Partnerships for Success

A guide to partnership working in the biomass heating supply chain
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An important element for establishing a successful and sustainable biomass heat market is the development of consumer confidence across the whole supply chain. The supply chain begins in the forest with the growing and harvesting of fuel, continues through to the installation of efficient and reliable biomass heating systems and ends up with a program of support and maintenance. Without such confidence biomass heat will struggle to compete with fossil fuels where the supply chains are well established.

This guide is designed to help actors in the biomass market build stronger links and strengthen supply chains through partnership working. It focuses on different aspects and opportunities for partnerships across the biomass supply chain and aims to provide guidance and information for:

- Businesses interested in providing services and products related to biomass heating in the capacity range between 100 kW and 10 MW.
- Developers and building owners interested in biomass heating for buildings which they own, manage or for which they have some other kind of responsibility.
- Wider market actors interested in effective supply chains and partnerships in the field of biomass heating.

The biomass heating supply chain can be considered as a series of partnerships and agreements as illustrated in Figure 1, these can be categorised as follows:

- Fuel supply partnerships
- Equipment related partnerships
- Integrated contracts (covering both fuels and equipment)

**Figure 1:** Elements of the biomass heating supply chain
In each of these three groups the most common types of partnership have been identified and are described in some detail. Checklists are provided on aspects of these arrangements which could be covered by a partnership agreement and examples on how some of these could be regulated are also provided. Case studies which illustrate existing successful partnerships have been included to complement this information and should be a good source of information and inspiration for actors who are already, or wish to become part of a more integrated supply chain.

The information in this guide can and should be used as a framework when developing supply chain partnerships and agreements. However, it is important for businesses to conduct their own research and make informed decisions on the scope and details of potential agreements which can depend heavily on the specific legal context in the region and on the level of market development.
Fuel supply partnerships

The most common fuel supply partnership or agreement is that between the fuel supplier and the end user. It is aimed at securing biomass fuels at a defined quantity, quality and price for a specific installation. Other less common, but useful partnerships, are for related services, for example in the forestry sector.

Agreements between fuel suppliers and fuel end users

A fuel supply agreement between a fuel supplier and a fuel user should aim to give security to both parties, and should aim to cover the following aspects:

**Obligations for the supplier:**
- Quantities and qualities of fuel provided.
- Delivery location, frequencies and times.
- Penalties for failures in delivery.
- Delivery equipment requirements.
- Certificates for the fuel qualities (e.g. a specification covering wood chips sourced sustainably or from a maximum distance).

**Obligations for the client:**
- Prices and payment schedules.
- Access to the building/site.
- Safety measures.
- Skills of staff handling fuels.
- Availability of staff during delivery.
- Responsibility for maintenance of relevant equipment (e.g. meters, filling funnels etc.)

**Other important elements:**
- Agreement on how delivery schedules are arranged (by phone, in writing, how much in advance etc.)
- Agreements how the fuel quality is checked.
- Financial guarantees, invoicing schedules.
- Fulfilment of legal requirements, especially safety measures.

If fuel is procured on the basis of delivered heat there needs to be additional agreement between client and supplier on provision of metering and assurances on the condition of the boiler, for example by boiler maintenance records.

Case Study

**Clare Wood Chip**

Clare Wood Chip is located in Flagmount, Feakle, Co. Clare and has several wood chip supply contracts in the area. The company buys timber from a number of forestry harvesting contractors and from the local farmers who are members of “thinning clusters”. The timber is allowed to dry from approximately 55% moisture content to 30% in the yard. The timber is chipped and delivered to the end user in a 40m³ tipping lorry.

The supply of wood chip is usually on 1 to 5 year contracts, which are publically tendered. Each contract is different, but generally chip is sold to the end user by delivered heat, usually in megawatt hours (MWh), measured at the customer’s heat meter. The chip is always provided to a specified standard (grade and moisture content), which is outlined at the tender stage to suit the particular boiler.
The energy available from biomass is related directly to the moisture content of the fuel.

Understanding fuel quality and quantity
Fuel supply contracts need to take into account variation in fuel demand due to weather conditions. In central Europe, where the winters can be very cold and long, fuel demand can be about one third higher than in milder climates. Fuel supply contracts are therefore often concluded as framework contracts and fuels are ordered on demand. Fuel supply contracts often account for both the “right to deliver” (a certain minimum quantity) and the “obligation to supply” (a specified minimum quantity). Fuel quantities are generally defined either by weight (tonnes), by volume (in m³) or in terms of delivered heat (in megawatt hours or MWh). The energy available from biomass is related directly to the moisture content of the fuel so when purchasing by weight or volume it may be necessary to consider systems for sampling and measuring the moisture content of delivered fuel and/or price adjustment mechanisms for different qualities of fuel. Systems for weighing or otherwise gauging the amount of fuel delivered will also need to be agreed. If the fuel is supplied on the basis of delivered heat, a heat meter will be required to measure the energy output of the biomass system. Meters will need to be corrected sited, particularly in the case of multi-boiler systems, so that they capture only the heat delivered by the biomass boiler and calibrated to the satisfaction of all parties involved. Assurances on the performance of the equipment are also likely to be required for example through an agreed maintenance schedule.

Fuel qualities are covered by standards which can define the whole range of physical characteristics including moisture content, chip or pellet size, ash content and bulk density. Boiler manufacturers will specify which fuel standards their equipment is designed to take but it is also important to make sure that the fuel transport and storage systems are also suited to the fuel specification. Important elements such as the size of augers, requirements for ventilation and total storage volume will all need to be specified on the basis of the fuel that is being used. For more details on standards for biomass see Annex 1.

Price adjustments
Prices may often be agreed on the basis of the energy content of the delivered fuel by taking into account the moisture content, this is reasonably straightforward as the relationship between the two is linear. Moisture content can be measured at the site with a suitable moisture meter. The pricing structure may then be based on the weight of “absolutely dry wood chips” (an oven dry tonne, ODT), for example, and the price of a given load determined according to the level of moisture measured.

In longer contracts there is usually a price adjustment mechanism (or index) which is agreed at the start. This provides a more stable business environment for fuel suppliers by giving them the confidence to be able to invest in stocks of timber (which may need to be secured a year and a half or more in advance) and end users will benefit from having a transparent pricing mechanism which may help to smooth out price shocks which are common in fossil fuel markets.

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### The use of price indices in Upper Austria

The regional chamber of agriculture has developed a price adjustment mechanism to be used by operators of biomass district heating systems. It consists of five other price indices, including

- Wood prices (0.40)
- Heating oil price (0.20)
- Electricity price (0.15)
- Construction costs (0.15)
- Staff costs (0.1)

A variation of the indicator includes natural gas instead of heating oil (also at 0.20). The index is controlled by the Chamber of Labour which acts as a consumer protection organisation. It is updated and published annually.
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**If possible, the storage should be designed to suit the delivery vehicles.**

**Delivery and storage issues**

Delivery frequencies will depend on the capacity of the heating plant, the size of the storage facility and on the delivery vehicles and equipment. If possible, the storage should be designed to suit the delivery vehicles, so if pellet trucks with a full capacity of 40m³ are anticipated, then the fuel store should have a capacity of at least 40m³ and maybe as large as 80m³. Additional capacity allows the user to order fuel in advance of running out completely and can have other advantages such as allowing more fuel to be purchased outside of the heating season when prices can be lower. Access to the storage facility should be possible under all weather conditions as peak fuel demand will usually coincide with periods of severe weather.

For larger pellet installations online monitoring of the fuel store may be possible. This can provide a convenient and reliable solution to the problem of running out of fuel. An agreement is made with a suitable pellet supplier who becomes responsible for ensuring that there are always sufficient amounts of pellets available. The client benefits as they no longer have to be concerned with ordering fuels while the pellet supplier can optimise delivery schedules and routes which can save time and minimise transport fuel costs. This is likely to be a longer term arrangement and can help to bring down the unit cost of the biomass fuel which can compensate for the costs involved with setting up the monitoring system.

Some arrangements may need to place restrictions on delivery times or the time available to make deliveries to avoid interference with the normal operation of the

**Case Study**

**Devon County Council woodfuel supply framework contract**

Devon County Council has held a series of consultations with local woodfuel suppliers and end users in an attempt to develop a framework for procuring woodfuel at a range of scales.

Previously some smaller woodfuel suppliers were excluded from the tendering process because they were unable to supply the minimum quantities required by Devon County Council’s largest boilers. As a larger woodfuel user it was in the Council’s interest to support the development of the market and encourage a more diverse range of suppliers.

An important part of the initiative is the development of a modular contract with clauses to suit the whole range of procurement options. End users wishing to procure fuel through the council system can ‘build up’ a supply contract from the available modules which are then able to be put out to tender collectively. Interested suppliers are able to tender to supply individual or groups of sites based on the quantities and service that they are capable of delivering.

There are potential benefits for all parties involved. Smaller woodfuel consumers can expect to benefit being able to buy fuel in a secure way and at lower prices than might otherwise have been possible. Smaller woodfuel suppliers are given the opportunity to compete head to head with the larger, more established companies while the larger companies still have to option of tendering for groups of sites.

It is hoped that the contract framework will eventually provide a robust and fair system for procuring fuel which will support the development of the market for woodfuel. If successful it is hoped that such a system might have implications for Local Authorities nationally.
site. While deliveries from tipping lorries can be reasonably swift, blown deliveries may take considerably longer. Blowing pellets at higher pressures could speed up the process but this is inadvisable as it risks destroying the pellets. Similarly, chipping on site can take some time and generate considerable noise. Suppliers on the other hand may require access guarantees based on the size of the delivery vehicles for turning and manoeuvring, fittings for hoses in the case of blown deliveries, or on the availability of staff to receive or sign for the delivery.

Other fuel related partnerships

Chipping partnerships

Wood chipping services are usually provided by owners of wood chippers (e.g. individuals or groups of farmers, machinery rings etc.) to either forest owners, fuel suppliers or owners of heating plants. Pricing is usually done either by hours of operation of the chipper (usually for smaller chippers) or by wood chip output. Hourly outputs can range between less than 10 m³ (loose) per hour (small, manually fed chippers) to more than 150 m³ (loose) per hour (high power chippers).

Producer co-operatives

Land owners can group together in the form of a cooperative to share resources, machinery and staff.

Success factors for fuel supply contracts

- Simple, but effective methods to test fuel quality on site.
- Selling heat by the megawatt hour makes quality control easier (and cheaper) and helps to avoid conflicts. However, the installation of a heat meter is usually easier to do when the boiler is being installed and a test period will usually be required where the heat output and fuel input is calibrated.
- Longer term contracts (e.g. 5 years and longer) with a price index which is accepted by both sides ensure a stable business environment for supplier and customers.
- Fuel should be sourced as locally as possible, this increases security of supply, has environmental advantages and is well perceived by clients and building users.
- Agreements based on existing fuel standards.

Case Study

Upper Austrian Machinery Ring (Maschinenring OÖ)

A good example of a machinery ring is the “Maschinenring OÖ” (Upper Austrian Machinery Ring), a cooperative of farmers that was started about 40 years ago with the objective of joint ownership and use of agricultural machinery by its members. This machinery ring has developed a range of services related to biomass heating, including chipping services, chip supply from their own woodlands as well as boiler maintenance and operation. For each supply contract an agreement is made with a group of 10-20 farmers in the machinery ring for the supply of fuel. Additional services such as ash removal may also be contracted.
The Dartmoor Woodfuel Cooperative was set up as an Industrial Provident Society (IPS) in 2009 by a group of Dartmoor residents with an interest in the environment and the benefits of woodfuel heating. The group is run as a not for profit organisation and acts as a hub for biomass activity in the area (see Figure 2). The cooperative aims to encourage collaboration between local woodland owners and biomass installations as a means of improving woodland management, reducing carbon emissions, raising public awareness of renewable energy and encouraging eco-tourism in the area.
Equipment related partnerships

Many biomass systems are bespoke and require careful planning.

Equipment related partnerships are business relationships and agreements between manufacturers, distributors or wholesalers, installers and customers. While these agreements will usually cover aspects of the supply and installation of equipment, they can involve maintenance or servicing of plant and training of staff.

Agreements for purchasing boilers

Before purchasing a biomass boiler careful consideration of the requirements of the proposed heating system will need to be carried out. Many biomass systems are bespoke so the planning process will need to address the following issues:

- Calculation of heat loads of the building(s), determining the capacity of the boiler taking into account existing systems.
- Legal requirements (fire safety, emission standards, boiler efficiency requirements, certification of boilers, construction and operation permits etc.).
- Selection and planning of the heat distribution systems.
- Choice of fuel (pellets, dry wood chips or wet wood chips), including suppliers, delivery, storage and handling options.
- Boiler room and the chimney requirements.
- Fuel storage in terms of volume and transport mechanisms required.
- Ash cleaning and disposal.
- Boiler maintenance requirement.
- Electricity consumption (boiler, feeding systems, other related equipment)
- Availability, prices and delivery times of spare parts for maintenance or breakdowns.
- List of locally available service contractors that have been trained and certified by the boiler manufacturer.

Fuel selection - pellets or wood chips?

The choice of whether to use wood pellets or wood chips will depend on a range of site specific factors. In different systems each fuel type may have advantages over the other under certain circumstances. The following table provides guidance on when one fuel may be preferred.

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Wood pellets</th>
<th>Wood chips</th>
</tr>
</thead>
<tbody>
<tr>
<td>Space requirement</td>
<td>Limited availability of storage capacity.</td>
<td>Ample storage capacity.</td>
</tr>
<tr>
<td>Delivery</td>
<td>Frequent delivery is a sensitive issue (residential area, etc.)</td>
<td>Frequent fuel delivery is not a problem.</td>
</tr>
<tr>
<td>Staff</td>
<td>No staff for operation and maintenance</td>
<td>Staff for operation and maintenance.</td>
</tr>
<tr>
<td>Fuel</td>
<td>Highly standardized fuel with stable quality is desired.</td>
<td>Different levels of quality are acceptable.</td>
</tr>
<tr>
<td>Fuel supply</td>
<td>Interest in working with commercial fuel suppliers.</td>
<td>Interest in “buying local” - availability of local fuel suppliers, local economic benefit from using wood chips.</td>
</tr>
<tr>
<td>Wood resource ownership</td>
<td>End user does not have access to wood resources.</td>
<td>End user owns wood resources (e.g. woodland).</td>
</tr>
<tr>
<td>Fuel costs</td>
<td>Generally a more expensive option. Longer term supply contracts with more favourable conditions can be negotiated.</td>
<td>In general cheaper than pellets.</td>
</tr>
</tbody>
</table>
Case Study

Chipping at Dartmoor Woodfuel Cooperative

A Heizohack HM4-300 drum chipper is being used to chip directly into the fuel store at Brimpts Farm at Dartmeet on Dartmoor, this particular machine can be used with roundwood up to 30cm in diameter. The timber is stored in the round for at least two years and cross-stacked to promote the flow of air and improve drying. Timber may also be de-barked which improves the fuel quality and reduces the ash content. The same converted building houses the 150kW biomass boiler so that the distance between the fuel and boiler is kept to a minimum.

Brimpts Farm coordinates activities of the Dartmoor Woodfuel Cooperative which has helped to develop a secure fuel supply at stable prices for its members. The boiler at the farm was installed with the funding and advice from RE4D (Renewable Energy for Devon) a partnership set up by Devon County Council to support the growth of renewable energy businesses and organisations installing renewable technologies. In 2009 Devon County Council received an Ashden Award for its sustainability work through RE4D.

For more information on the Dartmoor Woodfuel Cooperative and other examples of partnership working visit the FOREST case study pages at www.forestprogramme.com.

Photo: Andrew Aitchison/ Ashden Awards, www.ashdenawards.org
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Regular servicing and maintenance are essential to ensure the safe, economic and environmentally friendly operation of biomass boilers. Also there may be legal requirements for the regular inspection of boilers for levels of emissions and safety. Maintenance for biomass systems tends to be more expensive and takes longer than for fossil fuel boilers, although this may not be the case with coal. However it will prolong the life time of the boiler and prevent disruptions in the supply of heat.

Service and maintenance works can be carried out by:

- Boiler producers or dedicated service technicians working on their behalf.
- Installers.
- Specialised service companies.
- Boiler operators whose staff have been trained by the manufacturers or installers.

When selecting a maintenance contractor, it is advisable to check that the proposed maintenance team has been trained and certified specifically for the make and model of their boiler installed, preferably by the boiler manufacturer themselves. Also, reference lists should be requested to allow checking customer satisfaction.

A service and maintenance partnership could, for example, include the following aspects:

- Detailed description of the maintenance tasks and its extent, e.g. visual controls, technical controls, control of the safety equipment (e.g. fire safety), emission testing, service report.
- Pricing, invoicing and payment schedules, price adjustment mechanism.
- Contract duration and cancellation.
- Dispute resolution process.
- Legal requirements fulfilled by the maintenance.
- Costs for replacing expendable parts.

Case Study

1st Call Renewables

1st Call Renewables was started in 2006. The company originally provided solar hot water systems but has since moved firmly in the direction of biomass and now works in partnership with several leading European equipment suppliers including Austrian based Ökofen and Vänertekno and Effecta, both from Sweden.

Under the partnership, 1st Call Renewables is responsible for generating a proportion of the sales leads. However, the manufacturers will also pass leads the other way. While the number of opportunities for sales and installations increases both parties stand to benefit.

The Swedish manufacturers in particular, whose presence in the UK is currently limited, gain benefit from access to the UK market through an established company. Here they can capitalise on the local knowledge provided by 1st Call Renewables. In return 1st Call Renewables have access to the expertise and experience of the boiler manufacturers as well as a range of technical and backup services which has enabled them to develop their own expertise in biomass.
Partnerships for success

| A guide to partnership working in the biomass heating supply chain |

- Access to the plant, scheduling of on-site work.
- Skills of staff carrying out the maintenance work.
- Schematic of the heating plant.

The annual service will only take a few hours for a system with a capacity of 100 kW, rising to several days for systems larger than 1 MW. In addition to the maintenance of the biomass heating system, the agreement could also cover procedures in the case of a system breakdown or failure. For example, a guarantee might be given for service staff to attend within 5, 10 or 24 hours. Increasingly online monitoring systems are installed which can allow problems to be detected rapidly or even solved by changing system parameters either remotely or by sending service staff to make the necessary adjustments. In some cases the deployment of a mobile heating system can be agreed in the event that the heating system cannot be repaired within an agreed time. Some manufacturers may also offer an extension of the boiler warranty if a maintenance contract is made.

Success factors

- "All inclusive" service contracts can be a good solution to insure an optimal operational efficiency, safety and trouble-free operation.
- If possible checking of control systems as well as the mechanical and hydraulic systems should be included.
- Geographic proximity of the service provider can often be an advantage.

Increasingly online monitoring systems are installed which can allow problems to be detected rapidly.

Service contracts and training at ÖkoFEN

ÖkoFEN has built up an independent distribution and service network of around 180 regional partners who are in charge of service and maintenance contracts and give support to local installers. ÖkoFEN trains the regional partners and their service technicians while the service technicians go on to give training and support to the installers. The number of regional partners and service technicians established in a region is related to the number of service contracts.

After the installation of a boiler which is usually done by the specialised installation teams, the service technician offers the customer a service contract. There are several service contracts options available ranging from a servicing every second year (which also includes safety control and boiler cleaning) to comprehensive maintenance packages with online monitoring, free exchange of spare parts and extension of warranty. About 30% of the customers opt for the full service contract.

Case Study

Increasingly online monitoring systems are installed which can allow problems to be detected rapidly.
“Complete” solutions are integrated services for heat delivery in which the service provider is in charge of both the plant and the fuel. The most important such services are the delivery of district heating from biomass installations and ESCO (Energy Service Company) contracts.

District heating partnerships and contracts
Agreements between suppliers of district heating produced from biomass and their heat clients can include, for example, the following elements:

- Pricing.
- Invoicing and payment schedules.
- Price adjustment method (e.g. based on an existing index).
- Metering and requirements for regular calibration of heat meters.
- Period of heat supply (all year or only during the heating season).
- Ownership of substation and heat meter.
- Contract duration.
- Penalties in cases of non-delivery.

The pricing for district heating can consist of the following elements:

- Heat consumption per MWh.
- An annual flat rate fee based on installed capacity.
- An annual heat metering fee.

When a building is connected, usually a connection fee is charged on the basis of the installed capacity and on the distance from the building to the heat network.

Case Study

EcoCell Energy Ltd is an installer and supplier of biomass heating systems in Ireland, installing systems in the range of 14 kW to 10,000 kW. EcoCell predominantly supplies biomass boilers on an Energy Supply Company (ESCO) basis.

The company was established early in 2009 and is based on strong partnerships with two other companies, Tipp Wood Chip Ltd. and Environmental Heating Systems Ltd. This partnership approach has enabled the three companies between them to offer a complete biomass heating solution to its customers. The customers pay for their energy by the kilowatt hour so do not have to become involved in purchase of wood chip or the maintenance of the biomass boilers.

Under the usual arrangement the boiler remains in the possession of EcoCell. If however the customer has the necessary capital they can purchase the boiler from EcoCell and then enter into a heat supply agreement, which would normally include the supply of wood chip and operation and maintenance of the boiler. By offering this degree of flexibility the company is better placed to meet the differing requirements of its customers.
**ESCO contracts**

One approach designed to overcome the high capital investment costs of biomass heating is the instrument of energy contracting. Here an ESCO (Energy Service Company) installs, owns and operates a biomass installation within the premises of a company or a public body and sells heat to the owners or users of the buildings at an agreed price.

The ESCO is responsible for planning, installation, finance, fuelling and maintenance of the biomass heating installation and will give a guaranteed price for heat supplied over the contract period, subject to an agreed price escalator or index. The client just has to provide a suitable location for the biomass installation and commit to buying heat from the ESCO.

Benefits include long term security for the user and the ESCO and as the ESCO is a biomass specialist, the client does not need to be concerned with the daily operation of the plant or procuring its fuel supply. This can be particularly attractive option for companies, not for profit organisations or public bodies who can enjoy the benefits of renewable heat while minimising their involvement in the technicalities of biomass operation.

The contract between the ESCO and the client will state the main conditions and obligations clearly and is designed to form a longer lasting partnership than is typical in other contracts or agreements. Contract duration is often between 5 and 15 years and will depend on the amount of capital investment that the ESCO has had to put into the system. An ESCO contract could, for example, include the following elements:

**General terms, aim of the contract, contract duration**

- Scope of the project (e.g. which site, which buildings are heated, location of boiler room and fuel storage etc.)
- Contract duration, date of starting the heat supply.

**Benefits of an ESCO partnership:**

**Benefits for building owners/users:**

- Improvement building infrastructure (heating system) without the need of using own capital.
- Predictable heating costs for the contract duration.
- Professional planning and implementation of the system by a specialist.
- Low or no risk installation.
- No maintenance effort required.
- Environmental image benefits.

**Environmental & society benefits**

- Reduction of CO2 emissions.
- Use of local fuels instead of imported fossil fuels with related economic and employment benefits.

**Scope of services and guarantee of the contractor**

- Main technical features of the biomass installation.
- Heat delivery guarantee (MWh/year).
- Compensation if heat is not delivered.
- Measurement method and point.
- Maintenance measures (extent, frequency, costs), technical auditing.

**Obligations of the client**

- Minimum consumption by the client.
- Gives the contractor the right to install biomass heating system and free access to the site for maintenance and fuel delivery (including how and when the site can be accessed).

**Heat price**

- Price, price structure, price index.
- Invoicing and payment schedule.
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Passing of the risk and the property
- Ownership boundaries during the contract (e.g. heat meter, heat distribution system).
- Ownership after the contract (e.g. the ESCO remains the owner of the plant or the building owner becomes the owner of the plant).

Warranty and liability
- Liability, insurances and warranties in case of damage.
- Securities and bank guarantees.
- Provisions in case of bankruptcy and/or change of ownership of the ESCO or the client.

Other provisions
- Reasons to terminate the contract (e.g. non-payment, wanton destruction, bankruptcies, denied access to the plant).
- Confidentiality issues, conflicts of interest.
- Subcontracting.
- Settlement of disputes.

Success factors
A qualified ESCO:
- Has a list of references and is able to provide proof of its financial standing.
- Prepares the project well and provides a clear cost-benefit analysis.
- Involves and trains site management staff and users.
- Proposes a well structured contract which also includes provisions for "difficult" situations (e.g. bankruptcy, changes of ownership etc.)

Good project preparation and specification:
- Clearly defines the services required of the ESCO and allows a meaningful comparison of different offers.
- May include a requirement that the ESCO uses wood from sustainable or local sources (which tends to increase the image and the acceptance of the project).

Case Study

Heat contracting for school complex in Owidz

A renewable heating contract has been set up between VAPO Heat & Power and a school complex in Owidz, Poland. Pellets for the biomass boiler are delivered by VAPO Pellets and a service agreement has been signed for the operation of the plant. VAPO Heat & Power is obliged to ensure full service, but it cooperates with local service companies to carry out this work.

The heat supply contract is a formal contract and regulates, among other things, issues of heat demand, ownership of the heating system, maintenance, heat pricing and issues of plant ownership at the end of the contract. Heat pricing consists of a fixed fee plus the costs of heat consumed, which is determined from meter readings.

VAPO Heat & Power has implemented numerous large biomass heating projects and is therefore able to offer a reliable service. The arrangement has many benefits, the school complex benefits from a convenient, cost effective and environmentally friendly heating system, local service companies profit from an additional business and income and VAPO Pellets profits from regular demand and stable fuel deliveries which improves their fuel production business.

the school complex benefits from a convenient, cost effective and environmentally friendly heating system.
Taking the next steps

This guide has described some of the benefits of integrated and efficient supply chains in the biomass sector. The development of the biomass market in many EU countries may be growing slowly but in order to compete successfully with fossil fuels the biomass industry needs to develop more integrated supply options. Three groups of partnerships that can help to integrate the supply chain have been identified:

- Fuel supply partnerships.
- Equipment related partnerships.
- Integrated contracts (covering both fuels and equipment).

Examples of different partnerships from across Europe have been given to illustrate some of the possibilities for integrating successfully with other actors in the supply chain. For each group a range of success factors have been given which should be considered as the starting points for negotiation in any new arrangement.

Any biomass business using this guide should first identify where exactly it sits in the supply chain and, based on some of the examples given, see what partnerships might be developed locally, in most cases there will be options in more than one direction. The guide will provide the basis for developing successful partnerships which will strengthen the businesses involved will and help to add resilience to the market as a whole. It should be re-iterated that this mechanism is only effective if agreements are designed to reflect the interests of all parties equally, only then can arrangements be stable and the full benefits realised.

For more information talk to your local FOREST project partner as they may be able to offer further help and guidance and a range of other opportunities including:

- Exchange visits to see examples of partnerships working in other countries.
- Business promotion opportunities through three international trade fairs.
- Assistance with brokering partnerships with local or European partners.

Through the FOREST project we want to work with you to develop and strengthen the biomass heating industry!
Annex 1 –
Summary fuel standards for wood pellets
and wood chips

Standards for wood pellets

For wood pellets, the European standard EN 14961 provides the following recognised
property specification.

<table>
<thead>
<tr>
<th>Quality characteristics</th>
<th>Requirements</th>
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<tbody>
<tr>
<td>Diameter</td>
<td>6-8 mm</td>
</tr>
<tr>
<td>Length</td>
<td>3.15-40 mm</td>
</tr>
<tr>
<td>Calorific value</td>
<td>&gt; 16.5 MJ/kg</td>
</tr>
<tr>
<td>Ash content</td>
<td>&lt; 0.7%</td>
</tr>
<tr>
<td>Water content</td>
<td>&lt; 10%</td>
</tr>
<tr>
<td>Bulk density</td>
<td>&gt; 600 kg/m³</td>
</tr>
<tr>
<td>Ash melting point</td>
<td>&gt; 1,200° C</td>
</tr>
<tr>
<td>Fines</td>
<td>&lt; 3.15 mm: 1%</td>
</tr>
<tr>
<td>No chemical adhesives</td>
<td></td>
</tr>
</tbody>
</table>

There are also standards that define requirements for the logistic system and for final
customer storage systems. See for example the Austrian Österreichisches Normungsinstitut
(Austrian Standards Institute) standards ÖNORM M7136 and M7137.

Standards for wood chip

One example of a wood chip standard is the Austrian standardisation ÖNORM M 7133 for
“chipped wood for energetic purposes”. Important quality characteristics for wood chips
are bulk density (weight), the size and water content. Depending on the size, the following
classes are differentiated:

<table>
<thead>
<tr>
<th>Typical size</th>
<th>“Fine” wood chip</th>
<th>“Medium” wood chip</th>
<th>“Course” wood chip</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typical application</td>
<td>Under 3 cm (G30)</td>
<td>Under 5 cm (G50)</td>
<td>Under 10 cm (G100)</td>
</tr>
</tbody>
</table>

The water content depends on the type of wood and, besides bulk density, it is the main
criteria and will determine the fuel price. The following classes are differentiated:

<table>
<thead>
<tr>
<th>W 20 Air-dried</th>
<th>W 30 Storable</th>
<th>W 35 Limited storable</th>
<th>W 40 Moist</th>
<th>W 50 Harvest fresh</th>
</tr>
</thead>
<tbody>
<tr>
<td>water content</td>
<td>water content</td>
<td>water content</td>
<td>water content</td>
<td>water content</td>
</tr>
<tr>
<td>&lt; 20%</td>
<td>≥ 20% &amp; &lt; 30%</td>
<td>≥ 30% &amp; &lt; 35%</td>
<td>≥ 35% &amp; &lt; 40%</td>
<td>≥ 40% &amp; &lt; 50%</td>
</tr>
</tbody>
</table>
Requirements for wood chips according to Austrian standardisation (ÖNORM M 7133).

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Pellets</th>
<th>Wood Chips</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heating value</td>
<td>Up to 17 MJ/kg, up to 4.7 kWh/kg, up to 3,077 kWh/m³</td>
<td>Up to 13.4 MJ/kg, up to 3.7 kWh/kg, up to 750 kWh/m³</td>
</tr>
<tr>
<td>Density</td>
<td>~ 8%</td>
<td>~ 25%</td>
</tr>
<tr>
<td>Water content</td>
<td>~ 8%</td>
<td>~ 25%</td>
</tr>
<tr>
<td>Bulk density</td>
<td>650 kg/m³</td>
<td>~ 250 kg/m³</td>
</tr>
<tr>
<td>Ash content (%)</td>
<td>Maximum 0.5%</td>
<td>Up to 2%</td>
</tr>
<tr>
<td>Standards</td>
<td>ÖNORM M 7135, DIN plus, DIN 51731, EN 14961</td>
<td>ÖNORM M 7133</td>
</tr>
</tbody>
</table>

Comparison of the main characteristics of pellets and wood chips

Other options for wood chips

Quality definitions could also be based on:

**Moisture content:**
- Often price is based on the moisture content (the higher the moisture content, the lower the price). Depending on the equipment installed, maximum moisture content is often agreed. A moisture meter is used for measuring the moisture content.

**Chip size**
- Wood chips must be suitable for automatic feeding system (e.g. maximum sizes of wood chips).

**Source**
- No imported wood.

**Maximum bark percentage**
- Affects delivered heat and ash content.

**Contaminants**
- Wood chips must be free of ice, chemicals, coated or veneered wood, stones, and dirt and must be suited to the requirements of the plant.

Further details on fuel and boiler standards can be found in ‘A guide to Biomass Heating Standards’ available from the FOREST website:
Annex 2 –
Additional information sources

Below are some useful additional information sources that could help with supporting your biomass heating business:

**United Kingdom**

- The Biomass Energy Centre (BEC) provides a range of useful information on biomass in the UK. [www.biomassenergycentre.org.uk](http://www.biomassenergycentre.org.uk)
- The Carbon Trust has a number of useful guides and tools on biomass heating systems and the Biomass Accelerator programme to support biomass supply chains. [www.carbontrust.co.uk](http://www.carbontrust.co.uk)
- Department for Energy and Climate change – for national policy and initiatives: [www.decc.gov.uk](http://www.decc.gov.uk)
- Forestry Commission is the Government Department responsible for protecting, expanding and promoting the sustainable management of woodlands. [www.forestry.gov.uk/england-woodfuel](http://www.forestry.gov.uk/england-woodfuel)
- South West Woodshed is an extensive biomass heating and woodfuel portal hosted by Regen SW. [www.southwestwoodshed.co.uk](http://www.southwestwoodshed.co.uk)
- South West Directory of Woodland Products and Services is a directory of woodland services and products within the South West region. [www.woodland-directory-sw.org.uk](http://www.woodland-directory-sw.org.uk)
- Ward Forester is a pilot project to improve the productivity of small woodlands in Devon through collaboration. [http://wardforester.co.uk](http://wardforester.co.uk)
- My Forest is a service run by the Sylva Foundation aimed at connecting elements of the forestry supply chain. [www.sylva.org.uk/myforest](http://www.sylva.org.uk/myforest)
- Rural Development Initiatives Ignite programme provides a number of schemes to support biomass supply chains through training and collaboration. [www.ruraldevelopment.org.uk/woodfuel](http://www.ruraldevelopment.org.uk/woodfuel)
Ireland

- COFORD (Competitive Forest Research for Development) Provides newsletters, research and training days: www.coford.ie
- County Clare Wood Energy Project provides case studies and useful step by step guide to selling timber for farmers: www.ccwep.ie
- Department of Agriculture, Fisheries and Food: Forestry Service – responsible for legislation and regulation of the forestry sector – see website for felling licenses: www.agriculture.gov.ie/forestservice/
- Department of Communications Energy and Natural Resources – for national policy: www.dcenr.gov.ie/
- Irish farmers association: Information on forestry establishment supports & producer groups: www.ifa.ie/Sectors/Forestry/Planting.aspx
- Sustainable Energy Authority of Ireland: Guides to boiler & fuel procurement, policy documents, fuel price comparisons, listing and administration of current supports to renewable energy industry: www.seai.ie
- TEAGASC (Agriculture and food development authority) Relevant information to forestry growers and management / harvesting related operations: www.teagasc.ie/forestry
- Wood Energy.ie - Detailed reports and useful calculation tools for use in wood energy: www.woodenergy.ie
- Wood Fuel Quality Assurance Scheme – Independent quality assurance scheme for wood fuels sold in Ireland: www.wfqa.ie
This guide was developed in the framework of the “FOREST” project. FOREST’s objective is to work directly with bio-businesses in this supply chain to develop and consolidate long term supply chain partnerships that will give the end user confidence in the total bio-heat system and encourage investment from larger non-domestic heat users.

FOREST stands for “FOsteRing Efficient long term Supply parTnerships”. The project is funded by Intelligent Energy Europe (IEE), a European Commission programme. Further information about FOREST and the information and tools it is developing can be found at www.forestprogramme.com.