SUSTAINABLE ENERGY FOR THE RURAL VILLAGE ENVIRONMENT

WWW.SERVECOMMUNITY.IE
“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 is supported by the CONCERTO programme. 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 for whole communities is more efficient and cheaper than optimisation of individual buildings. 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 energy 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.

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Councillor Casey outlines that the main benefit from the SERVE Project for the County and beyond has been the level of achievement with regard to energy conservation and the use of renewable energy sources. The SERVE Project and the Eco-Village overall had a positive impact on the economic prosperity of the area.

“In the current economic climate when people are making financial savings as a result of SERVE they have more disposable income……money circulates”. The development of the Eco-Village has resulted in a population increase, quite a lot of employment created for various local contractors involved in retrofitting and construction of the Eco-Village and many new services in the Cloughjordan area.

Councillor Casey has experienced an extremely high level of satisfaction with the SERVE project overall. The area had benefited enormously from its inclusion in the project. “I would have to say that it was a great project, it’s a pity that it cannot be continued and cannot be extended right now to other areas”. Councillor Casey notes that it was a great opportunity for new friendships and new working partnerships to be formed.

Knowledge gained by the executive and Councillors directly involved in SERVE has been fed back into the system. Councillors in the SERVE Region are very happy with the outcome of the project.

In the SERVE Region over 400 houses have already been upgraded so there has been a huge spin off in the area. It was predominantly local contractors which were employed. “If you have people making a living through the project they will spend that money in their local area…… the local economy thrives from it”. Councillor Lowery feels that the project was an important aspect in supporting local initiatives in the area.

Councillor Lowery notes that he has had many enquiries from Councillors outside of North Tipperary. He believes that other Councils look to North Tipperary and the overall success of the SERVE Project. “There is willingness and an eagerness going forward when they look at how well it operated in North Tipperary”.

Councillor Casey and Councillor Lowery both believe that the SERVE Project was beneficial to the economic prosperity of North Tipperary. They both feel that it was hugely beneficial to contractors employed as part of the project.

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Councillor Clancy believes that one of the main benefits of the project for the County and beyond is that it has helped to develop a template which can be used by other projects in the future. He believes that the SERVE Project was beneficial to the economic prosperity of North Tipperary. He also feels that it was hugely beneficial to contractors employed as part of the project.

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Councillor Clancy feels that overall the SERVE Project had a very positive influence on the operations of North Tipperary County Council. “It made the councillors and officials aware of sustainability and energy conservation issues”. 
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% were 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 existing residential 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 in 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 widely disseminate the results.

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 meant a lack of trained installers, approved products/ systems and a lack of knowledge by buildings owners,
- 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, for example the EPBD Implementation and the National Retrofitting Scheme, that had to be taken into account in order to ensure the SERVE grants and standards were coordinated with the National Retrofitting 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.

**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
FEDARENE, 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 m² with a reduction of energy consumption of 3.5 MWh/year and 11 non-residential buildings amounting to 10,000 m².

HOW THE GRANT WAS 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 cf. page 4) had to be completed to avail of the SERVE grant.

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 met 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:

Before SERVE (Orange) : average BER in existing buildings, National average BER in existing buildings (Blue), After SERVE : average BER in retrofitted houses (Green)

Before in the SERVE region, most houses had a building energy rating between C. (*) The Building Energy Rating (BER) is a certificate that indicates the energy performance of the house. The BER covers annual energy use for space heating, water heating, ventilation and lighting calculated on the basis of standard occupancy. The label has a scale of A-G. A-rated homes are the most energy efficient and G the least efficient.

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, equine 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 per annum. The wind turbine should produce electricity worth €20,000. Thanks to the grant from the Sustainable Energy Authority Ireland (national energy agency) and a donation, the payback period is expected to be 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 will in future be produced on site, as a total of 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 internally and experimentation with LED lights externally, which was not satisfactory (due to poor lighting levels and slow response times which didn’t meet safety standards).
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.

**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€
Payback 8.3 years/After grant the payback is only 3.38 years.

- 185 (C2) Before SERVE
- 166 (C1) Attic Insulation
- 152 (C1) Upgrade Cavity Wall
- 131 (B3) Heating Controls Upgrade
- 123 (B2) Boiler Upgrade
- 109 (B2) Stove Upgrade for Open Fire

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

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

- 278 (D2) Before SERVE
- 264 (D2) Upgrade Attic Insulation to 300mm
- 243 (D1) Upgrade Cavity Wall
- 205 (C3) Heating Controls Upgrade
- 163 (C1) Boiler Upgrade
- 142 (B3) Windows
- 136 (B3) Lighting
- 133 (B3) Stove Upgrade for Open Fire

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

Semi-detached house
From 559 kWh/m²/year to 195 kWh/m²/year
Investment of 18,383€
Payback 13.7 years/After grant the payback is 9.73 years.

- 559 (G) Before SERVE
- 503 (G) Windows
- 482 (G) Upgrade Attic Insulation to 300mm
- 351 (E2) Upgrade External Insulation
- 276 (D2) Heating Controls & Cylinder upgrade
- 195 (C2) Boiler Upgrade

**ENERGY SAVING AFTER SERVE**

- CASE N.1/ SEMI-DETACHED HOUSE: 41%
- CASE N.2/ SEMI-DETACHED BUNGALOW: 52%
- CASE N.3/ SEMI-DETACHED HOUSE: 65%
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 includes improved commodity and environment protection.

HOMEOWNER 1: SINGLE HOUSE

“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”

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”

HOMEOWNER 2: SINGLE HOUSE

“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 ”

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”

HOMEOWNER 3: BUNGALOW

“It’s absolutely brilliant … this is an old house … we didn’t realise what could be done to conserve the heat”.

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.
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 to the village’s eco-charter: the charter says that buildings should be highly insulated, make use of passive solar gain and renewable energy, minimize 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 two 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 plays 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.

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 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 has 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 park is anticipated to provide approximately 20% of the heat requirements but during the best months of the summer this is expected to be 100%.
PA lives in and operates the ‘Django’s eco hostel’ in ‘The Village’. His hostel is constructed to a very high standard and consists of 11 en-suite rooms which accommodates 36 beds in total. Django’s is a four storey building constructed to maximise solar gain through a southerly/westerly orientation and minimise heat loss through innovative insulation (external thermal insulation) of the building. His hostel is surrounded by a garden of native plants which were planted with the help of his eco village neighbours through a communal work session known as ‘meitheal’ (an Irish word describing the cooperation of neighbours in rural Ireland, to help each other in turn).

He is a 60+ hostel proprietor from Dublin who has a background in law and many years management experience in retail, pubs and hotels. Pa is very happy and content with his choice to join the Eco-Village and feels it can and does provide guidance and education to like-minded people who want to make a change to a more sustainable life style.

Pa also appreciates the energy savings that he has gained since moving to the Eco-Village. “…it’s cheaper to run this hostel than my house in Dublin so obviously it’s a great benefit…”

Pa feels that SERVE was not just beneficial to the eco village but that it also was great incentives for area of North Tipperary as a whole to reduce energy costs through retrofitting their houses.

“…we couldn’t have afforded to put up what we did without the core funding we got from SERVE…the money that went into the area was hugely beneficial to the area…there must be a huge saving in oil because of what the grants have encouraged people to do here.”

He feels there is a lot of talent with the Eco-Village that in future can and needs to be utilised and promoted. For instance, the self builders in the village will have specialised knowledge on their chosen sustainable design and building methods and Pa feels this knowledge and skill will be invaluable for future visitors and learners coming to the Eco-Village.
The following case studies were carried out to assess the reasons why Eco-Village members joined the project. These are extracts of what they say about the SERVE project in general and about the benefit of living in an energy efficient house.

**ANNEMARIE** is 40+ and is originally from Dublin. She teaches Irish to students from her home. Her husband is a writer and her father lives with them. They live in a two storey closed wall timber construction (kit house).

When Annemarie and her family moved originally to Cloughjordan they rented in the area and as they mainly rented older houses her experiences were bad. When they built their own house in the Eco-Village she was delighted to have a comfortable house. “A warm dry house...I had a reasonable house in Dublin...but since I came to Cloughjordan I spent four years living in damp, cold, draughty places... it is nice to be in a dry house...”

Annemarie and her family enjoy the supportive and resilient ethos of the Eco-Village, the support and neighbourliness of the village of Cloughjordan and feel greatly at home in the community as a whole.

**BRENDAN** lives in a two storey detached house (165m²) constructed of a timber frame with cast hemp and lime walls. The attic space is unoccupied and has cellulose insulation. He is a 40+ energy consultant, proprietor of ‘Acorn Energy’. His wife is a self-employed business administrator. They decided to move to the Eco-Village as they both wanted to develop a more self-sustainable lifestyle.

Brendan wanted to put his expertise into a new low energy design and build. It seemed to be the perfect solution to their needs with the added benefit of a supportive and like-minded community.

Brendan had experienced major problems with dampness in the house he had bought prior to moving to the Eco-Village. He had to invest a lot of time and money in rectifying poor building techniques. He really appreciates his house in the Eco-Village both for its structure and efficiency. “…the house we have now is very warm, it very easy to heat, our heating bill is about 75% less compared to that house...we don’t have any more problems with damp”.

The SERVE project has made a big difference to Brendan and his business. “…it is probably one of the reasons I went self employed...it focused people on getting a BER done...it kept people focused on energy efficiency.” He feels that the Eco-Village has brought a lot of outside interest to Cloughjordan and revitalised the village. Brendan feels the data that the Eco-Village houses can provide could prove influential for future building techniques.

**JOHN** lives in a detached two storey hemp-lime constructed house. He is a 77 year old retired barrister from London and is living a dynamic and productive retirement within the Eco-Village project. His social and environmental ideals are combined with his legal knowledge and expertise to assist the project’s development. He is surrounded by supportive neighbours, a flourishing garden and vibrant lifestyle. His house which is very energy efficient is an obvious benefit.

“...it’s a very well insulated house and it holds the heat very well...”

The only challenge for John is the time it is taking to complete the project, approximately only 1/3 of the site is developed and with the economic downturn further development has been limited. He feels that SERVE has been invaluable to the Eco-Village project both financially and in relation to the guidance they provided the project.

“...SERVE made it possible. I think both from a financial point of view and from a discipline point of view, it required us to be more disciplined to comply with the terms on which we were able to get the grant.”
SERVE project also includes activities aimed to assess the impact of the project from a socio-economic perspective. Several aspects were evaluated such as:

- impact on job creation and service supply,
- economic analysis of retrofitting with an analysis of the payback period for project measures in the building sector and the analysis of local funding and money flows,
- opportunities for development of ESCOs and the potential for replication,
- involvement, attitudes of building owners and consumers based on surveys and on case studies. (See page 6-9 for homeowners and Eco-Village response).

Six case studies were also conducted among contractors (companies performing the retrofitting work in households). 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. 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 the contractors was how 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 similar grants.

**SOCIO-ECONOMICS / CONTRACTORS SURVEY**

www.servecommunity.ie

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**CASE STUDIES / CONTRACTORS**

www.servecommunity.ie

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**MUNSTER INSULATION**

- Founded in 200, employs 10 people
- Services offered: Comprehensive retrofitting
- National market coverage
- Worked in an estimated 190 SERVE houses

The growth in the company that could be directly attributable to the SERVE project was between 5% and 8% over the 3 year period.

*“It was a big, big help to us...it will be responsible for us growing more.”*

*“It helped us emphasize to staff the importance of quality control.”*

What has transpired in Munster Insulation, and the owner attributes this directly to his involvement with SERVE, is an evolution from a company geared solely towards insulation, to a company that now offers a ‘one-stop-shop’ for energy retrofit needs. Through working with SERVE he was able to identify the ease for customers in dealing with a single contractor as opposed to a different contractor for each measure.

*“I’m sure I’m not the only company who’s expanded to provide the full package...that would have been a massive benefit for us at Munster Insulation and we’re extremely grateful for that.”*

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**RYAN STOVES**

- Founded in 2004, employs 5 people
- Type of services offered: Stove sales and fitting/installing
- Involvement with SERVE: Installed stoves in 330 households
- Mainly local market coverage

An added benefit of the SERVE project is the result of the comprehensive measures required. The owner of the company feels that because SERVE houses were insulated to a high specification the size (kW output) of stove required was smaller than might otherwise be the case.

*“It has introduced us more to the cleaner burning stoves, more efficient stoves and all the staff as well, like if anyone comes in now straight away they’re pushing the better product all the time.”*

This company employed extra staff over the course of the SERVE project and assumes that there has to have been a “knock-on effect” in terms of the local economy.
The last phase of the SERVE project was to install innovative energy monitoring systems in 100 homes. Using advanced technologies and wireless connections these monitoring systems were used to track energy consumption and usage patterns in the 100 participating homes. All of the houses where the systems were installed, completed energy upgrades as part of the SERVE Project. The aim was to measure the energy consumption in these houses to confirm the energy, monetary and CO2 savings achieved by completing the upgrades. Limerick Institute provided the database systems where the information was assessed and analysed. This project links to the Institute’s 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, designed, manufactured, supplied and installed the monitoring systems. The challenges for EpiSensor were that they had to monitor significant numbers of variables, and also deal with the communications obstacles presented by working in a rural environment where broadband connectivity was limited.

The monitoring systems gather data on electricity consumption and main heating fuel use in all homes. In some houses particular focus was placed on either solar water heating systems, appliance electricity consumption or secondary heating systems. The installation of the equipment was also being funded by Sustainable Energy Authority of Ireland.

**FIRST RESULTS OF THE MONITORING: COMPARING CALCULATED ENERGY PERFORMANCE TO ACTUAL ENERGY PERFORMANCE**

The first results of the monitoring gave valuable information both to homeowners and to energy experts, complimenting the theoretical measures of Dwelling Energy Assessment Procedure (DEAP). The monitoring combined ‘soft’ survey data (fuel diaries filled in by homeowners e.g.) and ‘hard’ measured data (energy monitoring systems which offer much more information.

The monitoring helped to obtained a quantified confirmation that the Dwelling Energy Assessment Procedure (calculated energy performance) differs to the actual energy performance of a house. This was predictable as even though the DEAP is comprehensive it makes a number of assumptions in conjunction with calculations, for example it takes standard occupancy hours, heating run hours and patterns, no allowance for variation in occupancy levels, standard climate data for the whole country, domestic hot water derived from floor area and so on.

Theoretical kWh/annum/m² | Measured kWh/annum/m² | Difference | Number of Houses
--- | --- | --- | ---
B2 | 118 | 116 | 1% | 8
B3 | 135 | 121 | 10% | 27
C1 | 158 | 140 | 11% | 30
C2 | 174 | 160 | 8% | 14
C3 | 232 | 178 | 23% | 4
D1 | 222 | 191 | 14% | 2

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One of the finding is that the DEAP assumes that the secondary heat source would normally account for 10% of the total heat used. The results from the monitoring show that actually in the houses monitored, the secondary heat source accounts on average for 25%. Some analysis remains to be finalised but the first conclusions drawn are that the DEAP over calculates energy consumption, the actual energy consumption is 13% lower on average (see graph). The assumptions have been proved inaccurate for the secondary fuel use for example or the internal temperature in the two main zones of the houses. Further analysis need to be done to drill further into each assumption from DEAP for example on renewable outputs for example or boiler seasonal efficiencies. The work done on analysing the data will help sharpening the DEAP to resemble actual consumption. This could also be of course used at national level.
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

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/

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/


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/

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


