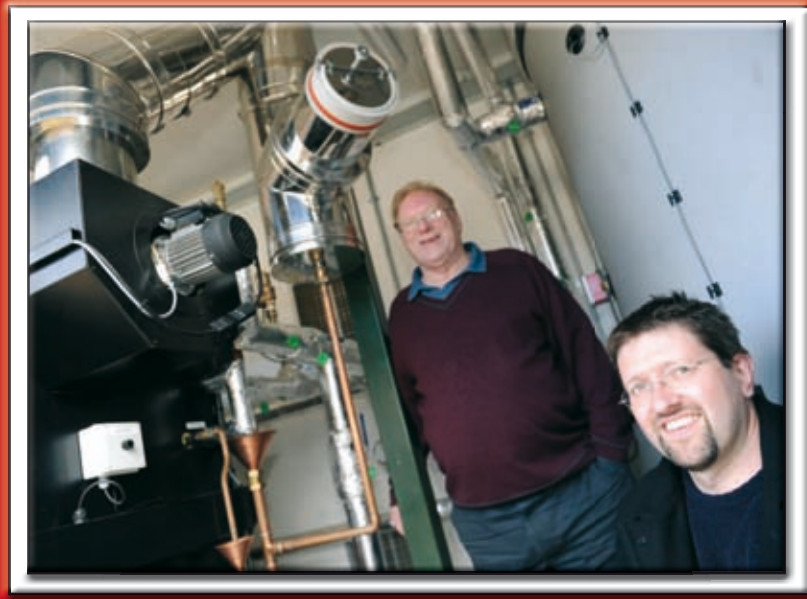


Energising Community Halls



REAP guide on how to save
energy and install renewable
technologies in your community building

Ann Davidson, **REAP** Community Energy Officer



Introduction

Would more groups in your area use your building if it was warm and welcoming?

Would your management committee welcome a source of income and cheaper energy into the future?

Then this guide is for you!

Based on research by REAP working with partners in Community Energy Scotland and the Moray Federation of Community Halls and Associations and funded by the Scottish Government's Climate Challenge Fund (CCF), this easy-to-use guide sets out how you can improve your local community building by:

- Insulating walls, ceilings and floors
- Improving draught-proofing & double glazing
- Using renewable technologies
- Obtaining funding for energy saving measures and renewables
- Generating energy and income
- Addressing planning issues

REAP worked with over 20 halls in the Moray Council area over the last 12 months to develop the information in this pack. REAP would like to thank all the hard-working volunteers running halls in Moray who have shared their time and hall stories with us. We hope it can help communities in Moray and beyond with their innovative projects and to secure future viability through better energy use.



Sandy Henderson and Hugh Fraser from the Fleming Hall, Aberlour look over their energy bills

Why bother?!

As you'll already know if you help out with your local community building, making changes takes a lot of hard work. Do you have the time and energy on your committee to take new measures? One committee we worked with had a big anniversary coming up in their village – and it was the same people helping out at the hall who were organising the celebrations. Another group were struggling to sort out finances for a recent refurbishment – they had to postpone their energy actions too.

However, it is worth considering:

- Energy costs are rising year on year – oil and gas prices have risen by over 120% since 2003 while Scottish wages have risen just 15% in that period. The Energy Savings Trust and others believe these rises will continue
- Energy saving measures also save you money – you could save the costs for insulation of your roof in 3-4 years for example
- If you access non-government sources of funding (see page 16) you can gain income for your building by producing renewable electricity or heat
- Your lets and bookings could increase by up to 50% if your hall is warm and welcoming. That's what happened at Lossiemouth Town Hall after installing a wood pellet boiler

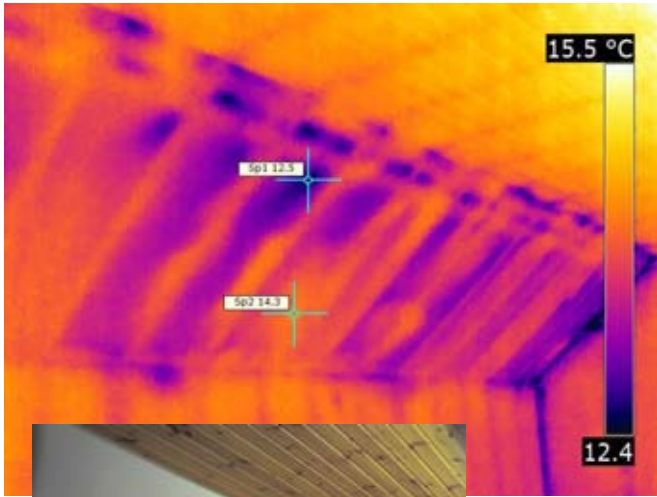
There is hard work involved in determining what you should do, where to source the correct advice, selecting the right supplier, sourcing the finance and gaining the vital local support to avoid unnecessary resistance to the change, but all of those who have taken the time to get the right advice and as a result taken the right steps testify to the enormous benefits of :

- Reducing bills and making buildings cosy
- Obtaining free or cheaper energy from the natural resources in your community
- Increasing income generated by community buildings
- Providing a legacy to the community, sometimes by supplying others with energy
- Increasing the value, attractiveness and use of community buildings

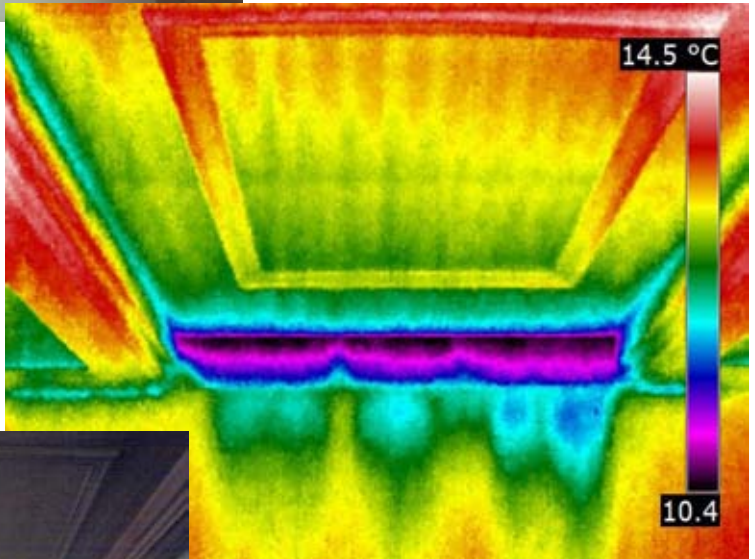
Building basics, Committee structures and procedures

- You may have other pressing matters for your hall. Your electrical wiring will need to be up to scratch for installing any renewable technologies that produce electricity. You can't install solar panels of either type if your roof is structurally unsound.
- You also need to be clear about who owns your building – for example if you rent it from the local Council on a long term lease, any funders you apply to will need to see the lease
- Are you a charity, a SCIO (Scottish Community Interest Organisation) a CIC (Community Interest Company) or a limited company? Different funders will have different criteria for who can apply.
- Do you have good public liability insurance and health and safety procedures to cover work while installations or insulation work is going on? If not, get some help with your policies and procedures to protect your hard working volunteers.

The Moray Council Community Support Team can help, as can Voluntary Action Moray, the Moray Volunteer Centre and other groups specialising in community advice



The thermal image of the combed ceiling above shows the gaps in insulation (in purple) where heat is escaping



This bird's eye view of a door clearly shows cold air seeping in through gaps in draught proofing at the bottom



NB Modern thermal imaging technology photographs of your building can reveal exactly where heat is escaping and which areas you need to prioritise. Thermal imaging surveys are widely available. REAP can support you in this. EPC's (Energy Performance Certificates) are also a useful means of obtaining a certified energy audit of your building identifying areas where efficiency can be improved.

Energy Saving Measures

REAP visited over 20 halls in Moray and carried out an energy survey and renewable checklist with the hall committee. This page will help you with energy saving measures. For renewables information (see page 9)

Think Insulation, insulation, insulation! Why?

- There's no point in installing renewable energy if heat is escaping out the roof and walls.
- Roof installation is cheap and often easy to install – it will payback (save you the money you laid out to pay for it being installed) in 3-4 years.
- If your building is less draughty and warmer you will attract more groups to use it.



You can get a survey for cavity wall insulation and get it installed if your building is suitable

| | |
|---|---|
| <p>Insulation Facts: An uninsulated building loses heat: 33% walls 26% loft 8% floor 3% doors 18% windows - (single glazed) 12% draughts</p> | <p>Loft should contain 27-30cms of roll-out insulation. You can get a free survey from an insulation company. Get three quotes and make sure the companies are certified</p> <p>Walls If you've got cavity walls (brick or block built post 1920) you can install cavity wall insulation. Get a free survey from a certified insulation company. Other external walls can be insulated internally during redecoration or by applying insulated plaster board on top of the existing surface.</p> <p>Floors Existing floors can be insulated by draped sheet insulation if a crawl space is available. If installing underfloor heating, insulate the floor then.</p> <p>Water heaters and water pipes Check you aren't heating a whole tank of water if you only need a small amount. Check pipes are insulated and protected by frost setting heating and not positioned in a draught.</p> |
| <p>Draught proofing: Check your windows and (especially external) doors. Draughty ones let in cold air and lose heat</p> | <p>Outside doors often need to be sill-less for disabled access. They lose a lot of heat if not draught proofed and if door glazing is not toughened double glazed. Check with a local craftsman about repair and draught-proofing and compare with the price of replacement.</p> <p>Fit automatic closers and check the code of conduct for user groups – don't prop an outside door open, but make it easy for users to open and close for pushchairs, wheelchairs etc</p> |
| <p>Double/triple glazing</p> | <p>Double glazed windows save energy and increase comfort by eliminating draughts. If your windows are special (stained glass etc) consider speciality secondary glazing. And don't forget easy, cheap measures like thick curtains. Open up and let in the light, especially on south facing windows to maximise solar gain. Make double glazing a priority for North facing shaded windows. Don't forget about skylights – single glazed ones in the roof lose a lot of rising heat. Check with council planning before installation.</p> |

| | |
|------------------------------|---|
| Lighting | Replace old fittings with energy saving fluorescents or bulbs. Replace any halogen lights with energy saving LED versions. Introduce timer switches and/or a code of conduct for user groups to make sure lights are switched off – perhaps introduce charges if they are left on? |
| Cookers/fridges/ kettles etc | Make sure electrical appliances are 'A' rated. A donated old fridge is not necessarily a good gift... Make sure your fridges are sited in colder areas away from your cookers or dishwashers |



A loft like this one at Spey Bay Hall can top up the roll-out insulation to make it up to 275-300mm

Take control of your heating system

How much is it costing you?

A lot of halls are not aware of how much they are paying for electricity and gas. It's worth checking what the KWh and Btu usage is (see page 21) and how much you are paying per unit for your fuel tariff. Public halls count as business users so have different tariffs from domestic customers. Ring round and see who can give you a good deal – but don't forget to check a company's customer service record as well as price, and how long they want you to sign any contract for.

NB We found a hall that was paying 23p per KWh to British Gas. This is nearly twice what many other halls were paying. The hall changed its supplier and is now saving £500 per year. They've used this to pay for their insulation.....

Are the Boilers and Heaters Working Well?

Check your heaters and boilers are working and regularly maintained and check their efficiency rating. If your hall has an older oil boiler for example you could be sending 30% of your heat up the flue. Older boilers are often only 70% efficient, while modern boilers are over 90% efficient. Elgin Youth Café changed their boiler for a new, efficient one and will save 30% on their gas bills.

Check the output of your boiler

This may take a bit of work if you have an LPG (liquid petroleum gas) or fuel oil system. If you need to charge groups for the fuel they use you can use a fuel meter if you have one on your system, or work out the cost of a year's usage from the amount of litres of oil used per year. Edinville Hall weren't sure how much to charge their user groups so REAP found out the efficiency of their boiler and how much it would use over a 4-hour period (the average time for a user group). The hall has now dropped its price to user groups – by a little – to reflect the true cost.

Make your heating system work for you

- Try to get separate heating circuits for different areas of your building so you only have to heat the area in use.
- Install thermostats in rooms and on radiators to regulate heat.
- Replace older electric heaters with newer ones designed to focus heat where you want it and to accommodate sports activities if required.

Renewable Technologies that suit your building

Confused by FIT's RHI COP MCS and KWh? (see page 21). You may still be at the end of this guide (though hopefully not!) but you will know more about which renewable technologies could suit your site. Read the first section, use the renewables checklist, then follow the flow chart and see where you end up - hopefully with a great project to bring renewable energy and an income into your community.

General points

All public buildings installing renewable technologies will require planning permission from the local council. Time needs to be allowed for this in any project planning. If you are using mains gas in your building, some renewable technologies may find it difficult to compete on running costs at present – for example to run a ground source heat pump (which needs fairly constant electrical power) mains gas may be a similar cost or cheaper to run. Insulate and refurbish first, or at the same time as you install renewables. Most funders will want to see that you've done this anyway, and new criteria for Feed In Tariffs (FITs) and other incentives also require this. Renewable installations and equipment need to be MCS accredited to access FITs and RHI (Renewable Heat Incentive). MCS (Microgeneration Certification Scheme) is an internationally recognised quality assurance scheme which trains installers and rigorously tests renewable equipment. Installers and renewable equipment can also have the REA trade mark. The Renewable Energy Association is a not-for-profit, independent trade association, representing British renewable energy producers and promoting the use of renewable energy in the UK.

Renewables Checklist – producing electricity

General Points

Wind, solar PV and hydro- electric installations use naturally available sources of renewable energy to produce electricity, either by turning a turbine (hydro, wind) or via a photovoltaic panel. Producing electricity via steam produced from biomass etc is outside the scope of this guide. To encourage the establishment of these technologies, the government offers Feed In Tariffs (FITs) per Kilowatt hour (KWh) of all electricity produced as long as the equipment and installation are MCS accredited. FITs can be (and are) changed by the government – check the current deal for your project. See our terms of Reference (page 20) and find out more about the details of how these clever technologies work and are being developed from the sources of more information (Page 20)

NB For communities accessing funding, however if you get any government-based funding (see page 16) then you won't get FITs. The European Union has ruled that this is 'double funding' and is not allowed. If you are able to access money from an energy supplier, private business or community shares for example, you will get FITs, which will form an important income for your business plan. If you can't get FITs, your project can still make an income if it can sell the electricity to local customers, energy companies etc.

Of course whether you get FITs or not, your building can still use the energy it produces free – a good saving if it's from wind and hydro. With solar PV you'd be able to save on electricity usage from any daylight lets (playgroups, schools etc) or for example to help run a heat pump. Output from both solar technologies is much higher during summer months, though modern solar panels work off ambient light as well as direct sunlight and give you significant energy from them during Spring, autumn and winter. Check with your proposed supplier.

| Renewable | Property issues | Usage issues |
|-------------------------|--|---|
| Solar Photovoltaic (PV) | <p>One of the most accessible forms of renewable energy.</p> <p>Need to have a South-, South-East- or South West-facing roof or piece of land, with no shading from other roofs or buildings, trees etc. Shading for any length of time makes PV panels much less efficient. Solar panels work best at 30° of elevation. It's ideal if your roof is at that angle, but frames can support panels, though this adds to the cost.</p> <p>Your roof must be in a sound condition Existing wiring must be sound Check how many panels you have space for. If you install over 4KWh of panels this will affect your feed-in tariffs. All of this information will be provided from a survey by an MCS solar installer</p> | <p>Solar PV panels produce electricity only during daylight hours (it doesn't have to be in bright sunlight) and especially from March to October. When are most of your lets or proposed lets?</p> <p>Easy to install and marry into existing building systems</p> |
| Micro-Hydro | <p>Need to have an accessible resource and a lot of time and patience to go through all the steps and permissions needed. If you have a local burn that already has or had a weir on it for industry and you have buy-in from the landowner and local community, it may be worth accessing funding for a feasibility study. Experts will</p> | <p>See if there are any community buildings or organisations near to your installation to buy the electricity directly from you. You'll get a better price than from electricity companies</p> |

| Renewable | Property issues | Usage issues |
|-----------------------|---|--|
| Micro-Hydro (cont) | investigate for you the head and flow of the water and so how much electricity can be produced, what would be the issues for SEPA (Scottish Environmental Protection Agency), SNH (Scottish Natural Heritage), planning permission, the Local Fisheries Board and best route, type of turbine and any access and grid connection issues | High start up effort/cost |
| Wind | Need a site (or access to one) away from obstacles and, like hydro, a lot of time and patience and often expert advice to bring your project to completion. You will need buy-in from the local community. If these are available, you will need to fund a feasibility study to investigate wind speed data (to assess how much power you could generate) suitable grid connection, access roads, commissioning, legal issues and types and models of turbines | High start up effort/cost Your community needs to look at which ownership model would suit their plans best |



Solar panels -Your Community can invest in electricity-producing renewables like these panels at Dufftown Memorial Hall.

John Fleming (left) and Peter Duncan(right) of the hall committee with AES solar installers Graham Meacher and Son



Do you have a suitable roof for solar panels? The roof on the left at the Findhorn Village Centre would be ideal, but the one below at Garmouth Hall may have shading issues with the trees



Renewables that produce heat

General points

Solar Thermal Panels, Ground Source Heat Pumps (GSHP), Air Source Heat Pumps (ASHP) Air to Air Pumps and Biomass use naturally available sources of renewable energy to produce heat, either by heating water (Solar Thermal, GSHP, ASHP & Biomass) or by heating air (Air to Air heat pump). See our terms of Reference (page 20) and find out more about the details of how these clever technologies work and are being developed from the sources of more information (page 20)

NB Like FITs, some of these technologies attract a government payment to stimulate the industry and to encourage further development. Renewable Heat Incentive Payment (RHIs) are paid per therm of hot water produced as long as the equipment and installation are MCS Accredited (see page 21) and also properly monitored via a meter, which can add to installation costs. Air to Air pumps don't attract RHI because there is no way of measuring the amount of air heated at present. As with FITs, RHI payments are not paid if you have accessed government funding (see above) and you must have carried out energy saving measures, too (loft insulation etc)



The 'boiler in a box' at Newmill Hall heats the nearby school as well as the hall and generates an income for the Hall from selling the heat and from the Renewables Heat Incentive payments

Whether or not you get RHI payments, your hall can make a good income from Biomass in particular by buying a larger system and supplying another nearby property with heat. In Moray there are 2 great examples at Newmill near Keith and Lossiemouth Town Hall.

NB You can use electricity generating technologies to help power heat pump systems

There are also specific requirements for these renewables as follows:

| Renewable | Property issues | Usage issues |
|--------------------------------|---|--|
| Solar thermal hot water panels | <p>Need a roof in good repair, correct orientation, no shading and tilt as for Solar PV panels (see page 10)</p> <p>Need space to install new hot water tank (which tend to be larger than normal domestic tanks)</p> <p>If you have a combi boiler already, this may be incompatible with solar thermal system and it will be more costly to install.</p> | <p>Solar thermal panels produce hot water best in summer.</p> <p>They are cheap to install, but payback times will be long if you have low hot water needs and currently use either combi boiler (modern efficient model) or point of use electric heaters</p> |
| Ground Source Heat Pump (GSHP) | <p>These work best in new buildings designed specifically to accommodate them or with extensive rebuilds/refurbishments with GSHP in mind. They deliver best value and COP* via underfloor heating or high flow/low temperature heating systems (ie not normal radiators which are low flow, high temperature). Need space outside for a horizontal collector, or extra finance to dig a borehole</p> <p>Existing wiring needs to be robust</p> | <p>High start up costs</p> <p>Fair amount of building disruption to install, upgrade/change heating system etc. Use electricity fairly constantly to run compressors. Not usually cheaper than mains gas to run</p> |
| Air source heat pump (ASHP) | <p>Work with best COP (see page 14) on an unshaded South facing wall</p> <p>Need a compatible heating system as for GSHP (see above)</p> <p>Existing wiring needs to be robust</p> | <p>Cheaper than GSHP</p> <p>No need for outside ground</p> <p>Uses electricity as for GSHP (above)</p> |
| Air to Air Heat Pumps | <p>Look similar to an air conditioning unit – minimal disruption to building</p> <p>Run on electricity but only as and when heat is needed</p> <p>Useful for heating large halls</p> | <p>Cheap to install</p> <p>Some models not MCS accredited</p> <p>No RHI available</p> |

| Renewable | Property issues | Usage issues |
|-----------|--|---|
| Biomass | <p>Check your hall is not in a Smoke Control Zone (there are none in Moray or Banffshire) and check emissions regulations with the Environmental Health department of your local council</p> <p>Uses either wood pellets or wood chip available locally in Scotland – good resource. Very efficient modern boilers</p> <p>Need space for fuel storage/ ‘boiler in a box’ and for lorries to deliver pellets or chip</p> <p>Flexible delivery – can use conventional wet radiator heating system, underfloor or blown air systems</p> <p>Needs properly sited flue of correct height for the installation</p> | <p>Need some input from personnel to feed boiler/empty ash etc but this can be once or twice a week at most</p> <p>High start up cost</p> <p>Opportunities to sell heat to neighbouring buildings</p> |

Co-efficient of Production

The Coefficient of Performance (COP) is a measure of the effectiveness of a heating system in converting the fuel it uses into heat. It is a simple ratio of energy in, to energy out. GSHPs and ASHPs can produce a COP of around 3 or 300%: that is around 3kWh of heat can be produced from 1 kWh of electricity. High performance, renewable micro generation is achieved when conditions are good – well-insulated buildings, unshaded south-facing walls for ASHP, properly scaled projects matched to the building and appropriate heating systems – low temperature, high flow - such as under-floor heating.



Finding the money

Feed-in Tariffs

As explained above, the government has set up schemes to encourage the renewables industry through Feed In Tariffs and the Renewable Heat Incentive Payments. Different technologies attract different rates of payments depending on the size of the installation. These change regularly so check the Department of Energy and Climate Change's website to find out the latest information: www.decc.gov.uk and click on the 'funding & support' tab.

Note: New rules may also require that your building is well insulated and draught-proofed to access these payments.

NB: Guaranteed income: whatever tariff is in place when your system is commissioned this is the tariff that you will get for the lifetime of the technology, even if the tariff subsequently changes.

Funders

FITs and RHI are not payable if government funding has been used for the renewable installation as explained above. However, this should not apply to feasibility studies, new heating systems and legal fees for example incurred as part of the whole project. Check this with your funders and Community Energy Scotland: www.communityenergyscotland.org.uk

Funders can be classified as follows (not an exhaustive list)

| Government Funding making your project ineligible for FITs and RHI | Funders that do not affect FITs or RHI |
|---|---|
| Big Lottery and all its funding streams (Awards for All etc) | Any independent Trust (Tudor Trust, Robertson Trust, Esmee Fairburn etc) |
| Heritage Lottery Fund | Energy Company funding (British Gas, Scottish Power, EON etc) |
| Sports Lottery Fund LEADER | Banks and Business funding (RBS community fund, Co-op Community Fund etc) |
| Community Energy Scotland (but if CARES is accessed for feasibility studies and planning permission this is ok) | Wind Farm Community Funds |
| Any Local Authority Funding | Postcode Lottery Scottish Community Foundation |

Increasing the income from lets for your hall

REAP spoke to halls committees in Moray who have worked hard to insulate, upgrade and install renewable heating systems in their community buildings. With a warm, welcoming hall to promote in their communities, some reported an increase in lets (for example 50% increase at Lossiemouth Hall). This extra income can be included in your business plan.

Gaining Income from selling your renewable heat or power

Think as big as you can when installing renewable systems. Look at the opportunities provided by your neighbours. If you can sell the electricity from your micro-hydro or wind turbine to a local customer directly instead of through the grid to energy suppliers, you will get a better income and help a local community project or public building. Knockando community are hoping to sell electricity to the Knockando Woolen Mill.

With renewable heat, you can install a biomass boiler larger than is needed for your building alone and sell excess heat to a nearby school, library or community facility. Good examples are Newmill Hall near Keith and Lossiemouth.

Other Finance

Instead of a grant, your community can go for other ways of raising finance, especially for larger projects with a good income potential like micro-hydro and wind turbines. A large biomass boiler will cost £100K, a small wind turbine between £18K - £1million+ and a hydro scheme £300K at least. These sums of money are difficult to raise via grants without losing lucrative FITs and RHI, and some groups have chosen other ways to raise money:

- Loans
- Community Shares
- Energy Co-ops
- Limited Liability Partnerships
- Joint Ventures
- The Green Deal

All these ways of raising money require a lot of time and effort and can involve partners who have different priorities to your community group. You need expertise in legal advice, technology, financial advice, project planning and management. A good place to start for advice is the Community Energy Scotland website and the DEC website (see Page 20)

Loans

You will need an extremely robust business plan to access bank loans even from 'green' banks like the Co-op and Triodos. Some projects may well require the bank to conduct 'due diligence' procedures (checking over by its financial experts) that can be a very costly process. Private equity investors may lend money either directly or through a co-operative (see below). Any loan plan will require good legal and fiscal management which you might need to buy in – ask a trusted local accountant.

Community Shares and Energy Co-operatives

Your community can form an energy co-op and give energy users, members of the community and others the chance to invest in your venture. Equity investors may also wish to invest if you decide to open the co-op up to this type of investment. An example is the Boyndie Wind Farm. More information can be found at the co-operative website www.co-operative.coop

NB In today's economic climate investing in an energy project is much more attractive than investing in a bank, pension or insurance scheme. Energy schemes can offer up to a 12% return on investment.

Making it happen

Planning

- Most renewable installations in public buildings need planning permission. There may be exceptions but check with your local council planning officer right from the start. Moray Council run a planning helpline:
- Issues for planning may include any listed building status, conservation area status, access and noise (eg from air source heat pumps) and whether other renewables are present, in your building or in the area
- Some works may also require a building warrant, even if they don't require planning permission. Ask your planning officer
- If your building is owned by the council but you have a lease, you will need to work with your council estates officer. Check the conditions of your lease, too.

Feasibility studies

These will be needed for hydro, wind and perhaps other projects. Get three quotes for the work, make sure you know what it should include and check it over before payment. Find out from other groups who they would recommend. More advice can be found at www.communityenergyscotland.org.uk

Architects

Work with a trusted architect or one recommended, preferably with experience in renewable schemes

Installers

Must be MCS accredited (see page 9) if you want to gain FITs and RHI. For insulation, heating systems and other works check with your local trusted craftsperson first as well. Ask other groups who they would recommend.

Conclusions

People all over Moray and Scotland are getting involved in their local community buildings and trying to make them more suitable to serve their community into the future. All hall committees are worried about the price of heating their buildings and are concerned to make them warm, welcoming and cheaper to heat and run - and earn extra income where possible. There is an opportunity for communities to take advantage of the various government incentive schemes for renewables and energy saving to generate income for community buildings and possibly the wider community. REAP hope that this guide will help them in their aims - and in the aims of our funders the Scottish Government - through saving energy, installing renewable technologies and reducing carbon emissions.

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Sources of more information:

Department of Energy and Climate Change:

www.decc.gov.uk. For funding advice click on the 'funding & support' tab, energy news, figures and information

Renewable Energy Association:

www.r-e-a.net/renewable-technologies: information about different renewables

Community Energy Scotland website:

www.communityenergyscotland.org.uk: lots of case studies, renewables info and funding sources

Energy Savings Trust website:

www.energysavingtrust.org.uk: renewables, tariffs, saving energy, installers and more

The Centre for Alternative Energy:

www.cat.org.uk: wealth of information about renewables - and a good solar calculator

The Moray Council:

www.moray.gov.uk: planning and the Community Support Unit (Chief Executive's Department)

Supporting the Third Sector in Moray

VAM: www.voluntaryactionmoray.org.uk

Moray Volunteer Centre: www.volunteermoray.org.uk

Moray Social Enterprise Network: moraysen.org.uk

The Moray Federation of Community Halls and Associations (MFCHA):

www.morayvillagehalls.org.uk: membership organisation for village halls in Moray with lots of useful information and sources of help

Terms of Reference

Solar PV: Electricity-producing solar panels developed originally from the needs of the space programme. Light is absorbed from solar radiation into silicon-based layered panels which use the photovoltaic (PV) effect to create electricity. Different types are monocrystalline (more efficient) and polychrySTALLINE (cheaper)

Solar thermal panels: Panels providing hot water heated by the sun. Different types are flat plate collectors and evacuated tube collectors. Most systems in the UK use pumps to deliver the hot water to an indirect coil in an insulated hot water storage tank. Some systems require new hot water tank installation

Heat Pumps: circulate fluid through collector pipes immersed in a heat source – the ground, the air etc, collect the heat and transfer it to a heat exchanger containing a refrigerant which is then compressed, increasing its temperature. A second heat exchanger (the condenser) extracts the heat for use and the refrigerant then passes through an expansion valve where it cools further and the cycle begins again – like a ‘reverse fridge’. Ground Source Heat Pumps (GSHP) take heat from a long pipe laid either horizontally in trenches (a ‘slinky’) or vertically in a borehole. Air Source Heat pumps take heat from the air; they resemble air conditioning units

Biomass is biologically based fuel such as animal waste, straw etc, but in this guide we concentrate on wood pellets or woodchips used to fuel a boiler. Biofuels are ‘carbon neutral’, that is they only release the same amount of carbon that they took up from the CO₂ in the air as they grew. Biofuels should be sourced as locally as possible to avoid transport costs and carbon emissions.

Micro-Hydro Power refers to turbines of under 500kW capacity making use of a ‘flow’ of water moving downstream under gravity from a height (the ‘head’). Water is extracted at an intake point and delivered via a pipe (the penstock) or lade system to a turbine. There are a few different types of turbine including Tubular, Siphon, Propeller and – waterwheels! A powerhouse contains the turbine, gearbox, controls and generator and electricity is delivered to the end user or the grid via an electrical connection. The water returns to the source via the outflow

Wind turbines produce electricity when wind turns blades connected to a rotor shaft. This conveys energy to the electricity generator via a gearbox to raise the revs to 1,500 revs per minute. Turbines also have brakes to manage wind speed surges. Power is supplied to the grid, or off-grid user via a transformer. Britain has a world leading amount of available wind resource. We know that in Keith – the name means ‘wind’ in gaelic.

Abbreviations

KWh = Kilowatt per hour – the same as a ‘unit’ of electricity.

Btu/h = British thermal unit per hour

MCS = Microgeneration Certification Scheme (see page 9)

REA = Renewable Energy Association (see page 9)

FIT = Feed-In Tariff (see page 9-10)

RHI = Renewable Heat Incentive (see page 12)

COP = Co-efficient of Production (see page 14)

Local examples of renewable installations and good practice
(see more at the **REAP** website www.reapscotland.org.uk)

Biomass boilers with underfloor heating and blown air system, refurbishment of grade I listed buildings: *Knockando Woolen Mill*

Biomass Boiler with district heating scheme to supply next door school, solar thermal panels and improved insulation: *Newmill Hall, near Keith*

Biomass Boiler with district heating scheme to supply Council library:
Lossiemoth Town Hall

Solar PV panels, solar thermal panels, improved insulation:
Mortlach Memorial Hall, Dufftown

Ground Source Heat Pump with underfloor heating, complete strip out of building and insulation, double glazing and new doors throughout, solar PV panels also fitted: *Drummuir Hall*

Air to Air heat pumps in large hall; electric heating in smaller rooms and specialist secondary glazing to stained glass windows: *Cornhill Hall (Aberdeenshire)*

Roof insulation, new, efficient gas boiler fitted, secondary glazing to skylights:

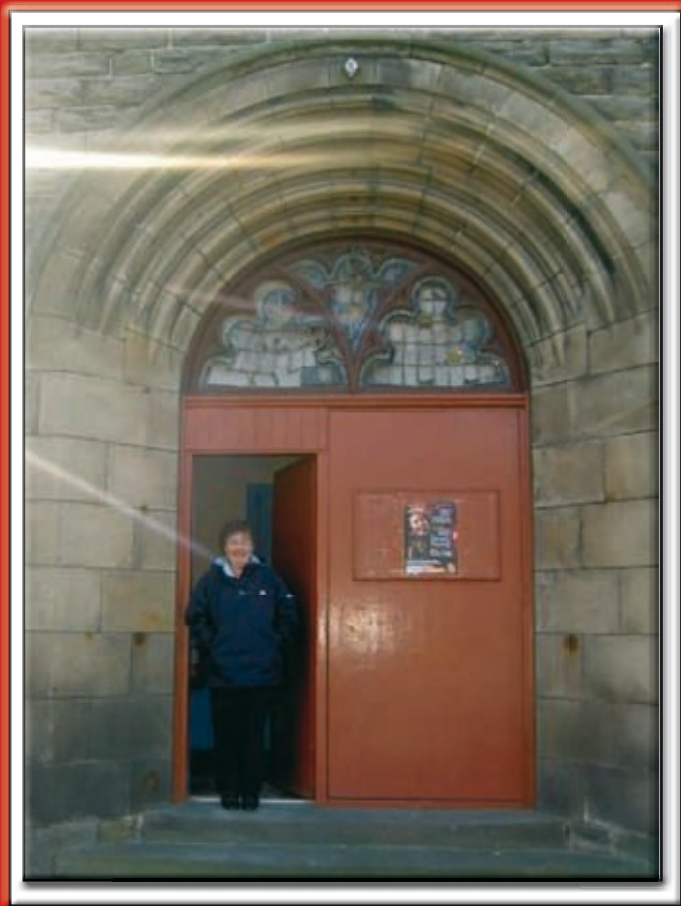
As well as the halls mentioned above **REAP** would also like to thank:

Boharm Hall, Mulben
Margach Hall Committee, Knockando
James Milne Institute, Findhorn
Findhorn Village Centre
The Loft Youth Project, Keith
Garmouth Hall
Rothes Grant Centre
Rothes Cottage Centre
Edinville Hall
Fleming Hall, Aberlour
Craigellachie Hall
Lhanbryde Community Centre
Soillse, Findhorn
Hopeman Church Hall
Hopeman Memorial Hall
Burghead Community Hall
Roseisle Hall
Clochan Hall, near Buckie
Spey Bay Hall
Birnie Hall, near Elgin
King's Memorial Hall, Grange

NOTES



Front Cover: Members of the James Milne Institute Management committee in front of their hall at Findhorn, Moray



Jennifer Christison outside the ornate door of Burghead Community Hall