Business Models of Heat Entrepreneurship

Niko Suhonen
Preface

“The Business model of heat entrepreneurship” is a report on different procedures and possibilities of heat entrepreneurship commissioned by Josek Oy (Ltd.). The main aim of the report is to survey the theoretical backgrounds, working methods and operational working places of small and medium scale heat entrepreneurship. In addition, the report offers a frame of reference and a backbone for new entrepreneurship that can be applied to other operational environments, such as Scotland.

This report is a part of European Union projects, Northern Woodheat and Baltic Biomass Network. The North Karelia University of Applied Sciences has also given their support in compiling the report by offering their knowledge of heat entrepreneurship. The clarification is written out by Niko Suhonen.

In Joensuu 18.12.2006

NIKO SUHONEN
1. **Operational Framework**

As a result of the increase in the price-level of fossil fuels, the prices of alternative fuels, such as wood energy, have become more competitive. Furthermore, since the investment costs have also decreased, wood heat energy has become economically more reasonable. Technological development, together with the increased prices of fossil fuels, has resulted in the implementation of so-called back-stop – technology. It refers to the introduction of new alternative technology or resource at the moment when the price of technology or resource increases. The increased use of fossil fuels can be seen as an example of the implementation of back-stop technology.

Structural changes in the countryside have generated new industries of livelihood. One example of these is heat entrepreneurship, which has given opportunities for farmers and forest owners to open up new by-businesses and use natural resources in a new way. The production of wood chips is also reasonable with respect to forestry. Moreover, aims to decrease greenhouse gases have motivated different actors to produce wood heat.

Although wood fuels are also environmentally friendly, the most important factors for the customer and the entrepreneur are the price of the heat and the cost of the investments (Rämö et. al 2002). Since the nineties municipalities and enterprises have outsourced their heat services. Often the heat fuel has changed from oil to wood fuels. The material investment costs of wood heat have generally been higher than those of alternative fuels. On the other hand, the price of heat per unit is cheaper (Suomen Kuntaliitto 2002). Since the role of the investor is significant at the early stage, the investor in most cases has been a customer. Nowadays entrepreneurs make investments more and more often (Nikkola and Solmio 2004). As a result, bigger investment caused by the change in fuel has influenced heat entrepreneurship and the formation business models.
2. Theoretical Background

2.1 Definition the Heat Energy Business Model

Heat energy business model is a model for
a) organising, and
b) defining of responsibilities and ownership
between all stakeholders involved, such as sellers and buyers of the service, subcontractors and fuel producers.

Heat energy business models differ from traditional business models, because in most cases it is the customer who has made an investment and, thus, the ownership relations are separate between the customer and the entrepreneur. The organisation of normal/traditional business model can be considered more directly from entrepreneur’s point of view. As we focus on operation models, we have to consider many factors that influence, either directly or indirectly, organisations and responsibilities and ownership issues. In this clarification we are interested in heat energy organisations the scale of which is about 100 kW – 5 000 kW.

2.2 Investment and Business Models

Since the investment costs of alternative fuels are higher than those of fossil fuels, the effect of the investment on the heat energy business is significant. It influences the operational model and organisation as follows: 1) the risks of investment are higher as compared to fossil fuels; 2) investment ties up more capital. Let us consider these two factors in the following.
Impact of Risk to Business and Investments

Heavy investments in heat energy business as well as other economic investments always involve risks that can be realised. As an example, let’s consider a heat energy entrepreneur who invests in heat plant but the total revenues do not cover total costs. In that case the risk is realised for the entrepreneur. In economic theory, risky investments are often considered with the help of so-called expected utility theory. In general people are thought to be averse to risks, and as a consequence, risky, although possibly profitable, investments are avoided. It is often the case that people are even willing to pay for not having to invest in risky business, such as insurance markets.

The investment decision is very much dependent on the entrepreneur’s resources. In this case, the financial loss caused by the investment does not have a significant effect on the resources of the decision-maker. On the other hand, even the profit made on an investment does not increase resources considerably. Thus, an investor who has greater funds in relation to the investment has better opportunities to participate in the investment than an investor whose funds are lower.

In Finland the heat energy business often started with the customer making the investment and the entrepreneur running the practical operations, such as maintenance and services. In other words, customers (municipalities) made investments because customers could carry risk better. In addition, governmental support decreased the risks of possible financial loss. This again has made investment in new technology more attractive. In larger heat plants entrepreneurs have been co-operative, so that they have been able to secure the delivery of raw material and share risks caused by the business/operation. In the early stage heat energy business was very uncertain: the new technology, pricing, profitability, raw material etc. were new to all parties.

However, positive experiences have changed the situation. Risks have decreased for several reasons: we have more experience in maintenance work, fuel supply and other practical operations; the price of fossils fuels have increased, so the profitability has increased; technology has developed and become cheaper; customers’ trust in production has increased and the whole business has became more profitable. All this development has decreased the risk of bankruptcy. As a result more and more entrepreneurs are willing to make an investment.
2.2.1 Tying-up of Capital

The greater investments related to the use of alternative fuels tie up capital for longer periods. Profits will be gained after some non-profit years. This is naturally an essential factor that impacts the decision to invest. It is often the case that the investor has to have abundant resources so that the investment would not have other negative effects on the investor’s activities.

In economic theory investments over time is examined with the help of present value methods. It gives us the opportunity to consider long-run profitability as we assume cash flow and discount rate. Most cases we assume that the discount rate is constant and it includes real rate profit expectation and risk premium. On the other hand it has been noticed in the economic theory that the discount rate is not constant but short term bullish and downward over time. In practice this means that investors are more interested in short term revenues than long term revenues. In other words investors are not willing to invest to the future even if it is reasonable in economic sense. To take an example, people buy air-condition systems which are cheap but the operating costs of which are expensive, although the expensive one would pay for itself in a short time.

Similar phenomena can be noticed in the starting phase of heat entrepreneurship. Small entrepreneurs did not invest in heating plants. Nowadays, with increased profits, entrepreneurs are also investing in the heating plants and taking the risk of the whole business. Furthermore new and bigger companies are interested in the heat business. Moreover the bigger heating units give an opportunity for better profits because of the economic scale. Okkonen (forthcoming) has made cost-benefit analysis in Scotland where he reported remarkable advantages over 800 kW heat production markets when compared to 500 kW markets.

Investment risk and long repayment period have influenced and influence the business models of heat entrepreneurs. Let’s next consider different types of business models in more detail.
3. Production Chain

3.2 Production chain

The demand of heat entrepreneurship can simply be defined as the customers need to get heat that has the best possible price/quality relationship. Quality refers to aspects such as local material, environmental-friendliness, etc. The aim of various business models is to offer the customers a service they demand – in this case heat. In broader perspective a customer him/herself can participate in the heat production process.

Aspects such as political decision-making, local legislation, statutes, regulations, research, and supporting measures also affect heat entrepreneurship. These factors set limits and define possibilities for heat entrepreneurship and its development.

When considering the operational chain of heat entrepreneurship, we notice that it can be divided into two different parts: 1) heat production, and 2) fuel supply (See Chart 1). Heat is produced in heat plants and delivered to customers via a heat network. The ownership relations of heat machinery affect the organization of the business. Correspondingly, the delivery chain of fuel can roughly be divided into two categories: A) energy wood from forests, and B) by-product flow. Wood chip is cleared from the forests. The process has various stages. Correspondingly, the by-product flow consists of the leftover material formed in the production process.
Heat production

The final user of heat production is the customer. The main customer can also sell heat on to smaller customers. In many cases this is only a system which creates superimposed operations. As previously stated in the theoretical part, heat entrepreneurship is strongly affected by the investor, that is, the sponsor, in which case it directly influences the ownership- and responsibility relations. From the sponsor’s point of view the investment can be made through various means. A sponsor can be a client, a major business, an individual, a franchising chain, a bank or an ESCO concept. The sponsor also sets limits to the business models of the entrepreneur. The most popular models are limited companies and individual entrepreneurs. Since the investors finance heat plants and heat delivery networks, the delivery of machinery and operational heat production have to be supervised by the sponsor. The delivery of production equipment is one crucial factor in heat production process. Aspects such as contracting, subcontracting and planning have to be considered in great detail. Operational activity involves factors such as heat production and care and maintenance measures.

Chart 2 present factors that affect heat production. The factors mentioned above together with those presented in diagram 2 influence heat production and the choice of a business model. Ownership and responsibility relations lay the basis for business activity. However, a heat plant needs raw material in order to produce heat, which creates the second part for business models.
1. Heat production

Chart 2. Heat production chain.

3.3 Fuel supply

3.3.1 Energy wood from forests

The harvesting of biomass for wood energy includes several stages (see e.g. Hakkila 2004 for more details). Raw material can be bought from the forest owner as a standing sale or as a sale on delivery. Standing sale means that the purchaser harvests the raw material from the forest. Sale on delivery, in turn, means that the purchaser buys the wood that has already been harvested. The harvesting can be made manually or mechanically. The raw material can be stems, small sized trees from thinnings,
logging residues or stumps. The harvesting constitutes a major part of the costs in the business model of raw material delivery. After the harvesting, the wood is transported into a temporary storage. The various stages of transport and the harvesting can be managed as a subcontract, and then it constitutes a part of the business model. In addition, transport machinery requires major investments. After harvesting, storage, transport and chipping, the wood fuel is ready for use in heating plants. The alternative operational chain for wood clearance is presented in chart 3 and part 1.
2. Fuel supply

A

Chipping
- production equipment
- cooperation in production

Transport
- transport machinery
- subcontractors
- cooperation in production

Storage
- duration
- logistics, e.g. GIS

Forest transport
- transport machinery
- co-ownership
- subcontractors

Sale on delivery

Harvesting
- woodchips:
  1) manwork
  2) mechanical
- logging residuals
- stumps

B

Transport
- transport machinery
- subcontractors

Refining
- production equipment
- subcontracting

By-product flow
- storage

Timber processing
- efficiency

Standing sale

Timber flow
- sawmills
- factories

FORESTS MANAGEMENT AND OWNERSHIP
- owners
- Association of forests owners
3.3.2 By-product flow

By-product flow is another alternative to acquire raw material for heat production. Material is available through sawmills or other sources that use wood as raw material (e.g. paper mills). It is produced, transported and stored before heat production. Material is not obtained straight from the forest owner, which constitutes the biggest difference between this method and the harvesting from forest alternative. In this case, the costs of the harvesting are not directed straight to the supplier, which makes it possible that the costs per unit are lower. The organizational chain of by-product flow is represented in chart 3 and part 3.
4 BUSINESS MODELS IN PRACTISE

4.1 Background of business models

In the following we will investigate practical business models and consider their special features. The main aim is to form a clear idea of the existing models. Another intention is that the business models presented can be applied to various operational environments irrespective of the country or region. In the investigation, we have applied material produced by North Karelia polytechnic for Motiva Ltd (Puhakka et al 2005).

4.2 Investment by customer

A business model in which municipality or other customer owns the heat production equipment and entrepreneur produces heat is popular because the economical risk for the entrepreneur is small. In practice, the customer invests in the heating plant and entrepreneurs take care of the fuel supply and operations for a set compensation (Okkonen et al 2005).

The size of the plant, that is, the amount of heat produced, affects to the details of the business model. Entrepreneur runs his business usually as part-time if the plant is small. Since the biggest investment comes from the customer, the entrepreneur can operate with a small initial capital and the business model is often a trade name/company name/sole trader. One way to organize heat production is a company ring, where several entrepreneurs share responsibilities according to their strengths and agree on compensations. Similarly, in case of a larger heating unit, it makes sense to choose the business model so that it corresponds to challenges of business activity (e.g. co-operative or limited companies).

From the customer's point of view the asset of the business model is the fact that the heat production equipment stay in customer's ownership, in other words, the customer retains authority over heat production. However, if the initial investment is high, the customer has to carry the economical risk. In addition, the question of responsibility between the entrepreneur and the customer can in some cases be problematic.
In practice, in investment by customer business model entrepreneur purchases the raw material as cheaply as possible either as wood chips or as by-product flow. The entrepreneur can have various suppliers such as forest machine contractors, chipper users, or foresters. Correspondingly, the customer acquires the operational institutions like the plant and network as well as takes care of the selling of heat to other customers. Basically operations cannot be divided between several contractors if the operations are small-scale and the business is meant to be profitable. From the entrepreneur's point of view the investment is functional when the entrepreneur wants to minimize risks and work part-time. Correspondingly, in case the intention is to expand the operation and make it more and more profitable, business model is not the best choice.

4.3 Investment by entrepreneur

In this second business model entrepreneur invests in heat production equipment (Okkonen et al 2005). In practice, the entrepreneur carries the economical risk, because all the possible technical faults and economical risks (e.g. rise in interest rate) are directed straight to the entrepreneur. On the other hand, great investment should enable entrepreneur to achieve greater economical profit.

The amount of heat produced affects the business model and its corporate forms as in investment by customer model. From the customer's point of view outsourcing the business is a good option when one wants to direct capacities to core functions, such as health care services. On the other hand, if business is completely outsourced, the heat entrepreneur acquires a position comparable to a leading market position. This, however, can be influenced by a detailed contract which defines among others factors that affect the price of heat. From entrepreneur's point of view the business model is favorable if he is capable and willing to carry risks. In addition, in slightly larger operations the entrepreneur can work full-time and the investment can be expected to make profit.

The working method for the customer on the level of practical business operations is to pay only for the produced heat which consists of joining fee, basic fee and user fee. Entrepreneur supplies production equipment and takes care of operational activity and management. Raw material can be acquired individually by the entrepreneur or by subcontracting. It has to be remembered that in case the business is small-scale the raw material supplied as a subcontract reduces entrepreneur’s profits. On the other hand, in large-scale operations entrepreneur can reduce the risks; investments in transportation equipment or chipper are not necessary.
As a rule, the more the entrepreneur refines the raw material, the better the profits are for the company. As an example, if an entrepreneur produces the raw material from his own forest, takes care of transportation, storage, chipping and heat production in his own heat plant, the cover from the sell of produced energy is highest. However, this presumes strong tolerance for risks and economical as well as mental resources.

4.4 Large-scale enterprise: A network model

Heat production organized by a large-scale enterprise constitutes one further business model. A large-scale enterprise can organize heat production in two ways: 1) an enterprise invests in and owns production equipment and takes responsibility for heat production and 2) a customer invests in and owns the equipment, but the enterprise is responsible for heat production (Vapo Ltd 2005).

What is typical for both methods is that a large company shares heat production activities between subcontractors. These include, for instance, raw material supply, transportation, chipping and the service and maintenance of a heat plant. An enterprise can thus carry the risk of investment, but share the risk of production with subcontractors and pay for a small scale entrepreneur for agreed measures. In general the model requires heat production to be large-scale.

It is important that a large company has experience of heat production, and better risk taking capacity. These matters are important also from the customer’s point of view, because they secure heat production. The model is suitable for a small-scale entrepreneurs incase they are not willing to expand their operations. This activity/operation is comparable to a business model in which a customer owned heat production equipment and an entrepreneur produced heat for a customer. It has to be noted that there is an extra participant between a customer and a service producer and it may reduce the entrepreneur’s compensation or business profit.

It may be that in this model the company has to only supervise or take care of administration. Company also controls the heat plant acquiring process. In addition, the unit’s/company’s etc operational activity is left for a subcontractor. Raw material is acquired from where it is the most economical and thus local entrepreneurs can be compete subcontractors. In a large-scale enterprise model a customer pays for a large company that takes responsibility of the operations.
4.5 ESCO

ESCO (Energy Service Company) business model derives from functional models aiming at energy saving. In the original ESCO –concept, company (from outside) provides services and investments for a customer to reduce energy consumption. The company improves energy efficiency, and operations are paid back with the savings of reduced energy costs. In heat production, the company invests in heat production equipment and customer pays the same price as before the investment. The heat produced with a new (wood fuel based) system is cheaper than in older (fossil fuel) system. After the company has got the investment back, customer gets the ownership of the equipment and also lower heating costs. The model has been applied for heat production for instance in Scotland and pilot projects have been tested also in Finland (Kokkonen S. 2005).

This model is suitable for customers who are willing to keep the ownership of heat production equipment, but who do not have resources for the large investments. For the entrepreneur, who has experience on profitability calculations, and also resources to make investments, the ESCO concept may be a good option. However, this concept requires very good basis both on heat production techniques, and also on investment calculations. This model is quite difficult to apply in a small-scale.

The biggest problem from company’s point of view is the big size of the investment and long payback periods (5 to 10 years). If a company makes several simultaneous investments, significant financial resources are needed. On the other hand, a company is sure to have ready-made concepts and skills to run the operations. Stable price level at the payback time reduces company’s economical risk, too.

From the customer’s point of view, the strengths of this model are small investment risk, steady heat price for agreed period and ownership of the equipment. The negative aspect is long payback periods. Usually the chipping system can be used for 15 to 20 years (Suomen Kuntaliitto 2002), which must be remembered when making the contract; although the price for the customer is the same, the total costs are affected by the length of the payback time.

Since ESCO -company operates in a broad scale, raw material has a major affect on business profitability. A company must have ready and clear raw material supplier chains: 1) by-product flow or 2) considerable forest resources. In practice this means that by-product flow can supply economical and high quality raw material. On the other hand, considerable forest resources in a particular area make co-operative activity possible. Moreover, it is possible that ESCO –company takes over the
supply of raw material and operational activity as a subcontractor. In this case the operation can be considered one type of franchising method. All in all ESCO –company operations are limited by large investments that tie up capital for equipment; this is too high a risk for the entrepreneur from the point of view of profit as well as long-term investment.

4.6 Franchising

Franchising is a business model, where two independent partners (franchiser and franchisee) have a contract. Franchiser has developed business model and concedes the rights to franchisee to use this model according to the franchise agreement. Franchisee operates according to the operational instructions, which are planned and looked after by franchiser. Franchisee pays to the franchiser for the rights to use developed business trademark.

In heat production, franchising could be organised in a following way: Franchiser gives the trademark, business concept and operational principles, and the entrepreneur (franchisee) would work for both himself and for the franchiser. In practice, franchiser would support franchisee in planning, investments, financing, contracts, maintenance, fuel supply and other practical issues. As compensation, franchisee would pay for this support. For the entrepreneur franchising would provide professional support and economic reliability. In practice franchising would require full-time entrepreneurship. Customer does not need to invest in heating plant, i.e. entrepreneur takes the risk of investments. At the moment this model is starting in Finland, and previously experiences are gained in organising the wood fuel supply in Austria.

The chain would help the entrepreneur in planning the chain. This would mean, that the chain would decide the best alternative for raw material resources, clearing, chipping transportation and storage, which make the operations effective for the entrepreneur and the chain. The chain would also take care of among others subcontracts and other administrative issues, which makes it easier for the entrepreneur. On the other hand, quality requirements of the raw material supply may complicate entrepreneur’s businesses.
There is a demand for franchising business model in heat entrepreneurship, because potential entrepreneurs and customers might consider a ready concept a good and flexible option. However, the need for major initial capital constitutes a problem for the business activity. Investments to open-up a ready-made chain are considerable, which means that the model requires great risk-taking. Actual profits would be made only after years from the start.

4.7 Supply of heat containers

In Finland have also business model where company provides ready-to-use heating unit for the customer. There are similarities between this model and large-scale enterprise model and franchising concept, but it differs from them in some respects. Company provides ready-to-use heating unit for the customer. Company owns the unit and customer pays for the company on the basis of produced heat. Company takes care of the management and uses subcontracting in organizing practical operations (e.g. fuel supply chains). Subcontractors have an opportunity to purchase company’s shares. It may be problematic for the customer as well as for the company that the heating unit does not fit into all cases. In addition, the company may have problems to recruit professional staff for example to various building projects in different areas.

5. Applying the business models and future

5.1 Applying and regional differences

Most of the business models presented above have been applied to heat entrepreneurship in Finland, and new case-specific applications are introduced. Regional differences and conditions may set constraints for applying the business models. Legislation and other operational environment have differences (e.g. types of enterprises, available support). On the other hand, supply-chains have the same ideology: Objective is to organize the sustainable supply of renewable fuel as efficiently as possible.

Business models are meant to raise new ideas and give new viewpoints to local, case-specific ways of action. As an example, let’s take the differences between Finland and Scotland. Not all models used in Finland can be directly applied to heat production in Scotland. On the other hand, operational modes and drawbacks can be avoided when the model is applied to a new environment. This calls for
reciprocity/discussions between parties, which this report aims to facilitate. Appendix 1 presents a list of matters that an entrepreneur can consider when planning his own business model.

5.2 Future of the business models

The future of heat energy business in Finland can be simplified to two main trends: 1) development towards large units and companies, and 2) small-scale and part-time entrepreneurship. Because larger units have the scale-effect and can create profits easier, this will lead to extensions and combining of businesses. These, on the other hand, can again create new subcontracting in harvesting, chipping and transportations. In this topic, we can identify the risk of tightening competition between SME level, which their risk taking capacities may not tolerate. In all large scale operations, there are still areas that are not included in business, e.g. small schools, halls, or other estates are not profitable enough and thus interesting. One option for small scale entrepreneurship is regional heat entrepreneurship, which consists of several small-scale units. Then it is possible to create new extra income for contractors in rural areas. This would again help to balance variation in seasonal employment and incomes.

These trends are not alternatives to each other but more like complements. The main objective is to reduce the use of fossil fuels and increase the use of renewables in economically and ecologically sustainable manner. After all, it is important to remember that heat energy business and entrepreneurship is a developing new field and future is not easy to predict. Theoretical background indicates several factors for a development trend, where the field is becoming are increasingly profitable and business opportunities will raise further attention.
Appendix 1

In following checklist, we can find out things that entrepreneur should consider when starting heat energy business and when applying the business models on a regional level. As starting phase we assume that there is demand, i.e. interested customers for the heating services.

1. *What is the entrepreneur’s objective?*
   - Full-time or part-time entrepreneurship?
   - The level of risks entrepreneur is ready to accept?
   - How much and for what time period entrepreneur is ready to tie-up capital in investments?

Objective creates the basis for entrepreneurship and business model that will be applied

2. *Entrepreneur’s economic resources*
   - Own capital (money, raw-materials, machinery, transportation equipment etc.)
   - Financiers (bank, external financier, partner etc.)
   - Available other business associates (e.g. business partners, relations to subcontractors)

Based on available finances, entrepreneur can look for business associates, available in different business models (e.g. franchising or networks of large companies)

3. *Human capital*
   - Knowledge on cost-calculations, acquisitions and tendering, planning, contracts, available support, organising the fuel supply, technology, equipment etc.
   - Skills in using equipment and machinery, organising the fuel supply in practice
     - Possibilities to improve knowledge and skills by training (by associates, franchisee or external trainers)

4. *Physical/geographical restrictions*

   a) Raw material basis
      - Ownerships
      - Raw material quality
- Harvesting conditions
- How raw materials can be utilised in a cost-efficient manner?
- Utilising possible flows of by-products

b) Available and suitable technologies
- What technologies are available and how compatible are they in local conditions
- Harvesting, chipping etc.

c) Regional infrastructure
- Transportation routes and distances (roads, railroads, water routes etc.)
- Ownerships of roads and railroads, possible payments
- Available storages

d) Regional associates, subcontractors and partners
- Potential actors, their credibility, reliability and perseverance

After the whole chain of operations is considered, the entrepreneur can start establishing the business according to own objectives.
References


