

Business models and innovative funding structures for LTDH

An introduction to business models and funding structures





LowTEMP training package - OVERVIEW

Introduction	Financial Aspects	Power-2-Heat and Power-2-X
Intro Climate Protection Policy and Goals	Life cycle costs of LTDH projects	Thermal, Solar Ice and PCM Storages
Intro Energy Supply Systems and LTDH	Economic efficiency and funding gaps	Heat Pump Systems
Energy Supply Systems in Baltic Sea Region	Contracting and payment models	LT and Floor heating
	Business models and innovative funding	Tap water production
Energy Strategies and Pilot Projects	structures	Ventilation Systems
Methodology of Development of Energy Strategies	Technical Aspects	Best Practice
Pilot Energy Strategies – Aims and Conditions	Pipe Systems	Best Practice I
Pilot Energy Strategy – Examples	Combined heat and power (CHP)	Best Practice II
Pilot Testing Measures	Large Scale Solar Thermal	
CO ₂ emission calculation	Waste & Surplus Heat	
LCA calculation	Large Scale Heat Pumps	





Overview

- What is a business model?
- Description of business model canvas
 - Business model of classic district heating
- Description of new innovative business model tools
 - Helicopter method
 - Ladder of value
 - The bridge method
- Innovative funding structures
- Examples of common scenarios for introducing Low temperature district heating in Baltic sea region





1. What is a business model?

A business model (BM) is the logic of how a company or organisation create, deliver and capture value



Description of business model



Different strategies- to reach a goal



Figure 1: Different ways to reach a gool. [4]



• There is no universal definition of a BM, but there are some common features

A business model:

- Is the logic of how a company or organisation create, deliver and capture value
- Reflects the company's strategies
- Can create competitive advantage for a company until it is being copied (first mover advantages)

Illustration of a business model 1

One way to illustrate a BM is that it consists of three parts:

- Customers (value, relationships, segments)
- Resources (infrastructure, activities, partners, logistics)
- Cost/income structure (tariffs, fees, prices models, income, costs)





Cost/income

Business model

Resources

Customers





Illustration of a Business model 2



- The main part of the BM refer to soft values and strategies and only a small part is the price model or the income structure mentioned earlier
- **The price model** includes how the company plans to earn money i.e. different types of tariffs, fees etc
- **The soft value and strategy** part of the BM could include policies such as keep all competence inhouse, choose fossil free when possible, strategic partnerships etc



Figure 3: Business model both soft and hard values. Original LowTEMP illustration [1,5] by Peter Abrahamsson, AliasDesign, for LowTEMP project and Sustainable Business Hub





2. Description of Business Model Canvas

Business model canvas is another way to illustrate a business model

One of the most commonly used business model tools, first described by Osterwalder and Pigneur 2010



Business model canvas has an "in house side" and a customer side





Figure 4: Business Model Canvas with inhouse side and customer side. Illustration modified from strategyzer.com by Peter Abrahamsson, AliasDesign, for LowTEMP project and Sustainable Business Hub [1,5]





The business model canvas contains nine blocks

- Key partnerships
 - Key activities
 - Key resources
- Cost structure

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- Value propositions
- Customer segments
- Customer relationship
- Channels
- Revenue streams

Figure 5: Business Model Canvas nine blocks. BMC modified from strategyzer.com, icons original illustrations by Peter Abrahamsson, AliasDesign , for LowTEMP project and Sustainable Business Hub [5]



Modified from Business Model Canvas at Strategyzer.com



Example of a business model for conventional district heating



Characteristics of BM of classic district heating

- In a classic business model for district heating, the main customer segment is professional customers e.g., large building owners, but also individual house owners
- The business logic is based on economies of scale i.e big volumes big income
- The strategy is push heat supply
- The infrastructure, the **key resources** are production units and distribution networks
- Necessity to cover fixed costs from production and distribution are seen in the cost and income structures

Conventional district heating



Figure 6: Conventional district heating. Original LowTEMP illustration by Peter Abrahamsson, AliasDesign, for Sustainable Business Hub (1,5]



A classic business model for conventional district heating presented in Business Model Canvas





Figure 7: Business Model Canvas for conventional district heating. BMC modified from strategyzer.com and [11] by Peter Abrahamsson, AliasDesign, for LowTEMP project and Sustainable Business Hub [1,5]



Different business models for LTDH compared to conventional district heating business models



- Keypartners more collaboration and key partnerships
- **Key activities-** shift from production to services
- Key resources new types of competences
- Cost structure more variation in costs
- Value propositions different for different customers
- **Customer segments** more and diversified
- **Customer relationship** more intense, educational
- **Channels-** different channel will be used for different customers segments
- **Revenue streams-** more diversified many small



Figure 8: Business Model Canvas for low temperature district heating. Original LowTEMP project illustration by Peter Abrahamsson, AliasDesign, for and Sustainable Business Hub inspired by BMC at strategyzer.com and [11]



General BMC low temperature district heating



Exempel of Business Model Canvas segment



- Key activities Production and services
- Key Resources New types of competences
- **Cost structure** More variation in costs
- Value propositions Different for different customers
- Customer segments More and diversified
- Customer relationship More intense and educational
- Channels- Different channels will be used for different customers segments
- Revenue streams- More diversified many small

Example of business model canvas LTDH



Modified from Business Model Canvas at Strategyzer.com

Figure 9: Business Model Canvas modified from BMC at strategyzer.com by Peter Abrahamsson, AliasDesign, for LowTEMP project and Sustainable Business Hub [1,5]





3. Examples of Business model tools

A business model toolbox to be used when developing business models for LTDH





The helicopter model -a tool to get the overview

A model that investigate the regional landscape and surroundings

- This model could be used by the municipalities and regional government as well as district heating company when preparing for a new district heating network or renovating an old one.
- The tool gives an overview and put the heating system into the regional context

Figure 10: The Helicopter model. Original LowTEMP project illustration by Peter Abrahamsson, AliasDesign , for Sustainable Business Hub

Helicopter model - zooming out





Helicopter model



This tool helps to investigate the regional landscape and surroundings

- Geographic preconditions: Geography? Where are we? Close to water? Forests? Agricultural landscape? Climate zone? Is it possible to store heat?
- Urban preconditions: What are the main industries? Could they be interested in heat, energy or cooling? Suppliers? Who will be customer? Who owns the buildings? When will the heat loads be?
- **Regional framework**: Are there any legislation or incentives, that promotes or prevents certain fuels?

Helicopter model- zooming out



Figure 11: The Helicopter model. [1,5]



Ladder of value - tool



- This tool could be used by the district heating companies in order to set the goals for what Value proposition they want to deliver. It could also be used by the municipalities or other organisations such as building owners.
- The tool helps to identify what **key resources** and **key activities** are required? It will also give some hints about if new **key partnership** are required.
- The higher you go in the ladder of value, the greater value



Figure 12: The Ladder of Value. Original LowTEMP project illustration by Peter Abrahamsson, AliasDesign, for Sustainable Business Hub [1,5]





Ladder of value tool– what is the value proposition from the LowTEMP





The Bridge method – a tool that gather several stakeholders around the same "table" and goal



When identifying incentives it is important to put a price on the value

- The value for each stakeholder group depends on the present situation and the goal.
- The challenge is to identify the monetary value for each stakeholder
- Once identified there could be incentives for local government and authorities to set up subsidies etc in order to create incentives



Figure 14: Bridge method, Original LowTEMP project illustration [1] by Peter Abrahamsson, AliasDesign, for Sustainable Business Hub with inspiration from <u>https://thebridge.se/method/</u>.





4. Innovative funding structures

Funding structures is essentially a way to finance a (LT)DH project



Funding structures introduction



- What are the challenges?
- Characteristics of different countries
- Size and ownership of DH systems and companies
- Are there any differences between LTDH and DH funding?
 - External/EU funding for innovative solutions?
 - Often higher risk of newer technologies





Figure 15A, 15B:District heating grid Source: [5]



Alternative funding



Funding structures are a way to overcome funding gaps

- Private DH companies have funding gaps
- Public DH companies are non-profit and need external investment funding



Figure 16A: Principle of funding gaps, positive and negative cash flows. Source [2]; 16B Nordic non profit model; modified from 16A [2]



How to find funding structures



- Funding structures differ from country to country
- Conditions and limits for funding
 - Ownership structures (Public vs Private)
 - Legalframework
 - New systems vs upgrading old systems



Figure 17: Finding funding structures. Source: [6]





Example: Danish DH Company creates new area

- Danish DH companies are publicly owned
 - They cannot generate profit and revenue is always equal to expenses
 - Certain other restrictions apply to income generation and project viability
- KommuneKredit is usually the primary source of funding
 - Funding organization owned by all Danish municipalities and regions
 - (Close to) Zero cost for loans
- Will need to present a project proposal including:
 - Project financials
 - Socio-economic calculations (incl. comparison to other heating types for end-users)



Figure 18: Logo Kommunekredit. Source: https://www.kommunekredit.dk





Example: Danish DH Company creates new area

- Costs are evaluated and heat tariffs are set according to all CAPEX and OPEX costs
- If user costs are too high, project might not be approved
- External funding, such as EU funding, can lower user cost and make project viable
- This is rarely done and usually requires innovative technical solutions, 4GDH is not enough



Figure 19: Operating expenses. Source: [7]





Different funding structures

Focuses on

- Loan from national banks or financial institutions
- International financial institutions (capital funds, international banks)
- National grants (in connection with CO2 and NOX emissions)
- City level subsidies (to provide cheap heat to social housing
- Loan guarantee
- European Investment Bank
- EU funds/programmes (EU Structural and Cohesion funds or European Regional Development Fund)





- Crowdfunding is a process in which individuals or groups pool money to fund projects initiated by people or organizations.
- Crowdfunding usually takes place via an online portal that handles the financial transactions involved.
- A good idea for small heating projects.



Large amounts from one, or a few, sources

Many small sums from a large group of individuals

Figure 20: Traditional vs Crowdfunding . source [8]





Overview of Energy Services

• Many types of models exist already

TYPE	DESCRIPTION	CONTRACTS REQUIRED
ESCO	An energy services company (ESCo) undertakes to supply heat to the customers, and for that purpose to build and operate the DH system. This could be set up with a defined set of consumer buildings to be connected, or to provide the service to developments within a defined area.	 Master agreement Connection contract Heat supply contract Service level agreement (SLA) Property leases
Wholesale supply of energy (Design- Build-Operate)	A sponsor appoints a single contractor to design, build, operate and supply wholesale heat and electricity. The sponsor sells the energy retail to consumers, and may be a consumer itself.	• DBO Contract • Wholesale heat supply contract with SLA • Connection contract • Property leases
Network delivery and operation	A sponsor (such as an owner of tenanted properties) appoints one or more contractors to design, build, operate and maintain a DH network but the sponsor remains the asset owner and contracts to supply heat and electricity to consumers. The sponsor may also purchase the fuel required.	• D&B contract • O&M contract with SLA • (Metering and billing contract) • (Connection contract)
Network operation	An operator is contracted to run a DH system that has already been constructed, for example under a main building contract. The operator may also be contracted to undertake metering and billing and customers services, if the landlord wishes to outsource these activities.	• O&M contract with SLA (Metering and billing contract)

BLT	Build - Lease - Transfer
BOO	Build - Own - Operate
ROOT	Build - Own - Operate - Transfer
BOT	Puld - Operate - Transfer
BRT	Build - Rent - Transfer
D&B	Design - Build
DB(F)O	Design - Build - (Finance) - Operate
PFI	Private Finance Initiative
FBOOT	Finance - Build - Own - Operate - Transfer
O&M	Operation - Maintenance

Figure 21: Description of ESCO and other stuctures. Source: [3]





- One country's traditional funding structure could be another country's alternative/innovative funding structure
- Models are to be used as inspiration as no universal model can fit any scenario
- Examples of cases might serve as guidelines





There are five example scenarios:

- Scenario 1: Existing DH operator: New development area with energy efficient buildings
- Scenario 2: Existing DH operator preparing to replace fossil fuels and/or improving primary energy factor
- Scenario 3: Access to surplus heat or RES, no DH grid
- Scenario 4: Older private buildings with local heat supply, which will undergo major refurbishment
- Scenario 5: Existing building stock of large buildings, which will undergo refurbishment





Description of Scenario 1- New development area

- Scenario 1: Existing DH operator: New development area with energy efficient buildings
- Key stakeholder: Existing district heating operator, owning both grid and a substantial part of the energy production
- Connection of area with new development, consisting of energy efficient buildings, with low heating demand and technical installations suitable for lower supply temperatures
- The regular business plan and price model will not be profitable and technically optimal, since the new buildings will consume less energy and heat losses in the grid will not be covered







Description of Scenario 1- New development area

- Scenario 1: Existing DH operator: New development area with energy efficient buildings
- A new secondary grid (separate loop) with lower temperature is built within the new development area to decrease heat losses
- The DH company can choose to use the same (well known) grid infrastructure as is used in the rest of the grid or switching to cheaper plastic grid solutions to cut overall costs
- The DH company could look at offering additional services to the customers







Description of Scenario 1- New development area

- There are a number of potential heat sources, which is chosen depending on availability and local conditions:
- Existing heat production is used, lowering of temperature in the secondary grid
- Connection of surplus heat from third party
- Solar thermal heat
- Environmental energy
- Use of return pipe heat
- Heat pumps, geoenergy
- Power to heat (PV or wind power)







Example of BM and funding structure for Scenario 1

• Funding structures Scenario 1

- Depending on whether it is individual houseowners or one big contractor that needs to decide, the approach will vary.
- A contractor will usually think a type of **ESCO model** might be the most beneficial, where a suitable ownership and operator distribution will be agreed upon.
- For individual houseowners, the engagement needs to be present for the connection percentage to be as high as possible, in order to keep costs low and revenues high. This can be achieved by either **publicity** or a type of **crowd-funding campaign**







Example of how to use BM tools for Scenario 1

- In this scenario we would recommend using Business
 Model Canvas and Ladder of Value to find new value propositions to reach the new customers and to create new business models for the second grid.
- It could also be recommended to introduce an innovative price model where the amount of energy consumed is not the cost driving factor for the consumers.



Figure 23: Example of BM tools for Scenario 1-New development area. Source: [1,5]





Description of Scenario 2- Replace fuels, existing grid

- Scenario 2: Existing DH operator preparing to replace fossil fuels and/or improving primary energy
- Key stakeholder: Existing district heating company operating fossil fueled CHP plants
- The company is preparing to change the energy source in the future or improving primary energy factor, due to regulatory reasons or the company's environmental goals
- The connected customers mostly have existing buildings with varying needs for supply temperature, but mostly high temperatures



Figure 24: Scenario 2 – Replace fuels, excisting grid. Original LowTEMP project illustration by Peter Abrahamsson, AliasDesign, for Sustainable Business Hub [1,5]





Description of Scenario 2- Replace fuels, existing grid

- Scenario 2: Existing DH operator preparing to replace fossil fuels and/or improving primary energy
- The new heat source should be renewable or recycled: surplus heat, geoenergy, solar energy, environmental energy, bioenergy
- The local availability of energy sources, might point to a low temperature grid being the most sustainable solution
 - To prepare a possible shift to a low temperature grid, the DH company need to map which supply temperatures customers really need
 - Customers need to adapt to enable lowering the temperature in the grid for the DH company
 - Cooperation is needed with building owners to refurbish houses to become better adapted for lower temperatures
 - Short term, buildings with a need for low supply temperatures, could be connected to the return pipe



Figure 24: Scenario 2 – Replace fuels, excisting grid. Original LowTEMP project illustration by Peter Abrahamsson, AliasDesign, for Sustainable Business Hub [1,5]





Example of BM and funding structure for Scenario 2

• Funding structures scenario 2

 Getting public engagement for an "internal" efficiency project might be troublesome, so here it would make sense to use a combination of the company's own capital and funding from a place like the EU, for improving CO2 emissions and energy efficiencies, which, for the moment, there are plenty of funds supporting.



Figure 24: Scenario 2 – Replace fuels, excisting grid. Original LowTEMP project illustration by Peter Abrahamsson, AliasDesign, for Sustainable Business Hub [1,5]



illustrations by Peter Abrahamsson, AliasDesign, for Sustainable Business Hub[1,5]

40

Example of how to use BM tools for Scenario 2

- Use the **Helicopter model** in order to investigate and screen for alternative energy sources, the need for energy and heat storage etc within the area. There could be some regional or national investment funding supporting suitable for fossil free fuels.
- Use the **Bridge method** to get the bets from the players i.e investigate the incentives and the value of the incentives for the different stake holders. How much is it worth for the municipality or the regional government to reach the environmental goals.
- Use the tool Ladder of value and Business Model Canvas to develop different business models and value proposition for different customer segments with regards to their temperature demand. The Ladder of value could also be useful to the DH company to use as a way to illustrate their future goals



Fossil free heating and tap water with LTDH

company

Key Resour

Channel

Key Partnershi









Description of Scenario 3- No grid, access to surplus and RES

- Scenario 3: Access to surplus heat or RES, no DH grid
- Access to large, stable amounts of surplus heat and/or land area for solar thermal park and/or heat pumps
- There is a nearby area with local heat solutions in the buildings or a natural gas grid today
- An entirely new DH grid needs to be developed and built, LTDH would offer lower investment costs
- The key stakeholders could vary and include factories, households, municipalities, small DH companies
- Ownership of grid and production could be organized in different manners
- Some buildings could need refurbishment to be able to connect to LTDH



Figure 26: Scenario 3 - No grid, access to surplus and RES. Original LowTEMP project illustration by Peter Abrahamsson, AliasDesign, for Sustainable Business Hub [1,5]





Example of BM and funding structure for Scenario 3

• Funding structures Scenario 3

- For this scenario, there is no existing infrastructure, which is a major investment if traditional district heating grids are to be implemented. So low-temperature grids are to be selected if possible. Investment costs will also be dependent on how many customers will be connected. This means that **public engagement** is critical for the project to be implemented.
- Therefore, a crowd-funding campaign would be highly beneficial, to increase awareness and publicity of the project, while at the same time possibly drawing in investors. The ownership structure, depending on availability, could be either an existing district heating company expanding, possibly as an island system or as a cooperative venture, owned by the investors or customers.



Figure 26: Scenario 3 - No grid, access to surplus and RES. Original LowTEMP project illustration by Peter Abrahamsson, AliasDesign, for Sustainable Business Hub [1,5]



Example of how to use BM tools for Scenario 3

- Use the Bridge method tool to investigate the incentives and the value of the incentives for the different stake holders as has been identified in stakeholder mapping. How much is it worth for the municipality to attract new businesses and inhabitants i.e taxpayers and to be able to show a sustainable leadership in order to introduce long term goals. Since local heating solutions and natural gas is used.
- It would be a good approach to get an overview and use the Helicopter model in order to investigate and screen for alternative energy and heat storage etc within the area. There could be some regional or national investment funding supporting suitable fossil free fuels such as solar thermal energy.



Figure 27: Toosl for Scenario 3. Original LowTEMP project illustrations by Peter Abrahamsson, AliasDesign, for Sustainable Business Hub [1,5]





Description of Scenario 4- Older buildings local heat, no grid

- Common scenario 4: Older private buildings with local heat supply, which will undergo major refurbishment
- Larger area with older buildings (households) with local heat supply
- Older wood furnaces or oil burners of different environmental standards, which causes poor air quality locally
- Municipality have strong incentives to decrease health hazardous emissions
- Buildings will undergo energy efficient refurbishment and new technical installations will enable lower supply temperatures
- There is an option to shift to centralized heat production; solar energy, heat pumps, environmental energy, bio energy or surplus heat



Figure 28: Scenario 4 – Older buildings local heat, no grid. Original LowTEMP project illustration by Peter Abrahamsson, AliasDesign, for Sustainable Business Hub [1,5]





Example of BM and funding structure for Scenario 4

• Funding structures Scenario 4

- Municipal funds
- **Collaboration** with the heat provider, whether a district heating company or a cooperative of the buildings being renovated, will need to be established.
- Utilize elements of ESCO models in terms of ownership
- **Crowdfunding** for stakeholder engagement and fundraising/equity-sharing



Figure 28: Scenario 4– Older buildings local heat no grid. Original LowTEMP project illustration by Peter Abrahamsson, AliasDesign, for Sustainable Business Hub [1,5]





Example of how to use BM tools for scenario 4

- Use Bridge method tool include house owners, architects, insurance companies, municipality units for tourism, social services, suppliers.
- Helicopter model in order to investigate and screen for alternative energy and heat storage etc within the area. There could be some regional or national investment funding supporting conversion of social burdened neighbourhoods.
- The Ladder of value -useful to use for the municipality to communicate future goals for the neighbourhood i.e the development of the area over several years. The value propositions are directed to the inhabitants since the refurbishment most likely will increase life quality, for the inhabitants.



Figure 29:Tools for Scenario 4 – Older buildings local heat no grid. Original LowTEMP project illustrations by Peter Abrahamsson, AliasDesign , for Sustainable Business Hub [1,5]





Description of Scenario 5- Large building stock existing grid

- Scenario 5: Existing building stock of large buildings, which will undergo refurbishment
- Major energy efficient refurbishments of larger existing buildings (for instance public) will take place, in accordance with new near- zero- energy-house regulations
- The business case for the existing DH operator is becoming less profitable, as less heat can be sold to some large customers
- Risk of higher return temperatures and increased heat losses since the grid still need to be run as a high temperature grid
- Refurbishment could mean there will an adaption of technical installations within the buildings
- If buildings within a DH area with many customers are refurbished one at a time, use of return pipes to heat selected energy efficient buildings could offer a slow shift to LTDH



Figure 30: Scenario 5 - Large building stock existing grid. Original LowTEMP project illustration by Peter Abrahamsson, AliasDesign, for Sustainable Business Hub [1,5]





Example of BM and funding structure for Scenario 5

Funding structures Scenario 5

- If the building stock is refurbished to near-zero-energy regulations, then the heat sales will plummet, making it an unfavorable transition for the heat provider. Therefore, a collaboration must be made between the building owners and the heat provider to ensure a common ground.
- A transition to a low-temperature grid/connection or even a cold one, might be required for the project to be financially feasible for the heat provider, if even a grid is needed. ESCO models could be investigated here in terms of ownership.
- **Crowdfunding** is a possibility, but it might not make sense depending on who the owners are and how many of them there are.
- **EU funding** could be an option given the ambitious goal of the zero-energy outcome.



Figure 30: Scenario 5 - Large building stock existing grid. Original LowTEMP project illustration by Peter Abrahamsson, AliasDesign, for Sustainable Business Hub [1,5]



Example of how to use BM tools for Scenario 5

- Recommended to use Business Model Canvas in order to find new value propositions to reach the old customers and to create new business models.
- Use the Helicopter model in order to investigate possibilities for heat storage, in the ground, in buildings etc. Could also be used for map heat demand at different costumers. This together with weather forecasts, technical devices and monitors could be used to predict when the heat peaks are in the system
- Recommended to introduce an **innovative price model** where consumers are rewarded for low return temperatures and where high return temperatures is a cost driving factor.



Figure 31: Business model tools for Scenario 5. Original LowTEMP project illustrations by Peter Abrahamsson, AliasDesign, for Sustainable Business Hub [1,5]



LowTEMF

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