

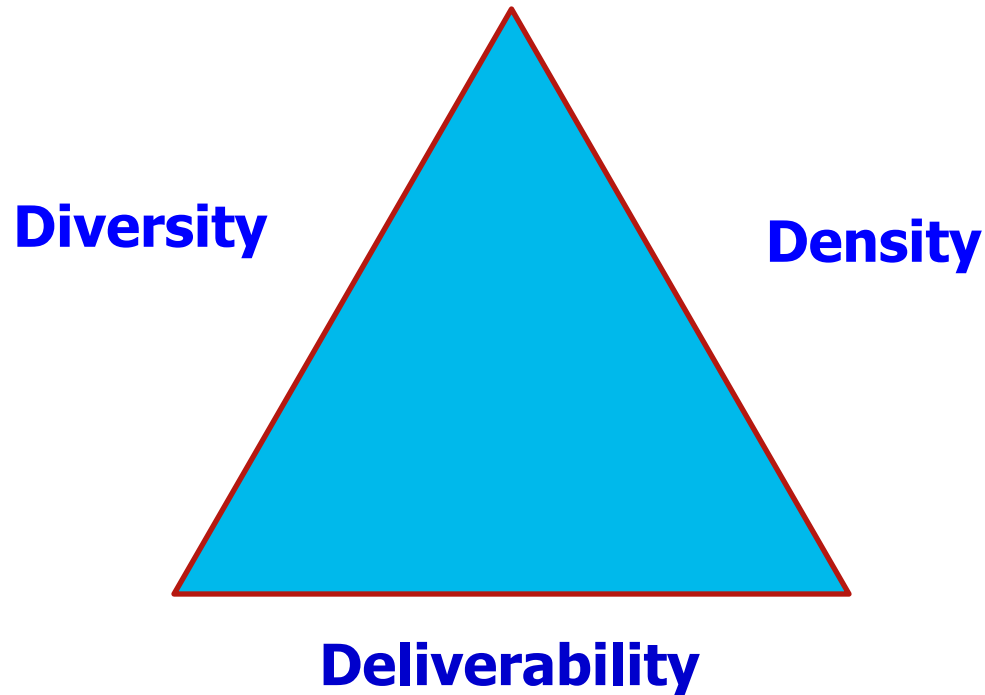
Fourth London Geothermal Symposium

Heat Networks – Characteristics of Success

Mike Smith, Director - Cities. Cofely UK - Energy Services

Characteristics of Success

The DE Triangle





Density

■ What does it mean?

- Heat density (kWh/m²)
- Proximity of buildings

■ Why is it important?

- Reduces capital cost due to reduced network costs
- Reduces highway buried services risk
- Increases financial viability



Diversity

■ What does it mean?

- Mix of building types
- Usage at different times of day/year
- Usage for different loads - DHW; space heating; process heating
- Existing buildings – a function of the existing urban geography
- New Developments – mixed use is quite common for larger developments

■ Why is it important?

- Geothermal, CHP and other low carbon plant operates optimally at continuous output
- Diverse loads provides year round base load
- Increases CO₂ savings and financial viability
- Can reduce peak demand significantly



Deliverability

■ Several key issues including;

- Potential for long term contract
- Number of customers
- Nature of customers
- Revenue certainty and financing
- Timing (phasing of loads)

■ Key questions;

- Who would the contracting party be?
- How much of the project can they commit to?
- Does this provide sufficient certainty around energy consumption, energy sales and appropriate plant selection?



Networks , the basic's – what's available?

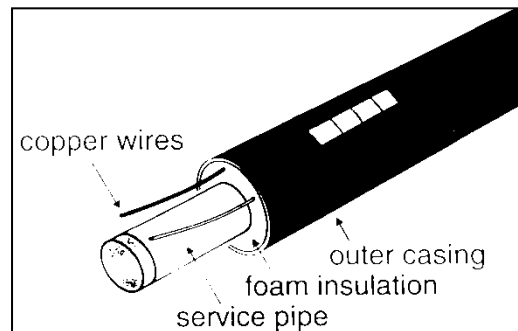
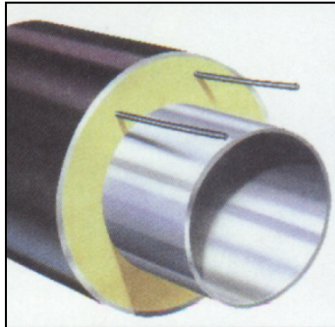
Essentially four systems:

- i. Steel in steel
 - ii. Pre-insulated steel
 - iii. Plastic – PEX
 - iv. Ducted steel post insulated – only installed where there are existing site wide ducts/tunnels which are dry and accessible
- Remember any buried pre-insulated pipework requires civils – burying anything increases costs considerably
 - Always get the pipe out of the ground ASAP
 - Do not install a large buried network when it is possible to put distribution pipework within buildings – underground car parks, ceilings, false floors etc..

The basic's – what 's available?

Pre-insulated steel

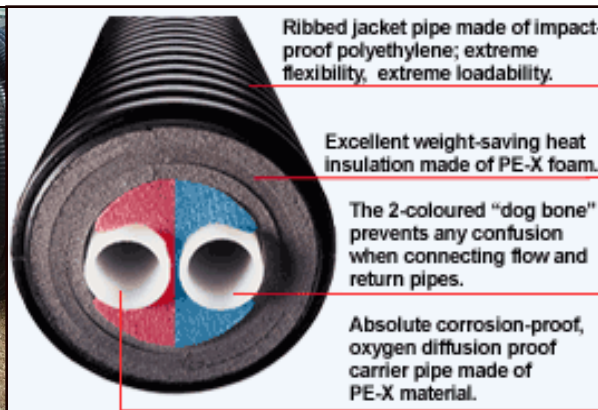
- i. Widely used – steel carrier pipe with bonded insulation and outer casing
- ii. Normal operating temperatures up to $\sim 120^{\circ}\text{C}$ if long life is required
- iii. Alarm wires detect moisture in system
- iv. Disadvantage is that each joint requires a weld, muff and insulation
- v. Also if not installed properly can corrode from external ground water
- vi. If water treatment is poor will corrode internally



The basic's – what's available?

Plastic – PEX

1. Relatively recent addition to the market
2. Can be used for systems with operating temperatures up to $\sim 90^{\circ}\text{C}$ (pressure, temperature curve determines life)
3. Sizes up to 90mm \sim 4 inch steel with lower friction
4. Smaller sizes available in twin pipe system
5. No potential for corrosion
6. Easier installation – welding not required
7. Available in 100 m rolls





Critical Scheme Design Point

Flow Temperatures

There is no need to design a system with flow temperatures well above 100°C

Cofely has networks operating at circa 80°C flow, heat losses are known and low, and it works ! – Lower flow temperatures mean:

- Longer life

- Easier and safer operation

- Direct connections are possible

- Lower capital costs – less expensive piping systems

- Lower heat losses

- More potential for heat recovery from other technologies such as CHP

You may be driven to increase temperatures and pressures due to the height differential across the scheme – but always keep to a minimum



Modern Community Heat Networks

- Very low heat losses - Current piping systems losses are 1°C per km
- 100% Reliability subject to good quality installation
- All systems laid directly in the ground
- Typically 100mm between pipe casings for steel system, compressed sand above, below and surrounding
- Also lay cable ducts in same trench for site wide monitoring and metering network
- A presentation on network design re expansion/stressing would take considerably more time, however modern systems are easier to design (i.e. coiled plastic you can effectively ignore) but always have calculations undertaken by a professional



Consider other scheme success factors

- ☐ Integrate other technologies – each have their own detailed design principles
- ☐ Chilling system and network for air conditioning
- ☐ Heat Storage
- ☐ Flow and return temperatures
- ☐ Governance



CONTACT

■ **Mike D Smith**

■ **Director, Cities. Cofely UK - Energy Services**

■ **President, UK Urban Development Fortissimo, GDFSUEZ**

■ **E-mail: mike.smith@cofely-gdfsuez.com**

■ **Mobile: 07976 606858**

■ **Web: www.cofely.co.uk**