Navigating between sources of energy is becoming distinctly harder as more sources of renewable energy reach maturity levels beyond that of demonstration.

However, looking at sources of energy for district heating the selection process becomes narrower;
- Direct heat; Geothermal energy and Sun
- Indirect heat; Wind (electricity)

And there are two sources of energy which in the coming years will have a significant impact on the energy mix;
- Waste heat, collecting heat from industrial processes feed-in to the district heating system
- Waste incineration, burning of the residual part of waste after separation into reusable fractions

A combination of sources can be illustrated as on the right. There are multiple combinations and only after calculating the commercial and societal effects can a choice be made.

However, geothermal heat is an excellent choice for a stable, sustainable, long-term energy source. Geothermal energy supplement all of the other renewable energy sources, and looking at sources for 'fuel-free heating' geothermal energy is an evident choice for future production.
Geothermal Heat on the Scale

We are transitioning away from fossil fuels for district heating – however, to develop geothermal projects we have to acquire knowledge. A pre-feasibility study with milestone and decision points is a way forward. Below are the recommended phases of mapping process.

1. **Project clarification**
   - This is the prologue of the project, where the scene, actors and story is defined. The prologue describes what the journey has been to reach the conclusion 'what is geothermal heat?'
   - The purpose of this stage is to understand the client’s needs. The information requested will allow understanding of the predicted heat demand.
   - If the economics does not support geothermal development, help can be sourced from our Danish Board of District Heating (DBDH) partners to recommend other options.

2. **Subsurface data**
   - When assessing a drilling project, the availability of good quality subsurface data is crucial, consideration will be given to the following:
     - What is the quality of the available seismic data sets?
     - What information can be concluded from local and regional geology studies?
     - It's possible that some of this information may not be publicly available and may be necessary to purchase this information at additional cost.

3. **Geological target assessment**
   - The RTD document contains specifics for a single well. For a multi well project each well will normally require a dedicated RTD, however, for a multiple wells within the same development it may be possible to streamline this process.

4. **Recommendation to drill**
   - The Recommendation to drill (RTD) document forms the basis for the conceptual well design. At this stage only design work necessary to allow accurate delivery of cost data will be completed. This is intended to minimise costs in early phase planning.
   - The final output will be a provisional well design with a focus on well integrity and environmental safety. Based on this design probabilistic time and cost estimates will be generated.

5. **Well design and cost**
   - The objective here is to assess the viability of the prevailing geothermal target reservoirs available.
   - The work will aim to address the following questions:
     - Is there a Target reservoir?
     - If several targets are present, can they be ranked?
     - What are the anticipated parameters of the reservoirs (porosity, permeability, thickness and distribution etc.)?

6. **Project risk assessment**
   - The social and HSE requirements will be clear
   - The revenues can be modelled
   - The predicted heat output of the system will be estimated
   - The information summarised in the 'Geological Target Assessment report' will be integrated with the results of other studies to produce a 'Recommendation to drill (RTD)'. The purpose of this document is to 'lock' certain design criteria, allowing the well engineers to proceed with well concept selection and planning. The 'locked' criteria are:
     - Well surface locations, Well Target locations subsurface, Formation tops anticipated, The subsurface pressure regime
     - The subsurface geometrical regime will be assessed on offset and regional data. An independent geomechanical study may be required as part of detailed well planning, but not at this stage.

7. **Environmental and legislative requirements**
   - This process means necessary due diligence has been carried out.
     - The social and HSE requirements will be clear
     - The key technical challenges will be clear and explicit
     - The costs will be clear with likely errors quantifiable
     - The key risks to the project will be understood
     - The revenues can be modelled
     - The predicted heat output of the system will be estimated

8. **Decision**
   - Milestone decision
   - Milestone decision
   - Milestone decision
   - Milestone decision
   - Milestone decision
   - Milestone decision
   - Milestone decision

Interrogation of the legislative requirements to thoroughly determine the following:
- What are the regulatory requirements of both the planning and well construction process?
- What permissions are required to construct the wells?
- How shall the well examination process be conducted?
- What are the requirements of the Environmental Impact Assessment?

The information from the previous documents will be combined into a project feasibility summary. This document will place the client in a position from where they can make an informed decision to proceed, or not.