SERVE

SUSTAINABLE ENERGY FOR THE RURAL VILLAGE ENVIRONMENT

www.servecommunity.ie

CONCERTO is a European Commission initiative within the European Research Framework Programme (FP6 and FP7) which aims to demonstrate that the optimisation of the building sector of whole communities is more efficient and cheaper than optimisation of each building individually.

The EU initiative of DG Energy has co-funded 58 communities in 22 projects in 23 countries and started in 2005.

CONCERTO demonstrates realised examples of:

- innovative technologies ready to be applied,
- use of renewable energies sources for cities,
- energy efficiency measures,
- sustainable building and district development,
- economic assessments,
- affordable energy,
- energy transparency for citizens.

The 58 CONCERTO communities integrate innovative energy efficiency measures with a substantial contribution from decentralised renewable energy sources (RES), smart grids, renewables based cogeneration, district heating/cooling systems and energy management systems in larger settlements of buildings. This set of innovative technologies and measures are optimised locally in order to take into account all specifications of the local site, climate and cultural differences or local political aspects.

CONCERTO communities demonstrate new realistic models to get close to zero energy communities. The results will pave the way for a future European legislation in the form of energy policy recommendations for the 2020 energy and climate change targets and the 2050 Energy Roadmap. CONCERTO demonstrates good examples for sustainable district development as well as for refurbishment in buildings.

CONCERTO is an initiative addressing the challenges of creating a sustainable future for Europe's energy needs.
www.concerto.eu

"YOU NEVER **CHANGE** THINGS BY FIGHTING THE EXISTING **REALITY** TO CHANGE SOMETHING, **BUILD** A NEW MODEL THAT MAKE THE EXISTING MODEL **OBSOLETE**"

R. Buckminster

/SERVE PROJECT/SUSTAINABLE ENERGY FOR THE RURAL VILLAGE ENVIRONMENT

North Tipperary County, Ireland

INVESTMENT:
€8 MILLION
CO-FINANCED BY
CONCERTO
UNDER THE FP6
PROGRAMME.

The SERVE project targets more than 400 buildings, existing and new, for energy efficiency and renewable energy measures. The SERVE region, home to this project, is a rural region, 600 km², 12,000 people, and 6,000 dwellings among which 60% constructed pre 1981. The project led to the creation of a region in North Tipperary which is a leader in the implementation of sustainable energy actions.

The project achieved complete retrofitting actions in more than 350 homes and non-residential buildings which dramatically improved their energy performance with a reduction of energy consumption within residential existing buildings of 3.5 MWh/year. Another concrete result of the project is the increase in production of renewable energy in existing dwellings from 660 to 2,300 MWh/year.
More than 50 new Eco-Buildings (average 54 kWh/m²/year) were constructed with the Eco-Village and they are supplied by Ireland first renewable energy district heating system (wood and solar thermal).
SERVE utilised technical and socio-economic expertise from European Partners to monitor performance and impacts in the region and to disseminate the results widely.
The aim was also to increase the training of professionals on sustainable energy in the SERVE region

The SERVE project was initiated in November 2007 and the main works were finished by October 2011. The challenges faced by the SERVE project, especially in terms of retrofitting were:

- Financial crisis hit Ireland just after the launch of the project,
- No history of retrofitting which means a lack of trained installers, approved products/ systems and a lack of knowledge of buildings owners. It involves also a lack of knowledge in terms of measurements and standards,
- At the same time when the SERVE project was launched there was some national policy changes with for example the EPBD Implementation and the National Retrofitting Scheme that had to be taken into account in order to coordinate the SERVE grants and standards to be coherent with the National scheme.

In total: Investment of €8 million in a region with a population of 12,000, half of which is co-financed by CONCERTO under the FP6 programme.

Eco-village in Cloughjordan

PARTNERS OF THE PROJECT

. Limerick Institute of Technology, **IE**

. North Tipperary County Council, **IE**

. Tipperary Energy Agency Ltd, **IE**

. Sustainable Projects Ireland Ltd, **IE**

. Renewable Energy Management Services Ltd, **IE**

. Energy Consulting Network, **DK**

. Senergy Econnect Ltd, **UK**

. CIRCA Group Europe Ltd, **IE**

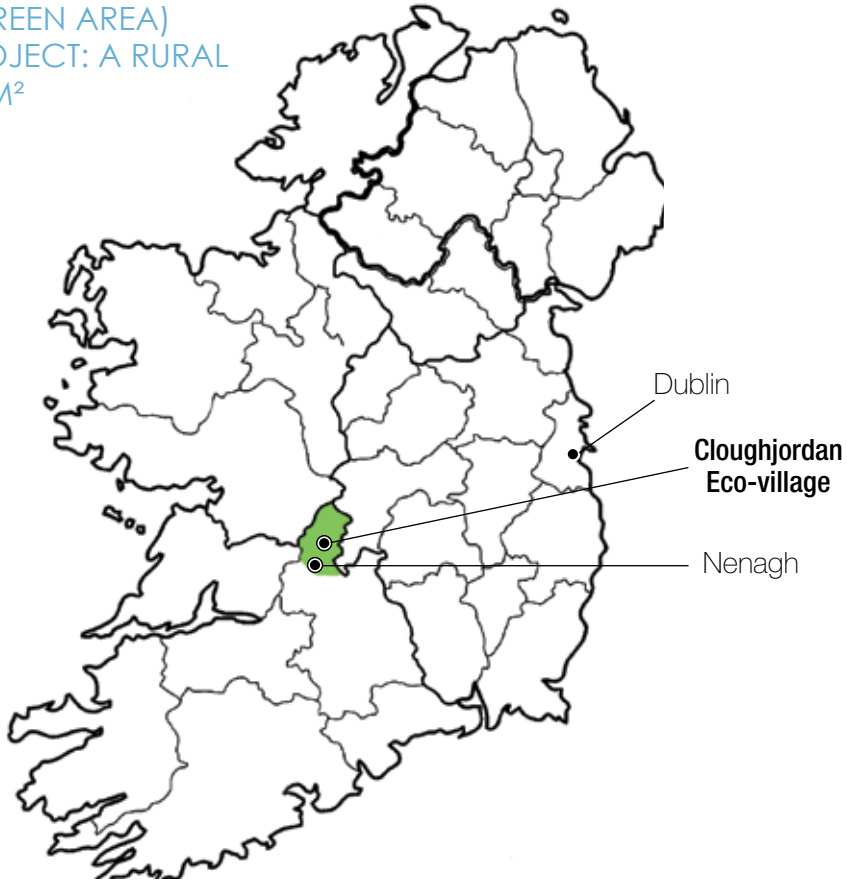
. European Federation of Regions and Agencies for Energy & the Environment, **BE**

. Surface Power Technologies, **IE**

. Ayuntamiento de El Franco, **ES**

. North West Croatia Energy Agency REGEA, **HR**

SERVE REGION (GREEN AREA)
HOME TO THIS PROJECT: A RURAL REGION OF 600 KM²



Regarding the retrofitting actions, the aim was to complete a comprehensive retrofitting and to avoid single measure actions: e.g. attic only so to avoid high interaction cost with low energy savings. Therefore the SERVE grant was given under the conditions of a combination of mandatory measures (attic and wall insulation, heating control, boiler interlock and either one more zone controls or thermostatic radiator valves) and additional measures (high efficiency cylinder, high efficiency boiler, upgrading of windows, LEDS, lighting controls, advanced heating controls, flat roof/room in roof insulation, external wall insulation..) to suit house requirements.

The support was linked to the energy performance of the house and aimed at integrating energy efficiency and renewable energy. At the end of the grant period the following has been achieved: 346 residential buildings retrofitted for a total of around 55,000 m^2 with a reduction of energy consumption of 3.5 MWh/year and 11 non-residential buildings amounting to 10,000 m^2.

HOW WAS THE **GRANT STRUCTURED**

The SERVE Energy Efficiency Grant Scheme worked in conjunction with the national Sustainable Energy Ireland's Home Energy Saving Scheme and then later on Better Energy Homes.

The scheme had a residential and a non residential section. The grant level varied depending on what measures were selected. A before and after BER (Building Energy Rating) had to be completed to avail of the SERVE grant.

346 RESIDENTIAL BUILDINGS RETROFITTED
11 NON-RESIDENTIAL BUILDINGS

Existing Buildings

The homeowner had to use a BER Assessor from Tipperary Energy Agency's BER Assessor Panel. These assessors had been trained and educated on the SERVE Project and were in a position to help the homeowner with any queries and advise on the options available to them. These BER Assessors also meet the National requirements in relation to standards of training, codes of conduct and quality assurance.

The SERVE Non Residential Grant Scheme was available to buildings that were at least 100m2 and had an annual heating spend of at least €1,000. Grants were available for attic and wall insulation, heating controls and boiler upgrades. The energy efficiency measures that were grant aided were based on the results of an energy audit of the building carried out by Tipperary Energy Agency.

A detailed application process was developed for both the residential and non residential scheme and it was launched on June 3rd 2009. The scheme was promoted in a number of ways including press, media, web, mailings and information meetings.

SERVE PROJECT IMPACTS:
AFTER SERVE (RED), NATIONAL EXISTING (BLUE), BEFORE SERVE (GREEN)

Before in the SERVE region, most houses had a building energy rating between C and G after retrofitting the majority of houses are now between B and C.

/CASE STUDIES/SEMI-DETACHED HOUSES & SEMI-DETACHED BUNGALOW

http://servecommunity.ie/project-impacts-and-results/case-studies

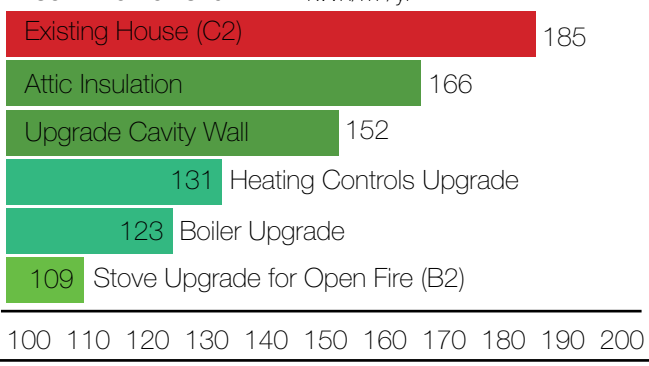
The following three graphs represent a summary of upgrades made in different houses and the energy saved by each single measure applied to the house. These examples showed the results achieved in some typical constructions in the SERVE region.

HOUSE 1: **41 %**
HOUSE 2: **52 %**
HOUSE 3: **65 %**

ENERGY SAVINGS

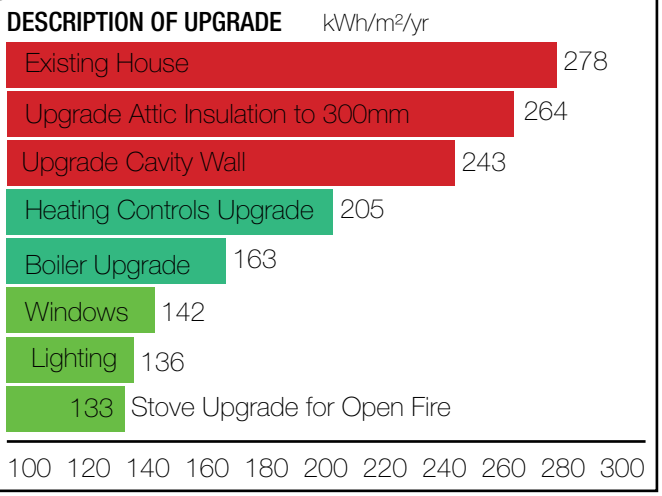
CASE STUDY 1: **SEMI-DETACHED HOUSE**

. Semi-detached house : 125 m²
. From **185 kWh/m²/year** to **109 kWh/m²/year/**
. **Investment** of **5,450 EUR**
. Payback 8.3 years/After grant the payback is only 3.38 years.



CASE STUDY 2: **SEMI-DETACHED BUNGALOW**

. Semi-detached Bungalow
. From **279 kWh/m²/year** to **133 kWh/m²/year/**
. **Investment** of **18,600 EUR**
. Payback 13.9 years/After grant the payback is only 4.74 years.



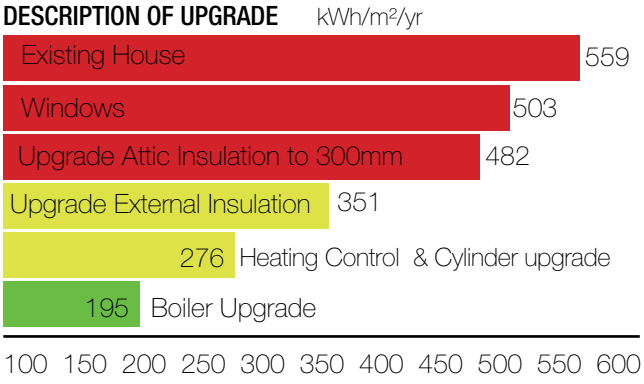
CASE STUDY 3: **SEMI-DETACHED HOUSE**

. Semi-detached house

. From **559 kWh/m²/year** to **195 kWh/m²/year**/

. **Investment** of **18,383 EUR**

. Payback 13.7 years/After grant the payback is 9.73 years



/**CASE STUDY**/GURTEEN AGRICULTURAL COLLEGE

www.gurteencollege.ie

Gurteen College is an agricultural college in the SERVE region which has decided to undergo major retrofitting programme using many grants including the SERVE one. The college runs agricultural courses, equine course and veterinary courses.

RENEWABLE ELECTRICITY

Gurteen College has installed a 50 kW wind turbine beside its main campus. The turbine should supply much of the College's electricity needs, their base load being approximately equal to the turbine's output.

Their electricity bill is currently €60,000 the wind turbine should produce €20,000 per annum. Thanks to the grant from the Sustainable Energy Authority Ireland (national energy agency) and a donation, the payback is expected to be of 7 years.

RENEWABLE HEATING

The system installed is two 300 kW wood chip boilers, with a back up of a new oil boiler. The fuel would be produce on site as in total 31.1 hectares of willow has been planted to provide fuel for the College heating system. In February 2011 a new 270 m² drying floor was installed within the farm building complex in readiness for the future harvested chipped willow, which will be reduced from 55% moisture to 25% in the process. They estimate that Willow will cost €5,000 to grow, €10,000 to harvest, €8,000 (loss in land to other agriculture) which is €23,000 per annum (max) for their heat meaning a 38% reduction on the costs.

ENERGY EFFICIENCY MEASURES

The idea was to make the College as energy efficient as possible by insulating to a high standard, use of efficient lighting and better controls on the heating system. Some of the measures were: internal insulation of the exam and concert hall; pumping of the cavities of the main educational and residential 1960's building; change of light fittings indoors and outside experimentation with LED which was not satisfiying (light levels and response time for security reasons).

/SERVE PROJECT/**ECO-VILLAGE: NEW BUILDINGS**

www.thevillage.ie

The Eco-Village is set within the SERVE region in a village called Cloughjordan. It is surrounded by 50 acres of land dedicated to woodland and active food production in the community farm. A renewable energy centre provides heat and hot water to all homes, and the eco hostel 'DJango's' is now open. The foundations have been laid for the green enterprise centre.

The financial crisis has presented significant challenges to the eco-village project in terms of site sales and financing the construction work but there are approximately 8,000 m² of eco-buildings constructed in the eco-village.

Every house built must adhere here to the village's eco-charter: the charter says that buildings should be highly insulated, make use of passive solar gain and renewable energy, minimise potable water consumption, reduce construction waste and use low embodied energy materials.

The buildings which have been constructed are indeed exceeding the SERVE energy targets, the average energy performance of residential buildings (54 kWh/m²/yr) are indeed 24% better than SERVE original targets at 70 kWh/m²/yr.

As regards the 2 non-residential buildings in the eco-village, one is completed, the Community Hostel Building – 588 m². It has opened to the public in June 2011 and will play an important role in providing on site accommodation to the many interested visitors and course participants that the Eco-Village is attracting.

The Enterprise Building will host a Community Enterprise Centre (518m²) within the eco-village. The centre will provide eco-entrepreneurship workspace along with an innovation hub, with training and education being a key feature of potential income generation.

8,000 M² OF ECO-BUILDINGS CONSTRUCTED IN THE **ECO-VILLAGE**

House in the Eco-village

RENEWABLES IN THE ECO-VILLAGE

The first 100% renewable district heating system in Ireland has been installed in the eco-village. It couples a 506m² solar array with 2 x 500 kW wood biomass boilers to supply the entire eco-village.

Perhaps the most special thing about the system design for the district heating is that it is designed for a community who can work in co-operation to deliver the best efficiency. Technically, the heat generation is performed by a central 506 m² Thermal Solar park and a 2 x 500 kW wood fired Boilers. This heat is distributed via the district heating network to each house through a network of 2.2km of pipe. Each house in addition to a heat exchanger and Heat meter to connect it to the district heating system has a heat storage vessel.

This allows for a distributed storage design creating some interesting possibilities to optimise the efficiency of the system. In summer for example when there is no heating demand just a requirement for hot water most district heating systems are at their least efficient as the losses in distribution become more significant relative to the energy consumed. In Cloughjordan however each house will have an 800 litre storage vessel allowing the network to be shut down for large parts of the day with the storage vessels providing sufficient hot water for any demand. Solar energy is then stored up in the central Buffer tank (17m³) which can be used to recharge the distributed buffers twice a day. This however requires co-operation for all to agree to recharge their buffers at the same times each day. This is possible due to the strong community ethos in Cloughjordan.

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%.

Eco-village Solar Park

Eco-village Energy Centre

/SOCIO-ECONOMIC
CASE STUDIES

www.servecommunity.ie

SERVE project also include activities aimed to assess the impact of the SERVE project in socio-economic viewpoint. There will be several aspects evaluated by the end of the project such as the impact on job creation and service supply, an economic analysis of retrofitting with the analysis of payback time for project measures in building sector and the analysis of local funding and money flows, the opportunities for development of ESCO's and the potential for replication and finally the involvement, attitudes of building owners and consumers based on surveys of attitudes, opinion and knowledge and on case studies.

The following pages present some examples extracted from the homeowners and contractors case studies

HOMEOWNERS CASE STUDIES

Six case studies were undertaken in retrofitted households which participated in the SERVE project. The questionnaire developed for this purpose consisted of questions intending to identify the situation and comparison before and after retrofitting, identify possible issues and problems within the project and determine the overall satisfaction and main motivators for household retrofitting.

A very important benefit of the retrofitting which is mentioned by all households is the improved quality of living, which beside reduced financial costs include improved commodity and environment protection.

"IT'S BECAUSE LAST WINTER WAS MAYBE COLDER THAN THE YEAR BEFORE AND THE HOUSE WAS WARM … THAT'S A BIG DIFFERENCE I'D SAY … IT WAS MONEY WELL SPENT"

CASE STUDY 1: SINGLE HOUSE

37 years living in this house situated in a terrace of houses

TYPES OF RETROFITTING

Attic insulation; cavity fill wall insulation; heating controls; high efficiency cylinder; wood stove

BEFORE SERVE

"The heat was escaping as quickly as you were heating the room; it was escaping because there was no insulation in the walls and the attic"

GRANT/SUBSIDIES

"everything was paid up fairly promptly… no problems"

"IT'S MUCH MORE COMFORTABLE… NOW WHEN YOU COME IN, YOU PUT IN A FEW BITS OF TIMBER … IT'S AS EASY AS THAT … I'M TALKING ABOUT MINUTES TO SEE THE IMPACT "

CASE STUDY 2: SINGLE HOUSE

190 m² Single storey house in a rural setting, core house built in 1950 and 2 extensions added in 1983 and 1986

TYPES OF RETROFITTING

Attic insulation; cavity fill wall insulation; internal wall insulation; heating controls; windows; high efficiency boiler; high efficiency cylinder

BEFORE SERVE

"You'd come home from work … the place was cold … you'd put on the heating … by 7.30 pm it was still not comfortable"!

GRANT/SUBSIDIES

"The grants were too significant to ignore … it wouldn't have been viable without them … that's being frank, it gave us a bit of a spur to go and do it"

"IT'S ABSOLUTELY BRILLIANT … THIS IS AN OLD HOUSE … WE DIDN'T REALISE WHAT COULD BE DONE TO CONSERVE THE HEAT".

CASE STUDY 3: BUNGALOW

The householder has been living here since 1970 and he feels that he will stay here for the foreseeable future

MEASURES

Heating controls; high efficiency boiler; high efficiency cylinder; attic insulation

BEFORE SERVE

"The farthest room from the central heating … now when you go into it … it's unbelievable, there's no real cold in it … I can't get over the boiler, it's instant heat nearly"

MOTIVATION

The householder feels that it was both the cold and the rise in energy consumption costs that led him to apply to SERVE.

/CASE STUDIES/**CONTRACTORS**

www.servecommunity.ie

"IT WAS A BIG, BIG HELP TO US …IT WILL BE RESPONSIBLE FOR US GROWING MORE BECAUSE WE HAD TO ADAPT…"

In addition to the six case studies for homeowners, six case studies were conducted among contractors (companies performing the retrofitting work in households) through structured interviews. The questionnaire developed for this purpose consisted of questions regarding level of engagement in SERVE project, views on the benefits of the project, any problems encountered within the projects, homeowners knowledge on Renewable Energy Sources and Energy Efficient technologies, future of RES and EE in the residential sector in Ireland and overall satisfaction with the SERVE project.

All the contractors stated their satisfaction with the SERVE project and its impact not only on local economy but also in increased awareness among people on Renewable Energy Sources and Energy Efficiency. Also one of the key results of the project is the improved standard of workmanship of contractors as well as the boosted professional reputation. The problems mentioned were related to detailed project documentation and paperwork and the awareness and uptake of the scheme was initially slow according to all contractors.

The main challenges and recommendations from contractors should be now to assess the project and identify particular elements that could be repeated without the same level of grant assistance. One other improvement could be reducing the time required for grant payment to householders who can afford only the difference between the grant and the overall cost of upgrades. The largest demographic to engage with the SERVE project has been older people whose houses are not mortgaged and were built between the 1960s and the 1980s so the challenge would be to encourage younger population to participate in SERVE project or similar grants.

/SERVE PROJECT/
MONITORING

www.servecommunity.ie

The last phase of the SERVE project is to install innovative energy monitoring systems in 100 homes. Using advanced technologies and wireless connections these monitoring systems are used to track energy consumption and usage patterns in the 100 homes participating. All of the houses where the systems are installed completed energy upgrades as part of the SERVE Project. The aim is to measure the energy consumption in these houses to confirm the energy, monetary and CO2 savings achieved by completing the upgrades. Limerick Institute will be providing the database systems where the information will be assessed and analysed. This project links to the Institutes new Bachelor of Sciences Programme in Computing - Smart Sustainable Energy which will produce graduates who can develop and implement management systems, mobile communication tools and interactive controls focused on the energy sector.

EpiSensor, a Limerick based company, is supplying and installing the monitoring systems which are designed and manufactured by themselves. The challenges were that they had to monitor significant numbers of variables, and also deal with the communications challenges presented by working in a rural environment where broadband connection is limited. The monitoring systems gather data on electricity consumption and main heating fuel use in all homes. In some houses particular focus are placed on either solar water heating systems, appliance electricity consumption or secondary heating systems. The installation of the equipment is also being funded by Sustainable Energy Authority of Ireland.

/SERVE PROJECT/**PARTNERS**
www.servecommunity.ie

Limerick Institute of Technology, IE: lead partner, overall scientific co-ordinator and involved with education and training, socio-economic research and project promotion and dissemination. http://www.lit.ie

LIMERICK INSTITUTE OF TECHNOLOGY
INSTITIÚID TEICNEOLAÍOCHTA LUIMNIGH

North Tipperary County Council, IE: leading the work packages on retrofitting and renewable in existing buildings, control the support of upgrades and renewable energy installations in existing buildings, key partner to disseminate the information at local level. http://www.tipperarynorth.ie/

Comhairle Contae Thiobraid Árann Thuaidh
North Tipperary County Council

Tipperary Energy Agency Ltd, IE: technical knowledge in terms of retrofitting and renewable including specific energy auditing of buildings and analysis of results from research programmes, quality inspection of the installations. http://tea.ie/

TIPPERARY energy AGENCY

Sustainable Projects Ireland Ltd, IE: overall responsibility for the development of the eco-village. http://www.thevillage.ie/

the village
building • sustainable • community

Renewable Energy Management Services Ltd, IE: design, install and commission the renewable energy solution for the heat requirements of the eco-village through a district heating network. http://www.rems.ie

REMS RENEWABLE ENERGY MANAGEMENT SERVICES LTD.

Energy Consulting Network, DK: in charge of the monitoring aspects. http://www.ecnetwork.dk/

ENERGY CONSULTING NETWORK

Senergy Econnect Ltd, UK: research into the electrical load characteristics of the Eco-village and evaluation of the technical, economic and regulatory aspects of installing polygeneration. http://www.senergyworld.com/

senergy

CIRCA Group Europe Ltd, IE: administrative and contractual management of the project. http://www.circa.ie/

THE CIRCA GROUP EUROPE

European Federation of Regions and Agencies for Energy & the Environment, BE: European dissemination. http://www.fedarene.org/

FEDARENE

Surface Power Technologies, IE: micro renewable electricity solutions. http://www.surfacepower.com/

SOLAR Surface Power
Solar Thermal Power Technology

Ayuntamiento de El Franco, ES: Observer community. http://www.elfranco.net/

Ayuntamiento de El Franco
la Mar de tierras

North West Croatia Energy Agency REGEA, HR: socio-economic research. http://www.regea.org

REGIONALNA ENERGETSKA AGENCIJA NORTH-WEST CROATIA
SJEVEROZAPADNE HRVATSKE
REGIONAL ENERGY AGENCY

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