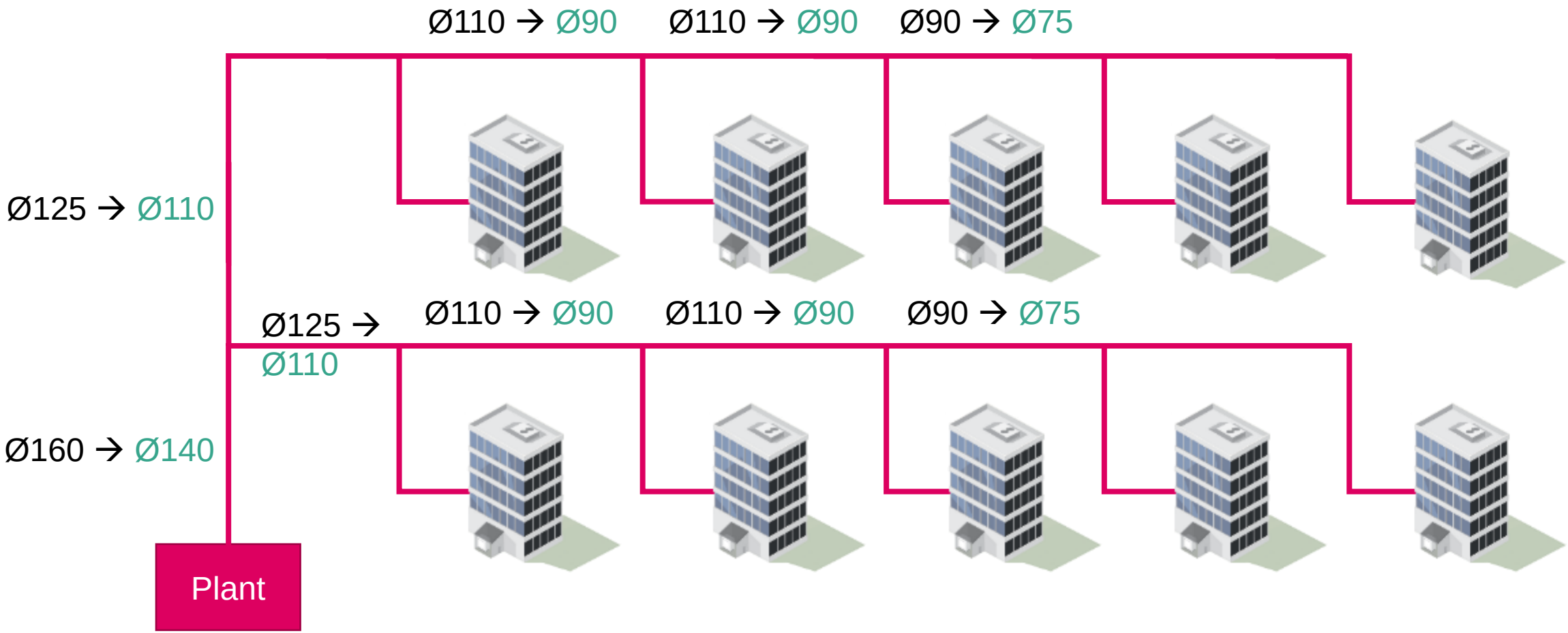
Each 200kW

1,200m network length

Sample network: 10 blocks of flats of 200kW each

ΔT scenarios

Δ 20K → Δ 30K



Design case study

Cost comparison

Flow / return temperature (°C)		Network material cost (£)	% Cost saving to 80/60°C or Δ20K network
Δ 20K	80/60 60/40	£188K	
Δ 30K	70/40 65/35	£145K	23%
Δ 40K	70/30	£118K	37%

Design case study

Heat loss external distribution network

	Flow / return temperature (°C)	Total heat losses (kW)	Saving on additional electricity demand @ 0.10 £/kWh HP COP 3	% saving to 80/60°C network
	80/60	36.63 kW		
Δ 20K	60/40	24.42 kW	£3,565 /a	33%
Δ 30K	70/40	24.48 kW	£3,547 /a	33%
	65/35	21.76 kW	£4,342 /a	41%
Δ 40K	70/30	16.26 kW	£5,948 /a	56%

Creating additional capacity on an existing network

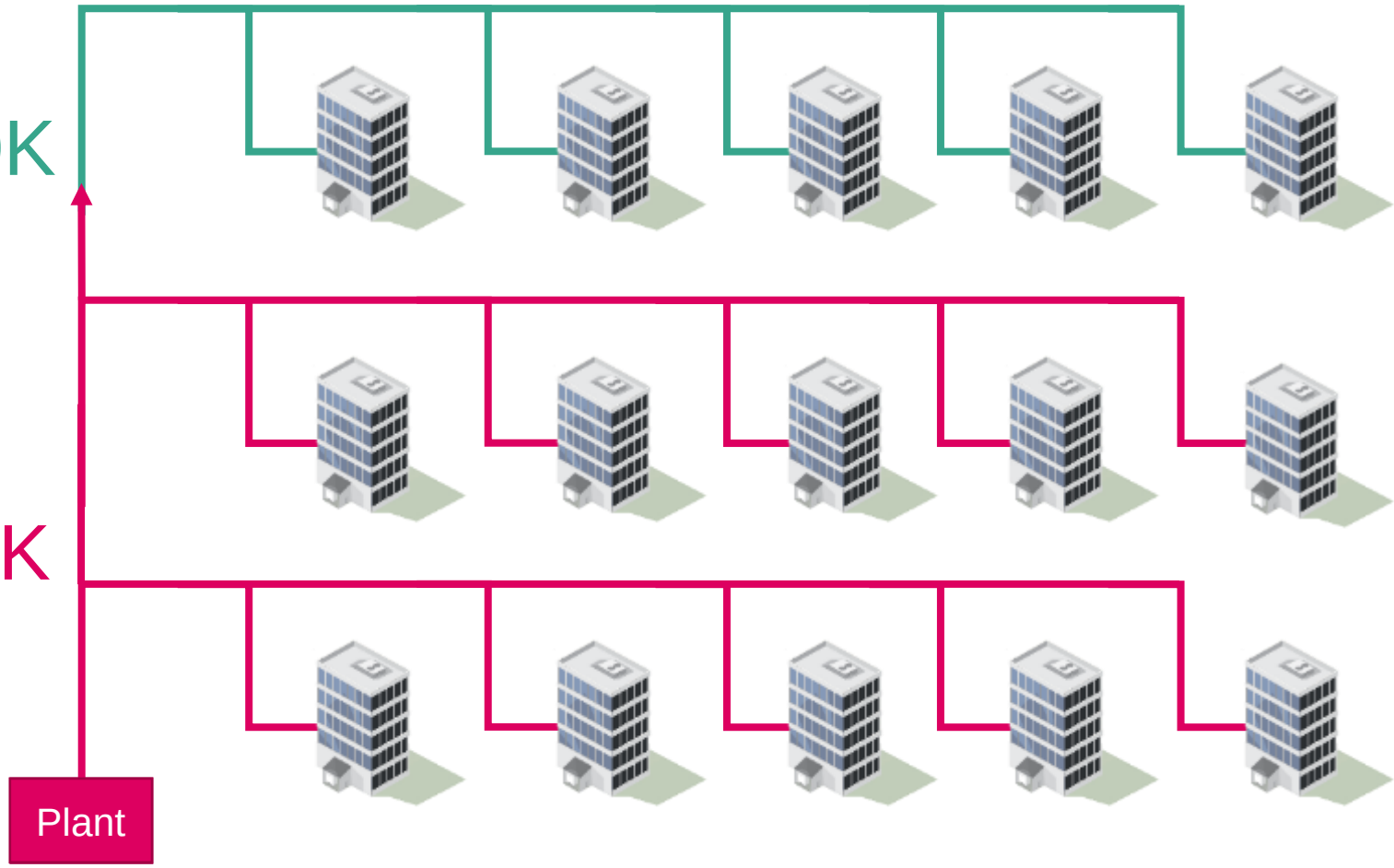
ΔT scenarios

- 70/40°C

4G - 65/35°C

- 80/60°C

4G - 60/40°C



A 4G heat network can reduce heat losses by 30-40% compared to an equivalent 3G network. CAPEX is influenced significantly by the operating temperatures and pipe choice.

Case studies

District heating

Case studies

Hill Park, Glasgow

350 apartments – ASHP – Over 1km network

Eleanor Street, Sheffield

127 properties – 1.9MW gas - Over 2km network

Case studies

Portmeirion, North Wales

Hotel & 30 cottages - Biomass – Over 3km network

Dunbeg, Scotland

50 apartments – Biomass - Over1km network

Case studies

Regional Performance Centre, Dundee

Sports centre – GSHP / CHP – Nearly 2km pipe

Soho Farmhouse Estate, Oxfordshire

45 luxury houses – Biomass – Over 7km network


Any questions?