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## Eco Village ESCO case study

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## **CONCERTO INITIATIVE SERVE**

# **Sustainable Energy for the Rural Village Environment**

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## Executive summary

The main objective of this report is to present the analysis of the establishment and operational experience of the ESCO within the Cloughjordan Eco Village as well as to draw conclusions and make recommendations regarding the further possible replications of the model in Ireland and beyond. Developed biomass district heating system for the residential needs in the Eco Village is a first of a kind in Ireland while the founded ESCO – Cloughjordan Eco Village Service Company operates and runs the system. The established Cloughjordan Eco Village is a show case of an alternative approach to developing a community. As these activities in the SERVE project have been pioneering a lot of learning has been done through the project by all stakeholders involved to acquire the necessary knowledge on the issues. Therefore, the main value of the case study is in gathering the experience so that the barriers but also drivers encountered could be used to inform other interested parties on the advantages of forming a community ESCO type company as well as progressing other innovative energy saving projects with strong holistic approach.

In order to assess the recent developments on the Irish ESCO market, an overview of energy supply and energy service companies (ESCOs) was provided in chapter 2, while the first part of chapter 3 refers to the national policy changes regarding the newly established MUD Act 2011 that obliges any new housing development to set up a management company to manage the estate – Owners Management Company. This Act has clearly influenced SPIL Ltd in choosing the ESCO model for the Service Company. Company structure, ownership, management principles as well as pricing strategy have been analysed in details in the chapter 3 and 4 for both SPIL (Sustainable Projects Ireland Ltd.), trading as *The Village* and Cloughjordan Eco Village Service Company. The intention of this study is to recreate the scenario from early days company start-up to final business concept developed were heating price was determined in order to make the community viable on the long run. All profits are shared within community members and any surplus is reinvested back in the community.

The main part of the report is presented in Chapter 5 focusing on the replicability aspect of the established ESCO. Replication potential of the model established was investigated in its features as an energy service company which adheres to the current needs of the Irish ESCO market, thus facilitating the possible replication. Moreover, co-operative principles, both applied on the Service Company and SPIL make a strong argument for the structure aspect of organizations as Ireland, according to the report *Global Business Ownership 2012: Members and shareholders across the world* (Co-operatives UK, Mayo, 2012), is the world leader in co-operative ownership as a proportion of the population.

The final chapter provides conclusions based on the gathered and analysed experience and recommendations for the establishment of community ESCOs within Ireland and beyond.

Data were obtained through direct communication with the Service Company and from a variety of written information available on the web. Several organizations provide case studies and published information on successful examples of district heating schemes developed for already existing communities as well as for those newly founded and unconventional like eco villages. This information was used in order to better understand the potential of the community ESCO analysed in this case study and can be found in annexes.

## 1. Introduction

### 1.1. Background on the Cloughjordan Eco Village and SERVE project

The SERVE project is funded under the EU CONCERTO Programme and aims to develop a sustainable region in North Tipperary, Ireland, through the implementation of actions in the field of sustainable energy. Actions include energy upgrades for existing dwellings, installation of renewable energy heating systems and the development of an Eco Village in Cloughjordan. The Village project is a lot more than an eco-housing estate - set out with the objective of *Building Sustainable Community* is now putting in many systems to build resilience. As well as the planned 130 high performance homes, renewable energy for heating, land for growing food and trees, an enterprise centre and community buildings, the project is championing community supported agriculture, exploring community currencies, introducing local democracy and governance systems and playing a part in the strengthening of the local and regional economy background.

The activities within the SERVE project have also included the development of a biomass district heating system for the Eco Village – first of a kind in Ireland and the establishing of an ESCO which would operate and run the system. The completion and implementation of the system was as planned finalized at the end of 2009.

In addition to the technical and environmental benefits which will be brought about by the SERVE project, the objectives also include the assessment of the impact of the project on the SERVE region and its citizens from a socio-economic viewpoint, utilising data and information gathered during the demonstration, innovation and training activities.

The work in this area is organised through a separate Work Package, namely WP6: Socio-Economic Analysis and Research, with the following tasks:

- Provide a detailed analysis of the impact on job creation and service supply;
- Provide a coherent overview and prepare (scenario based) forecasts for replication both within North Tipperary and beyond;
- Identify opportunities for the development of ESCOs within Ireland, based on the experience gathered through the establishment of the ESCO in the Eco-village;
- Perform an analysis of local funding and money flows from proposed action;
- Perform an evaluation of the different externalities of the above-mentioned chains compared to key alternatives for the different timeframes envisaged; applicable to regional conditions in the SERVE project;
- Perform an analysis of payback time for proposed SERVE project measures in buildings sector as well as other cost-benefit and SWOT analysis as appropriate;
- Study the effects on health, involvement of citizens, attitudes of building owners and consumers, acceptance and effects of job growth for concrete cases included in this project.

As part of the activities implemented within the framework of WP6, in December 2008 during the third SERVE project meeting a Socio-economic stakeholder workshop was organised. One of the conclusions of the workshop was that the planned modelling of the opportunities for Energy Supply Companies (ESCOs) and Community Energy Supply Companies (CESCOs) within WP6 will be of significant benefit to Sustainable Project Ireland Ltd as a part of planning and research preceding the establishment of Eco Village district heating system and the connected ESCO company. In this context it was proposed and accepted that this work would be done earlier than originally planned by project activities schedule, which resulted in the preparation of report in the summer of 2009 focusing on an overview of energy supply and energy service companies (ESCOs) and existing ESCO schemes in Ireland and the UK. Relevant information through examples were provided also from Austria, Finland and Croatia in order to assess all aspects of biomass heat entrepreneurship model as well as solar thermal ESCOs – model of a special interest for SPIL Ltd at the time. Recommendations provided in the report were based on the drivers and barriers for starting up and operation of an appropriate ESCO model within the SERVE project.

After the completion of the district heating system and more than 50 estates sold in the village with buildings finalized or close to finalization, it was made possible to analyse the ESCO model chosen by SPIL. The natural development of the project which is at this stage close to finalization enabled the complete gathering of the Eco Village experience.

The main objective of the report is to provide analysis of the establishment and operational experience of the ESCO within the Eco Village as well as to draw conclusions and make recommendations regarding the further possible replications of the model in Ireland and beyond. The information provided on the advantages of forming a community ESCO type company will provide assistance in progressing other energy reduction and energy saving projects. The implementation of such projects will help to accelerate the use of ESCOs in Ireland to meet local, regional and national climate change and energy targets.

### 1.2. Objectives and scope

The general objective of this report is related to the WP6 tasks as mentioned in the Introduction, specifically in the identification of the opportunities for the possible replication of community ESCOs within the SERVE region and beyond.

The specific objective of this report is to provide a detailed scenario of the Cloughjordan Eco Village success story and the establishment of the Service Company with the following tasks:

- describe barriers encountered and driver factors for establishing ESCO model chosen by SPIL Ltd.;
- provide a coherent overview of companies operation and infrastructure in order to enhance model replication;
- identify advantages of forming a community ESCO type company based on the Eco Village experience gathered;
- draw conclusions and make recommendations regarding the further possible replications of the analyzed ESCO model in Ireland and beyond.

### 1.3. Methodology

Two main sources of information were used for the preparation of this report:

- **information provided directly from the established Service Company and SPIL Ltd.** Data were obtained through direct communication as well as from a variety of written information available on the web.
- **desktop research - existing reports on ESCOs in Ireland and reports on successful community ESCOs models in Europe.**  
Several comprehensive overviews of the status and potential development of the Irish ESCO market have already been performed by various organisations, providing extensive information about the subject. The latest available data are relevant to 2010, hence there was a need to obtain more up to date information. Case studies of other ESCO community schemes were taken into account to assess the replication potential. Several organizations provide case studies, while in some cases direct contact was also made with operators of several of these schemes.

After analysing the obtained information, it was possible to identify success and failure factors regarding the starting up and operation of the chosen model of ESCO established and finally to make relevant conclusions and recommendations for further model replication.

## 2. ESCO market in Ireland

An overview of the status and potential development of the Irish ESCO market has already been performed in the form of a report and made public in 2009 as a part of Work Package 6 (Segon et al 2009).

To provide a review of energy service companies throughout Ireland in the report, findings from several studies have been used such as the one undertaken by the Economic and Social Research Institute from Dublin (Scott 2004). The study, performed within the framework of the investigations undertaken for the European Commission's BARRIERS project, focused on barriers to energy efficiency. The main finding on ESCOs in Ireland was that they are a relatively new concept to many as there were very few companies in Ireland that perform ESCO type activities.

Second report analysed was Sustainable Energy Irelands' (SEAI) report aimed at assessing the potential of ESCOs in Ireland (ENVIROS 2005). The main focus was on performing a review of Irish/EU regulations regarding energy and energy efficiency that may have an impact on energy prices and the ESCO market, assessment of European ESCO's and ESCO Associations, assessment of the Irish energy services market to determine existing status and future potential and the analysis and presentation of options for future policy initiatives.

Based on analyses of both reports, ESCO type organizations operating in Ireland can be grouped in three categories (Scott 2004):

1. Companies that offer contract energy management
2. Companies that are engaged in the supply of combined heat and power (CHP)
3. Companies that manage their clients' facilities (facilities management)

In order to obtain more up to date information, the report had also provided a review of companies offering energy services and dealing with renewable energy sources and thus identified several newly founded small and medium companies offering energy services mainly in the form of heat providing. The list of companies, their short description and activities was provided, including those identified in the above mentioned overviews. 11 companies were identified that could be classified as energy service providers - ESPCs<sup>1</sup>. Of these, two multinational companies were found to offer guarantee on their services in the form of energy performance contracting, namely Dalkia Ireland and RWE Solutions – both Europe's leading service providers (ENVIROS 2005).

To assess the present status of Irish ESCO market development, findings from *Energy Service Companies Market in Europe – Status Report 2010* undertaken by Joint Research Centre were also taken into consideration (Marino, Bertoldi, Rezessy 2010). However, ESCO market in Ireland was not a subject to many changes in recent years. Almost similar to UK, the widespread adoption of the terms EPC and ESCO has not occurred yet and they remained a relatively new concept to many. Moreover, ESCO-type activities are often referred to as Contract Energy Management (CEM), which is perceived as "the managing of some aspects of a client's energy use under a contract that transfers some of the risk from the client to the contractor (usually based on providing agreed 'service' levels)" (DG EC JRC 2007).

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<sup>1</sup> In contrast to an ESCO, *Energy Service Provider Companies* (ESPCs) are natural or legal persons that provide a service for a fixed fee or as added value to the supply of equipment or energy. Often the full cost of energy services is recovered in the fee, and the ESPC does not assume any (technical or financial) risk in case of underperformance. ESPCs are paid a fee for their advice/service rather than being paid based on the results of their recommendations (WEEA 1999). Principally, projects implemented by ESPCs are related to primary energy conversion equipment (boilers, CHPs). In such projects the ESPC is unlikely to guarantee a reduction in the delivered energy consumption because it may have no control or ongoing responsibility over the efficiency of secondary conversion equipment (such as radiators, motors, drives) and over the demand for final energy services (such as space heating, motive power and light) (Sorrell 2005)

As of 2009 15 companies are identified as energy service providers, of which 13 small enterprises have a market share of approximately 95 %. The majority of these companies are national companies. A few are subsidiaries of international companies and energy service provision is typically supplementary to other business activities. The providers are mainly consulting and engineering firms, energy service & supply companies and facility management companies.

A general conclusion regarding the status of development of the Irish energy market is that there is still a lack of existence of ESCO models in Ireland. There is a considerable number of small companies which are doing their business through supply and installation of equipment, which is facilitated by several grant programmes implemented by SEAI. These companies are in the position to potentially start doing business through energy supply contracts. This would typically include long-term energy supply under which the client enters into a long term contract to buy metered energy at a preagreed price.

The most typical motivation for potential clients is to outsource energy management to a specialized company, with or without the actual ESCO service and concept. The most prevalent contract model in Ireland is the Build-Own-Operate-Transfer (BOOT) model<sup>2</sup> which has no performance guarantees. Projects are financed by the ESCOs, client's funds and with public grants. On the other hand, Irish ESPC companies do not often use energy performance contracting models, but prefer to work for a fixed service fee, and thus face little risk.

The main focus of the Irish ESCO market is on co-generation (BOOT CHP) and supply side projects in the service sector (e.g. hotels and leisure centres). A smaller part of the projects target district heating and renewable energies. The most prevailing market stakeholders are the following types of ESCOs: consulting and engineering firms, energy service & supply companies and facility management companies. Although the impact of the global financial crisis was substantial on the countries' economy as Ireland was the first state in the Eurozone to enter recession as declared by the Central Statistics Office, the impact on the current ESCO market has been somewhat limited. Moreover, in comparison to the period 2005-2007, the Irish ESCO market is reported to have remained stable during 2008. In the same year, the state funding injected approximately €4 million in the ESCO projects development. Along with favourable taxation incentives and public grants, other market drivers include the increasing electricity price and the relatively stable gas price which has increased the benefits of CHP.

Despite the incentives providing the further impetus for the market growth, ESCO services are still not perceived as services with high added value by potential clients. The mistrust is often based on lack of knowledge of the ESCO concept, low and fluctuating energy prices, small size of projects and related high transaction costs, as well as the long contractual terms often associated with ESCO projects. These are often perceived as the major barriers to further development of the ESCO market.

Although ESCOs have an important role in the delivery of the National Energy Efficiency Action Plan under Directive 32/2006/EC, an ESCO Association, unlike in UK, has not yet been established.

Bioenergy still represents less than 2% of Ireland's total primary energy requirements which among other reasons, accounts for lack of incentive in applying in practice numerous policy initiatives aimed at developing bioenergy sector. National Renewable Energy Action Plan (NREAP<sup>3</sup>) has set up an ambitious plan for the country to attain the EU27 average of 11.6% of final energy consumption deriving from biomass<sup>4</sup>. To be precise, according to NREAP, the targets set by Government for the

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<sup>2</sup> The BOOT model may involve an ESCO designing, building, financing, owning and operating the equipment for a defined period of time and then transferring this ownership across to the client. This model resembles a special purpose enterprise created for a particular project. Clients enter into long term supply contracts with the BOOT operator and are charged accordingly for the service delivered, the service charge includes capital and operating cost recovery and project profit.

<sup>3</sup> [http://ec.europa.eu/energy/renewables/transparency\\_platform/action\\_plan\\_en.htm](http://ec.europa.eu/energy/renewables/transparency_platform/action_plan_en.htm)

<sup>4</sup> AEBIOM Annual Statistical Report on the contribution of Biomass to the Energy System in the EU27. Brussels. June 2011. <http://www.aebiom.org/?cat=20>

contribution of renewables to thermal energy (heating & cooling) are at 12%. Considering the EU's Renewable Energy Directive (RED), which has set a mandatory target for its members to produce 16% of its final energy needs from renewable sources by 2020, it is clear that Ireland has a considerable way to go if bioenergy is to make a contribution on the scale of that envisaged.

According to National Renewable Energy Action Plan (NREAP) growth of ESCOs in Ireland will require the encouragement of district heating, grouped stakeholders and ESCO contract templates. In order to boost the deployment of district heating systems that would enable spreading of ESCO concept in the country, one of the key issues is to create renewable heat deployment schemes and policy mechanisms – like the Renewable Energy Feed-in-Tariff (REFIT) supporting the development of biomass CHP systems.

Example of a successful government scheme under the EU State Aid rules administered by the SEAI was certainly ReHEAT Renewable Heat Deployment scheme that ran from March 2007 until the end of 2010. The programme was an expansion of the previous Bioheat Boiler Deployment scheme (which supported woodchip or pellet boilers only) providing assistance for the deployment of renewable heating systems in industrial, commercial, public and community premises in Ireland. Capital investment support of 30% from SEAI for eligible costs was available for the purchase and installation of biomass boiler systems and in the end was applied on 188 wood chip and pellet boiler systems with total power of 78.149 kW.



### 3. Company organisation

#### 3.1. Policy background

In recent years and particularly during the Celtic Tiger period<sup>5</sup> the Planning Authorities made it a condition of planning, that any new housing development must set up a management company to manage the estate. A lot of these newly founded management companies did not provide the required services for residents and therefore the Irish Government has recently introduced the Multi-Unit Developments Act 2011 - *MUD Act 2011*.

The Multi-Unit Developments Act 2011 was signed into law on 24 January 2011 and brought into operation on 1 April 2011. The significance of MUD Act 2011 lies in its role of the first legislation that provides a statutory framework for the operation and governance of multi-unit developments. Duties and obligations of developers have been clearly defined. The rights and obligations of members have been established and a framework for dispute resolution is provided for in the Act.

The Act defines a multi-unit development (*MUD*) as a development being land on which there stands erected a building or buildings comprising a unit or units and that as respects such units it is intended that amenities, facilities and services are to be shared. The Irelands' first ecovillage established as a part of the SERVE project, with its 114 low energy homes (building complete or well underway), 16 live-work units and a solar and wood-powered community heating system with embedded philosophy of building sustainability through community sharing is in accordance with this definition.

*Owners' Management Company* is defined as a company established for the purposes of becoming the owner of the common areas of a multi-unit development and the management, maintenance and repair of such areas and which is a company registered under the Companies Acts. In this case study the term *Owners' Management Company* refers to Cloughjordan Eco Village Service Company Ltd, set up by SPIL so to manage the utility services and infrastructure of the ecovillage.

*Common areas* are defined as those parts of a development designated as common areas including all relevant structural parts of a building such as walls, foundations, roofs, halls, landings, lifts, lift shafts, staircases and passages. They also include all access roads, footpaths, kerbs, landscaped areas, boundary walls, architectural and water features, as well as ducts, conduits, cisterns, tanks, sewers, pipes, drains, wires and central heating boilers which are used to serve more than one unit in a development – solar and biomass district heating system in the Cloughjordan Eco Village.

The primary purpose of the Multi-Unit Developments Act 2011 is to clearly define the obligation of developer to transfer ownership of common areas of completed multi-unit developments to the owners' management company - made up of unit owners in the development. The Act requires that the common areas shall be transferred to the owners' management company prior to sale of the first residential unit. For existing developments in which a residential unit has already been sold but the common areas have not been transferred by the developer to the owners' management company, the time frame for the transfer has been clearly set by the Act – it should occur within 6 months, i.e. before 30 September next: *Where, before the coming into operation of section 4, a multi-unit development has been substantially completed by or on behalf of the developer, and the ownership of the relevant parts of the common areas or the reversion in the units concerned has not been transferred to the owners' management company concerned, the developer shall within 6 months of such coming into operation arrange for the transfer of such ownership to the owners' management company concerned of the lands referred to in section 3(1)(b), without the reservation of any beneficial interest.* Subsection (2) defines *substantially completed* in the context of the section as being where sales of not less than 80% of the residential units have been closed.

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<sup>5</sup> UK economist Kevin Gardiner, in 1994 coined the term *Celtic Tiger*, comparing Ireland's unexpected economic take-off to the Asian tiger economies. During the '*Celtic Tiger*' period (1994-2000), Irish income per head reached and eventually exceeded EU-15 levels.

As described above the Act represents a very significant step towards enabling apartment owners in multi-unit developments to take control of the common areas of the developments and to manage those areas for the benefit of all the residents.

The Act also contains detailed provisions concerning the management and operation of owners' management companies, including rules relating to the holding of annual general meetings; the making of house rules; the calculation of service charges as well as the establishment of sinking funds for the purpose of spending on refurbishment, improvement or maintenance of a non-recurring nature of the multi-unit development. Detailed rules on calculation and apportionment of service charges (including an obligation on developers to pay service charges on all unsold units) and on establishment of a sinking fund will help to ensure the sustainability of multi-unit developments in the future. The calculation of service charges is defined by the Act under Section 18 providing that the owners' management company must establish a scheme for annual service charges to fund expenditure on the maintenance, insurance and repair of common areas within its control and for the provision of common services (security, legal, accounting etc.) to unit owners.

Subsection (2) provides that any such charge shall be approved by a general meeting of the members of the company, while subsection (3) outlines the categories of expenditure which must be itemised in the scheme of charges. In case in which over 75% of the members do not approve the proposed charge, the existing charge shall remain in place until adoption of a new charge. Where no service charge was applied in the previous period, the directors may determine a scheme to operate for a period of 4 months. However, an owners' management company may set the initial annual service charge for a development without the holding of a meeting. Subsection (6) provides that the service charge shall not be used to defray expense on matters which are the responsibility of a developer or builder unless agreed in writing by 75% of the members of the company.

Subsection (7) provides that any approval of such expenditure is conditional on 65% of the units being sold and can only come into effect 3 years after the transfer of ownership of the common areas to the owners' management company. In the case of unsold units, owner, including the developer has an obligation to pay the annual service charge. The annual service charge must be calculated on a transparent and fair basis while any excess is to be diverted to the sinking fund. MUD act requires owners' management company to maintain proper records of expenditure for auditing purposes.

As regards voting rights in owners' management companies, the general rule for residential developments is that one vote attaches to each residential unit. In mixed-use developments, other voting arrangements may apply as long as they are fair and equitable.

The summary of the main provisions of the act:

- Requirement to establish an Owner Management Company (OMC) for all Multi-Unit Developments (MUD) at the expense of the developer;
- Strict conditions for the sale of units and obligation for developers to transfer ownership of common areas to OMC's – The common areas must be transferred within 6 months of enactment of this Act (i.e. by 1st October 2011);
- New Regulations for Mixed Use Multi-Unit Developments;
- Automatic membership of the OMC;
- 1 vote is attached to each residential unit;
- Requirement to hold annual meetings and prepare annual reports to members for which the format is defined in the Act;
- Establishment of a scheme of annual service charges & expenditure categories;
- Establishment of a sinking fund within 18 months of enactment of the Act (i.e. by 1st October 2012);
- Making house rules;
- Dispute resolution, mediation & rehabilitation of multi-unit development;
- Restoration of struck off OMC's to Register of Companies within 6 years of strike off.

### 3.2. Company start up

The construction of the District Heating system was financed through the company named SPIL (Sustainable Projects Ireland Ltd.). Incorporated in 1999, trading as *The Village*, SPIL is registered as Educational Charity. Run along co-operative principles, SPIL has a context of a community where rights and responsibilities of making the project work successfully are shared out to its members. Accordingly, the evolving decision-making processes are founded on the Consensus Model, with practical structures in place to ensure that the company will achieve its aims. The Village is both an organisation - a company limited by guarantee and a community - articles of association ensure that the group operates as a co-operative. A legally binding members agreement defines members' rights and obligations. In addition members subscribe to an ecological charter which sets out guidelines for the design of the development and which will continue to affect all future operations.

As a company that has been using an evolving structure of consensus decision-making for many years, decisions that enjoy popular support are arrived at within a very short time-frame. The framework within which the company's strategies are formulated is well comprised in the SPIL's mission statement explaining its *raison d'être*: *To serve as an education, enterprise and research service resource for all.*

Much of the early years was spent developing the structure and ethos of the company and raising finance to buy land for the Eco Village. Capital was raised through the members putting in their own money and through a bank loan. In 2003 members adopted the idea of shared purposes and principles of shared out responsibilities. Since then members have adopted a revolutionary organisational system which gives maximum autonomy to all participants. It represents a shift towards the new paradigm of self-organising adaptive systems instead of command-and-control ways of organising.

In 2005 the land was purchased in Cloughjordan and Outline Planning Permission for a sustainable community of 130 homes and work units was received. The infrastructure work began in February 2007 and March 2009 was the starting date for construction of the first homes. The first residents of the Eco Village moved into their new homes in December 2009.

The company provides its members with fully serviced sites which have either outline planning permission, or full planning permission for certain buildings. All buildings are built by members in line with the overall Master Plan design, and with Ecological Charter specifications. When one purchases a site in the Eco Village he/ she automatically becomes a member of Sustainable Projects Ireland Ltd. Site price was determined by two amounts – Site Purchase Price and Community Development Charge. A person purchasing a site within the Eco Village paid two amounts to SPIL:

- Site Purchase Price. This charge covers the cost of the site and the provision of utility services such as, electricity, water, sewage, fibre optic cable, district heating pipe and access to an allotment.
- Community Development Charge. This charge is a contribution towards the cost of construction of the District Heating Plant and Solar Park. With this fee it was also planned to cover the cost of providing a 800 litre buffer tank and house station to each house. Internal heating installation such as under floor heating or radiators are viewed as additional cost and as such are to be covered by the homeowner.

Indirect funding was also secured through REMS Ltd as part of the SERVE project to assist with the capital costs of the DH plant and solar park.

### 3.3. Ownership

The Eco Village was created by the company Sustainable Projects Ireland Ltd. As part of the planning requirements a Service Company (Cloughjordan Eco Village Service Company Ltd) was set up to manage the utility services and infrastructure of the ecovillage.

The service company structure is a company limited by guarantee with no share capital. Once a person purchases a site within the Eco Village from SPIL they automatically become a member of the Service Company. Therefore membership of the Service Company is restricted to residents within the Eco Village.

The owners of SPIL are the members and they all have one vote. In accordance with the MUD Act and voting rights in owners' management companies, the general rule for residential developments is that one vote attaches to each residential unit. Due to the specific organisational structure and 'consensus decision making' approach, it is a very rare occasion that the owners have to resort to a vote on a specific issue. The Board are elected by the members for a maximum term of 3 years. The board of directors work on a voluntary basis.

Sustainable Projects Ireland Ltd and the Service Company are both 'not for profit' organisations. Therefore they are companies limited by guarantee with no share capital. One of the main reasons for this structure is to ensure that any profits or surplus is reinvested in community infrastructure, such as playgrounds and community buildings. The ownership structure of both SPIL and the Service Company resembles a co-operative business model that exists to serve its members – both companies are owned and run by the members - the people who benefit from the co-operative's services and they all have an equal say and share of the profits. Rather than rewarding outside investors, a co-operative shares its profits amongst the members.

### **3.4. Management principles**

Since 2008 an organisational system called the VSM or Viable Systems Model has been implemented in SPIL Ltd. VSM is a *whole systems* approach to management which facilitates the communication and information mechanisms that allow the company management to deal with complexity. The model seeks its inspiration from the form of human body - as in human system muscles and organs and all the various nervous systems all work together to create a Viable System.

VSM can also be described as a set of tools for rethinking the way people work together in an organisation. It's not a structure in itself. It's a set of ideas, principals, laws and axioms which explain which functions have to be present for a human activity system to be viable. The VSM provides the management of SPIL with an appropriate learning context to understand and assess the complexity of the tasks which need to be managed but also provides maximum autonomy to workers or volunteers to complete their tasks. Within the design it facilitates the communication and information mechanisms that allow both companies to deal with this complexity.

The strategic plan has been set up to propose the creation of ten departments within Sustainable Projects Ireland Ltd, operating according to the principals of the Viable Systems Model as listed above. The departments are divided between two basic elements of the Model – element M (Meta-system) consisting of Governance Department, Administration Department and Finance Department; element O (Operation) that incorporates Cloughjordan Services Company, Cluster Department, Community Department, Energy Department, Infrastructure Department, Members Department and Village Buildings Department.

No departments are encompassed by the third element – E (Environment). Generally speaking, the term environment refers to the sum of the total of the elements, factors and conditions in the surroundings which may have an impact on the development, action or survival of an organism or group of organisms. Consequently, what is defined by the term environment in the context of Viable system model are all the external organisations and individuals included in the company's interactions with over the course of its work.

### **3.5. Energy infrastructure**

Cloughjordan Eco Village Service Company owns and runs the distribution of energy for space-heating and hot water to Eco Village residents through District heating system – first of a kind in

Ireland and solar park. The showcase of renewable energy systems provided in the Village is in line with the Ecological Charter, ground document that every member signs upon joining. As set out in the Village Ecological Charter, the Eco Village is committed to a policy of Rational Use of Energy, a term meaning much the same as energy efficiency. The areas such as waste minimisation, water consumption and efficiency, wastewater treatment, renewable energy supply of electricity and home heating are all covered in the Charter as it implies using the energy in a rational way in order to satisfy the needs of the residents – and using it in such a way as to minimize the environmental impact of meeting these needs.

Currently wood-and solar-powered community heating system is managed by the Service Company to satisfy the residential needs but the future plans also include ensuring a supply of *green electricity* to be replaced in time with clean electricity produced on site.

All space-heating and hot water are provided by a District Heating system, which is one of the first community heating systems on renewable energy of this scale in Ireland.. The District Heating System has the capacity for providing heating for 132 houses, community buildings and commercial units. With the aim of providing 100% energy supply from RES within the buildings the Eco village will avoid the emission of 1,200 tonnes of CO<sub>2</sub> per annum (when compared to typical buildings in Ireland).

Designing the district heating system posed challenges due to the fact that the system had to be installed before houses were finished. The boilers, buffer tank and most components for the district heating system were supplied by an external company. The District heating Network in Cloughjordan Eco-Village operates like a domestic central heating system only on a larger scale. The design and equipment were well proven and based on long experience in northern Europe. The two boilers are Herz BioMatic 500 Biocontrol Boilers with a variable power output rating of 79-500kW, giving a total installed capacity of 1 MW. The biomass fuel source is woodchips with approximately 35% moisture content, but wood pellets can also be used. Woodchip was chosen as the main fuel source opposed to wood pellets due to lower cost and its availability locally. However, due to the lack of sawmills in the SERVE region which could provide the quantity and quality needed for the eco village district heating the provider had to be found in the wider region. There are several well-established wood-chip suppliers in the West-Midlands which offer long and short term wood-chip supply contracts. Current prices are set around € 110 (without VAT) per tonne (transport included) at 30% moisture with variations depending on the type of contract. Due to the proximity of the supplier (40 miles) wood-chip is bought from the Aughrim Timber & Stake Company from the Galway region. The decision of not signing a long term contract with the supplier was made since current small quantities which are needed (162,12 tonnes in 2011) would not guarantee a lower purchasing price.

The maintenance expenses are consisted of fuel replenishment (once every 2 months in summer, once/twice a week in coldest winter), ash removal and some monitoring. This allows the community to run the system themselves with occasional maintenance support from technicians. This is a further saving for the community and another step to community energy sufficiency.

The district heating system has received substantial grant funding from the SERVE project of the EU Concerto programme and the House of Tomorrow programme of SEAI. The plant was first fired up in October 2009.

The biomass boilers are backed up by 506 m<sup>2</sup> of ground-mounted solar panels, the largest such array in Ireland, so the boilers are rarely needed during summer months. The initial plan for a solar thermal array of approximately 530 m<sup>2</sup> was modified to an area of 506 m<sup>2</sup>, for which planning permission was received in September 2008. The solar thermal array supplies thermal energy to the 20,000 litre buffer tank via a heat exchanger. During normal operation the solar thermal array heats up the bottom two thirds of the buffer tank, and during periods of high solar irradiation it also heats up the remaining top third. This energy is then be distributed through the DH system as required. The solar thermal array is made up from individual flat plate solar panels (approx. 12 m<sup>2</sup>). The solar is anticipated to provide approx. 20% of the heat requirements but during the best months of the summer this is expected to be 100%. This prevents the boilers from having to operate for small summer time loads keeping their

average efficiency high. The Heat production plant is automatically controlled, with on line visualisation of the system and SMS alarming. This allows the network to operate without fulltime staff.

Both heat sources supply hot water into 2.5 km of well-lagged distribution pipes, which provide a metered supply of heat to an 800 litre heat storage tank in every home. This tank gives the householder complete control over the distribution of heat within the house – timing, room temperatures etc. Each dwelling has its own separate meter and an electronic system. The plant was first fired up in October 2009 and is now providing heat to approximately fifty buildings on site. The external company was chosen as the contracted suppliers and installers of the biomass burners and the solar park. However, the contribution from external company had ceased after the DH system was commissioned and now it is run and owned by the Sustainable Projects Ireland Limited (SPIL). It will be transferred to the Service Company in January 2013.

The Village Ecological Charter states the community's commitment to purchasing electricity from a *green* supplier. The Charter aspires to generating all or most of the electricity needed, when this becomes feasible, so greatly reducing the CO<sub>2</sub> emissions arising from use of electricity required to satisfy the needs of the residents.

## 4. Company operation

### 4.1. Services provided

As part of the planning requirements of the SERVE project the Service Company was set up to manage the utility services and infrastructure of the Eco Village. The services provided will also include monitoring and verifying the project's energy savings and the performance of houses. The work will consist of data collection on the performance of houses which have used a variety of different building materials and building methods.

The transfer of the responsibility for the maintenance and operation of the District Heating plant from SPIL to Service Company is set mandatory due to The Multi-Unit Developments Act 2011 which defines both party obligations whereas the transfer of ownership is set through a Licence Agreement.

### 4.2. Business concept (contracting, pricing model)

The following items were taken into consideration when determining the site price:

- Funding for operations
- Setting level of energy price for customers
- Setting level of standing charge (towards fixed running costs)
- Setting level of capital replacement fund contribution (sinking fund)
- Application of VAT to charges if appropriate
- Wood fuel supply, cost, quality, continuity, proximity of supplier
- Heat supply contract
- Impact of Solar Park on whole District Heating system when connected

It was agreed that the site price will be determined by two amounts – Site Purchase Price and Community Development Charge. Site Purchase Price covers the cost of the site and the provision of utility services such as, electricity, water, sewage, fibre optic cable, district heating pipe and access to an allotment. The DH system has received € 326,474 grant funding from the SERVE project of the EU Concerto programme which has helped greatly to create a sustainable financial construction of the project. The rest of the financial sources were obtained through a Community Development Charge. This charge represents a once-off payment to cover the cost of the eco village's District Heating System and other development costs. This amounts to € 10,340 for apartment and leasehold live-work unit sites and € 15,340 for house sites. With this fee it was also planned to cover the cost of providing a 800 litre buffer tank and house station to each house. Internal heating installation such as under floor heating or radiators are viewed as additional cost and as such are to be covered by the homeowner. Sustainable Projects Ireland makes no profit made on site sale income, and all sites are priced on break-even principle.

Along with a fixed charge which would contribute to the running costs and maintenance of the DH Plant other costs for residents are Kilowatt hour charges linked to heat usage. Residents are charged a monthly standing charge of € 23.09 per month. This amount is charged to cover the operating costs, insurance and maintenance. Residents are also charged 3.5 cent per Kilowatt hour of heat usage. Meter readings are taken on a monthly basis and invoices are generated and sent to residents. The running costs and the charges to residents are reviewed annually. In case that the district heating system is running at a loss then the fixed charge and the rate per kilowatt hour are increased to cover the loss.

Residents have also qualified for some grant funding if the house reached a set target for energy performance. Due to high insulation levels within the houses and their energy efficiency, the running costs for the users have been reduced.

## 5. Model replicability

Cloughjordan Eco Village Service Company Ltd, due to regulations and current status of Irish ESCO market, could be classified under energy service & supply companies/ facility management companies - one of the most common types of ESCOs in Ireland. In contrast to a traditional definition of an ESCO, the Eco Village Service Company has more features corresponding to the ESPC model – Energy Service provider Companies, defined as natural or legal persons that provide a service for a fixed fee or as added value to the supply of equipment or energy. Often the full cost of energy services is recovered in the fee, and the ESPC does not assume any (technical or financial) risk in case of underperformance. ESPCs are paid a fee for their advice/service rather than being paid based on the results of their recommendations (WEEA 1999). The definition of ESPC model corresponds to the fixed charge billed each month to the Eco Village residents, covering operating costs of the plant, insurance and maintenance as well as the Kilowatt hour charges of heat usage. Moreover, similar to ESPCs, and opposed to a traditional ESCO, the Eco Village Service Company has no risk engagement in the case of the plants underperformance as the fixed charge and the rate per kilowatt hour would increase to cover any eventual losses. The type of ESCO chosen for the Eco Village Service Company is one of the most common in Ireland and in the perspective of the recent government policy change for multi-unit developments - Multi-Unit Developments Act 2011 which obliges the developer to establish an *Owners' Management Company* to manage the utility services and infrastructure of the development, it represents a risk free model in the terms of ESCO. As such it offers high replication possibilities.

As stated at the beginning of the study, on the Irish market ESCOs are already in operation, in a variety of forms but they are used to a far greater extent elsewhere in the world. In Scandinavia, for example, community ESCOs commonly operate large biomass district heating schemes. According to National Renewable Energy Action Plan (NREAP) growth of ESCOs in Ireland will require the encouragement of district heating, grouped stakeholders and ESCO contract templates. While Sustainable Energy Ireland (SEAI) already has a role in developing model contracts and advising of the procurement process, the showcase of a community ESCO linked to operating a biomass district heating is what the Village project provided in practice thus enabling others to follow in their footsteps.

Both SPIL Ltd and the Service Company are run as a co-operatives and as such show a very high replication potential regarding the ownership structure as Ireland, according to the report *Global Business Ownership 2012: Members and shareholders across the world* (Co-operatives UK, Mayo, 2012), is the world leader in co-operative ownership as a proportion of the population. This statistical analysis in the report was done to compare for the first time co-operative and conventional business ownership worldwide while the quote from the cover page sums up the idea behind the co-operatively run enterprise, applicable by all means to the philosophy of the SERVE's Eco Village: *There are two tribes of business ownership. Despite the focus on stock markets, it is co-operative enterprise that touches the lives of more people.* The report attributes the high co-op membership in Ireland to the respective strengths of the Irish Credit Unions and Agricultural Co-ops which resulted in a widespread presence of co-operatives from rural to high-tech settings. As opposed to the conventional structures of ownership which enable only one stakeholder to take control over the business and reap the benefits, the existence of diverse ownership structures has wider systemic effects. Both SPIL Ltd, trading as The Village and the established Service Company include owners other than just investors and are established for the benefit of the community with operating surpluses being ploughed back into the community. It could be argued that markets consisted of co-operative enterprises provide more choice to consumers, help prevent monopoly, provide room for innovation and generally keep investor-owned businesses on their toes and competitive. This corresponds to one of the key objectives of the Cloughjordan Eco Village - promoting a resilient and sustainable local economy.

The SERVE project is a showcase of many different pioneering aspects - the Cloughjordan Eco Village brings together a diverse group of people creating an innovative community in Tipperary formed in the Ireland's first ecovillage but it also demonstrates the use of renewable energy systems as the biomass heating system supplying the ecovillage is also the first of a kind in the country. As such, the SERVE project has accumulated ice-breaking experience and necessary knowledge on these issues and it will for sure encourage others and provide them with the understanding to replicate



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possibilities showcased in the project so to deliver sustainable energy in their own communities or even creating a community of their own.

## 6. Conclusions and recommendations

Ireland has not traditionally adopted district heating principles in the planning and development of living accommodation, even though the practice has been in operation for many years in many countries. The Cloughjordan Eco Village project has to be considered as an important step forward as it demonstrates the first community heating systems on renewable energy of this scale in Ireland. Replication potential of the ESCO model established was investigated in its features of an energy service company which adheres to the current needs of the Irish ESCO market, thus facilitating the possible replication.

Assessing the data for the SERVE ESCO case study but also taking in consideration lessons learned from other examples of biomass district heating system implementation in the existing or newly formed communities lead to certain recommendations that can be drawn:

- Consider district heating at an early stage: e.g. Density of properties, e.g. Phasing of development.
- Clients (developers, architects, building services engineers) need more experience and training. This is due to lack of biomass DH technical knowledge and experience in the Ireland.
- Necessity of government supporting financial mechanisms and biomass deployment schemes in order to stimulate the ESCO market which is lacking in familiarity and perceived risk awareness.
- Complexity of biomass DH network ownership issues, ESCO's Community Interest Companies, service and maintenance costs.

Both SPIL Ltd, trading as The Village and the established Service Company include owners other than just investors. They are established for the benefit of the community with operating surpluses being ploughed back into the community which makes them economically viable in the long run and explains the wide spread of the co-operative model across Ireland. The philosophy of democracy providing a vote to each member backed up with a sense of reconnection with the community makes a strong case for project replication as *it is co-operative enterprise that touches the lives of more people* (Mayo, 2012) enabling the chain effect reaction. The ways in which the project will promote ESCO and district heating principles are with this fact certainly enumerated.

This case study referred to national policy changes regarding the newly established MUD Act 2011 that obliges any new housing development to set up a management company to manage the estate – Owners Management Company. The MUD Act has clearly influenced SPIL Ltd in choosing the ESCO model for the Service Company. Company structure, ownership, management principles as well as pricing strategy have been analysed in details so to recreate the scenario from the early days of company start-up to final business concept. The main purpose of the case study is in gathering the Eco Village experience so that the information on barriers but also drivers encountered can be used to inform other interested parties on the advantages of forming a community ESCO type company as well as progressing other innovative energy saving projects with strong holistic approach. The implementation of such projects will help to accelerate the use of ESCOs in Ireland to meet local, regional and national climate change and energy targets. The Service Company established certainly managed to showcase interplay between nature and mankind in enabling economic development while achieving a society that is sustainable in a long-term perspective.

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## APPENDIX I - About the Viable System Model

It took the author Stafford Beer 30 years to develop the Viable System Model (Beer, 1979; 1981; 1985) which explores the viability of the systems taking into consideration their capability of independent existence. The main focus of Beers' work was to elucidate the laws of viability in order to facilitate the management task. The VSM is perhaps one of the most insightful tools available today for studying the structure of organisations. The focus of the model are the resources and relationships necessary to support an organisation's viability rather than on the organisation's formal structure, thus offering a new approach rather than holding on to the traditionally over-emphasised hierarchical relationships. Its basic assumption is that viable organisations emerge when people find successful strategies for working together, to the extent that they are able to develop and maintain a group identity in spite of environmental disturbances. These strategies entail creating, in one form or another, organisational mechanisms for the invention, re-invention, development and maintenance of the organisation over time. People, supported by all kinds of other resources, constitute these mechanisms. These resources create policies, and provide intelligence, cohesion, co-ordination and implementation capacity for the organisation; they provide its functional capacity.

The structural problem is in creating the conditions for people to relate to each other in such a way that they enhance the organisation's chances for viability beyond survival. This requires respect for their autonomy in a cohesive and creative structural context. For instance, it is not good enough for an enterprise to have a well-designed business process relating it with its customers if it is not well supported by organisational processes. These are the processes both maintaining its autonomy and cohesion with other business processes, and ensuring that its meaning is aligned to the meaning of the organisation as a whole. These processes, underpinned by structural mechanisms, support the effective implementation and adaptation of the organisation's policies.

The key objective of VSM is in offering managers the chance to design and manage these mechanisms in such a way that people are allowed to contribute to the organisation's performance to the best of their abilities. Thus, these mechanisms are not rigidly defined, but are the outcome of organisational processes, in which functional capacity and interactions are assessed, and adjusted over time, by management. Therefore, the purpose of management is to enable a structure that provides people with adequate resources and communication channels to constitute effective interactions. Organisational processes, if well constituted, should provide people with a framework for the co-ordination of their actions. Equally, managing organisational processes should also mean keeping business processes aligned with global organisational policies; otherwise local improvements may be achieved to the detriment of global performance.

Moreover, since the VSM is structurally recursive, it is expected that people throughout the organisation, and not just top managers, will be responsible for developing policies, and related enabling structures, within their areas of concern in the organisation. Indeed, if the organisation is truly effective, all people in it are participating in its policy formulation and implementation. The same organisational processes and the same needs for viability are recurring everywhere. The mechanisms are independent of the content of the interaction; the same checks and balances, the same controls recur at all levels in the organisation and in all organisations; therefore they are equally relevant to large and small, profit and non-profit oriented.

In simple terms the VSM is composed of three elements: E, O and M. E represents the Environment; O represents the Operation; M represents the Metasystem. These three elements can be further subdivided into five interacting systems. According to Beer these five interacting systems in the human form are defined as follows:

SYSTEM 1: All the muscles and organs as parts that actually DO something representing the basic activities of the system.

SYSTEM 2: The sympathetic nervous system, which monitors the muscles and organs and ensures that their interactions are kept stable.

SYSTEM 3: The Base Brain, which oversees the entire complex of muscles and organs and optimises the internal environment.

SYSTEM 4: The Mid Brain – as a connection to the outside world through the senses.

SYSTEM 5: Higher brain functions.

In an organisation these systems are reflected as follows;

SYSTEM 1: Primary, basic activities – the operation

SYSTEM 2: Conflict resolution, stability.

SYSTEM 3: Internal regulation, optimisation, synergy.

SYSTEM 4: Adaptation, future planning, projections, forecasting.

SYSTEM 5: Formulation of policy decisions, ultimate authority, identity.

The strategic plan aims to create a whole functioning system from all the parts ensuring they all come together to form an integrated whole respecting the principle of recursion. Recursion, as the core condition behind the VSM, ensures that an organization is formed as a system composed of (smaller) Viable Systems. Each is nested one within the other, the smaller systems embedded in larger ones, like Russian dolls or fractals. Recursion also means that at each level, the same principles of organisation "recur" - if one is to diagnose a small village group or the Administration Department - exactly the same principles apply.

System 1. In order to explain the model it is important to identify the working bits of the organisation. Working bits are actual operational bits of the company, the rates which are considered to do a physical thing. The muscles, the engine room, the projects and the producers are defined as working bits - department's, as listed above.

System 2. Secondly, good organizational structure is able to ensure the ways of dealing with conflicting interests, inevitable in the interactions, which occur as the parts of System 1 interactions. Thus, the most important function of System 2 is conflict resolution. System 2 is also given the role of ensuring stability. These are the departments listed as Meta-system above.

System 3. Once the interactions of the System 1 are rendered stable, it becomes essential to find the ways of optimising the interactions which is the role of System 3. It is suggested by the strategic plan that existing decision-making bodies already operating within Sustainable Projects Ireland Ltd such as the Board, Process Group, Strategic Plan Group, The Hub, Village Group Coordinators; Cluster Coordinators should be grouped together as sub-departments of the Governance Department (element Meta-System) and work together to provide the System 3 function for the organisation. The extra efficiency of System 1 units as a result of System's 3 overview and regulation in order to provide optimisation - is called synergy. System 3 exists to regulate System 1 - its function is optimisation. The strategic plan intends that the Hub carries out this function.

System 4. Once the optimised set of Operational units has been set, the next step is to ensure their viability in a changing environment and this is the role of System 4. System 4 takes in consideration changes in the outside environment, considering the threats and opportunities, and schemes. The key role of System 4 are planning activities to ensure long-term viability. The strategic plan proposes the Strategic Plan Group to carry out this function.

System 5. System 5 provides the ultimate authority - the ground rules and the means of enforcing the units to act as a whole ensuring the completeness of the system. In this case the ultimate authority lies with the membership. The role of the Board as part of System 5 is to implement policy decisions which have been agreed by the Membership. The Service Company has a voluntary board of directors elected by the members, similar to SPIL.

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## APPENDIX II - Examples in other European countries

For the purpose of this report several case studies of other ESCO community schemes were taken into account. First example is the one of a Danish **Hjortskoj ecovillage and its wood chip district heating**. As stated in the INFORSE – Europe database, Eco-village in Hjortshøj, Denmark, was started in 1991 as an intentional community based on democratic, technological, economic and social pillars. The heating system in the eco-village in Hjortshøj, Denmark is a successful example of a local heating system made for 105 households plus community buildings and an institution. It supplies the heat from a 185 kW wood pellet boiler and additionally installed 160 kW wood-chip boiler (for up to 40% humidity in wood-chips), and from a small (35 kW electric and 115 kW heat) combined heat and power plant with a stirling engine. The stirling engine was installed in 2007-2008, but due to technical problems total power production was just above 1000 kWh in 2009. After a number of improvements, including measures to reduce vibrations and noise, the testing was done to enable automatic operation, including automatic change between operation and hot stand-by. The scheme also includes decentralised solar heating allowing the network to be stopped during summer, and for 23 houses pulsating district heating to reduce heat losses in the network. These houses are in extension of the ecovillage and have heat provided only part of the day. During that period a heat tank in each house is charged to store heat for the rest of the day. This saves up to 50% of the heat loss in the network. All the new houses are de-tatched, low-energy houses, and the network losses are therefore potentially large compared with useful heat delivered to the houses. The automatic control of pulses and remote metering was installed.

The eco-village is organised around three house groups, where community members bought the land together, two groups with social housing (rented), one group with co-housing and one group with houses developed by a local, development company into individual houses. For the heat supply is formed a heating association with status as a cooperative with limited responsibility, and recognised according to Danish regulation as a heat-supplying entity. For the first groups the heating cooperative operates on an exemption from the obligation to have heat supply from the municipal district heating, while in the new developments, it has the sole right to supply heat according to Danish regulation of energy supply. The heating cooperative is managed by a board with one person from each group of houses which work on voluntary basis, but the cooperative has an accounting that is paid. The heating station is operating automatic, while adjustments, smaller maintenance, and solving of smaller problems is done by a group of volunteers. A chimney sweeper has the overall responsibility for the operation of the heating station.

The energy demand was in 2007-2008 (one year) 617 MWh including network losses inside each group of houses. The network loss was 52 MWh (8%) in the network of the heating cooperative (between house groups). Each member of the heating cooperative has paid 135 DKK (18€) incl. 25% VAT per m<sup>2</sup> of heated area + a meter to become member. The heat price is set to cover costs including depreciation of investments. There are separate tariffs for seasons - 0.85 DKK/kWh (0.11 €/kWh) during winter and 1.00 DKK/kWh (0.13 €/kWh) during summer. All payments are according to consumption, no fixed charges are applied.

The investments of the system have been covered by a loan for the original heating station of 548,000 DKK (57,000 €), a loan for the increased heating station with stirling engine of 1,850,000 DKK (247,000 €) with a municipal guarantee, subsidies/support for the heating station of 2,570,000 DKK (343,000 €), subsidies for the pulsating heating of 97,000 DKK (13,000 €), and membership payment of 645,000 DKK (86,000 €).

The second example was focused on the **wood chip district heating scheme and Community Interest Company, Gloucestershire, UK**. This case study is another success story from INFORSE-Europe database (West, P., 2008). The Littlecombe site comprising 39 hectares of brownfield land near Dursley, Gloucestershire, in ownership of South West Regional Development Agency was tendered for developers in order to obtain a mixed use redevelopment scheme that will benefit both economy and the community. The overall site CO<sub>2</sub> emissions reduction target was set at 30% below 2006 building regulations.



A company called St Modwen Developments won the SWRDA tender to develop the Littlecombe site and appointed Severn Wye Energy Agency as consultants to carry out an options appraisal into use of on-site renewable energy. In consultation with energy experts and architects, wood chip district heating plus 200 PV installations were selected as the preferred renewable energy options, coupled with improved insulation levels and air tightness compared to 2006 Building Regulations. Tendering and procurement of the wood chip district heating network was assisted by the Energy Agency. Financial support amounting £1m was secured through the Low Carbon Buildings Programme Stream 2B. The Littlecombe mixed used site for housing employment will be supported with a system made of three 500kW modular wood chip boilers, a 2 MW back up gas boiler and approximately 4km of insulated underground district heating pipes. Final choice of low carbon technologies for the dwellings included the following: 450 new dwellings supplied by woodchip district heating (which were initially provided with energy from a single 1MW temporary biomass boiler); 200 dwellings to have 1.4 kW photovoltaic installations. It was also taken in consideration to provide the Rednock School in the territorial vicinity with a heating link. Total site CO<sub>2</sub> emissions resulted in 55% below 2006 Building Regulations.

Each house has a heat exchange unit mounted on the kitchen wall, housed in a white outer case and almost identical in appearance to a gas combi boiler. Moreover, each dwelling is equipped with an ultrasonic heat meter. The meters are read remotely via a radio module. Householders are billed for the heat they use in the same way as they receive gas and electricity bills. Heating costs for the residents will be the same price as gas or slightly lower.

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3. Hjortshøj eco-village own website  
<http://www.andelssamfundet.dk/>