Challenges when Planning & Developing Industrial Waste Heat DHC
Rundown

- Background / Context
- Challenges
- Pilot Project
  - TDHS
Why should Ireland develop DHC?

- Heat: 37%
- Transport: 42%
- Electricity: 21%

Progress to 2020 Targets:

- RES-E: 75% (40% target)
- RES-H: 58% (12% target)
- RES-T: 74% (10% target)
Why should we develop DHC in NWE?

All in bottom 5!

A little better, but still very low DHC!

(source: Eurostat)
What is 4th Generation DHC?

- Low Temp Sources
  - Environmental Heat Sources (e.g. river, water, geothermal)
  - CHP Plants Powered by Biofuels
  - Large Scale Thermal Storage
  - Large Scale Heat Pumps

- Low Temp Demands
  - Large Civic Buildings
  - Hospitals
  - Residential
  - Hotels and Retail
  - Data Centres
  - Commercial Refrigeration
What is 4th Generation DHC?

Integrated Heat & Electricity Markets = Smart Energy System

- Low Temp Sources
  - Environmental Heat Sources (e.g., river-water, geothermal)
  - Data Centres
  - Commercial Refrigeration

- Low Temp Demands
  - Large Civic Buildings
  - Hospitals
  - Residential

- CHP Plants Powered by Biofuels
- Large Scale Thermal Storage
- Large Scale Heat Pumps
- Solar Energy
- Wind Energy

Interreg North-West Europe HeatNet NWE

European Regional Development Fund
The Vision
DHC – Not just for heating

- Industrial Waste Heat – increasing plant efficiency
- Thermal Storage – Cheap Energy Storage for Large Scale Demand side Response
- Customer Safety – no onsite combustion or fuels
- Low-carbon & lower local air pollution
- Integrate more Renewable Electricity – Large scale Heat Pumps & Electric Boilers & RE CHP
- Less Fossil Fuel Imports – increased security of supply
- Low-cost heat – utilises waste and renewable sources of heat
- New market – new local employment
Energy Planning – Evidence Base Challenge

Heat Demand

Heat Supply

Constraints (physical, timing, political)
Heat Sources

17 Heat Source Types Investigated – Approx. 70 different data sources used

Commercial:
- Flue gas heat recovery
- Process heat recovery
- CHP excess heat
- Existing Biomass
- Commercial/Industrial Cooling with Heat Offtake (e.g. Data Centres, Cold stores)

Infrastructural:
- Electrical power plants (CCGT, OCGT, EfW)
- Electrical transformer substations
- Landfill biogas
- Landfill waste heat
- WWTW biogas
- WWTW waste heat
- Sewer waste heat (EPA Licence data)

Environmental:
- Air (ASHP)
- Surface water (HP)
- Ground (GSHP) – SEAI suitability map
- Deep Geothermal
- Mine water
Heat Sources

Enough industrial sources to heat 250,000 homes
Heat Demand

57% of Heat Demand in Ireland could be covered by DH

https://www.districtenergy.ie/heat-atlas
Physical Obstacles

These obstacles include: Infrastructure, Historical & architectural heritage sites, Habitat, Rivers & lakes.
DH provides <0.8% of heat demand in Ireland

Industrial waste heat = 0% of heat supplied to DH in Ireland
Where to Start
Bridging the Gap

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<td>Rathcoole</td>
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<td>Newcastle</td>
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Legend

- CHP (KW)
  - 50 - 1000
  - 1000 - 10000
  - 10000 - 100000
- Surface Water (KW)
  - 42.0 - 1000
  - 1000 - 10000
  - 10000 - 31000
- Data Centres (KW)
  - 50 - 1000
  - 1000 - 10000
  - 10000 - 15246
- WWTF (KW)
  - 120 - 2689
  - 2689 - 55762
  - 55762 - 311220
- Biomass Heat Sources
  - 50 - 1000
  - 1000 - 10000
  - 10000 - 50000
- Ind Waste Heat Sites (KW)
  - 50 - 1000
  - 1000 - 10000
  - 10000 - 52200
- Heat Density > 150 TJ/km²
- Land Use Zones
- Dublin Basin

Pilot project
Challenges for DHC Company/Municipality

- No tradition of DHC – lack of knowledge (across all sectors - academia, public bodies, semi-state utility companies & customers)
- No municipal utilities - all delivered by national level bodies
- No evidence base for decision making & low autonomy levels
- All energy policy & regulations controlled at national level – difficult to change
- Current energy policy never designed with DHC in mind – creates unintended barriers
- No long-term planning – energy plans changed with changing political parties
- No national level Heat Plan (although there are transport & electricity plans)

...BUT things are changing! 😊
Barriers & Challenges
Common Across North-West Europe

Biggest Impact Barriers
- Using Local Authority powers
- Getting local politicians on board
- Using Public Buildings as anchor customers
- Timing, Facilitation, connecting stakeholders
- Customer Risk
- Organisational
- High upfront capital costs
- Low-cost loans/investment, Shared trenching costs with other infrastructure
- Creating new evidence-based low-carbon heat policy

Most Prevalent Barriers
- Technology
- Physical Constraints
- Policy
- Regulatory
- Political
- Legal
The Opportunity for Waste Heat Producers

- Provide free cooling
- Act as a heat sink for CHP plants
- Potential to generate extra revenue from heat which currently has no value
- Reduce the space requirement and capital costs of on-site heating and cooling plant
- Where applicable DHC can also provide low-cost, low-carbon heating on site to provide hot water, space heating, process heating or pre-heating etc.
- Potential to reduce capacity charges for electricity and gas
Challenges for Waste Heat Producers

- Disruption to production – financial implications
- Reluctance to be an early adopter “guinea pig”.
- Engagement in EE
- Trust regarding payback, IRR etc. – especially if calculation is performed by the supplier and no expertise to verify these internally
- Availability of capex – competition for investment internally with processing equipment etc.
- Knowledge, awareness or time to fully investigate options
- Access
- Reluctance to take on the role of heat supplier – ensuring security of supply
- Impact on quality of product or service
Tallaght District Heating Scheme

Source: Data Centre Waste Heat
TDHS Specific Benefits

- Utilises waste heat that currently has no value
- Provides cooling as well as heating (high combined efficiency)
- Integrates elec and heat networks – allows balancing of the grid, greater utilization of RE
- Has high potential for replication due to the growing number of data centres
- Contributes to South Dublins CO2 (\(~1,400 \, \text{tCO}_2\) and EE targets
- Provides low-cost, low-carbon heat to residents in the Tallaght area
- Reduction in fossil fuel use by **up to 99%**
Thank you!