
Report to Clackmannanshire Council

Date of Meeting: 22/10/15

Subject: Installation of Photovoltaic Panels

Report by: Head of Housing and Community Safety

1.0 Purpose

1.1 This report recommends the installation of Photo Voltaic (PV) arrays to up to 500 suitably orientated Council owned houses and informs of a contract with Edison Energy to install up to another 500 PV systems on residential homes (owner-occupied and Council) throughout the county.

2.0 Recommendations

2.1 It is recommended that Council

2.1.1. approves borrowing on the Housing Revenue Account (HRA) of up to £1,710,000 from the Government's SPRUCE Fund¹ to install photo voltaic (PV) panels on up to a maximum of 500 Council owned homes.

2.1.2. agree during the annual rent consultation to seek views on increasing the rental charge for the properties that will benefit from the PV panels

2.1.3. note that an existing contract with Edison Energy to install between 350 and 500 PV systems is about to commence.

3.0 Background

3.1 Over a number of months officers have been investigating the case for significant investment in PV panels positioned on Council-owned domestic properties.

3.2 On the basis of local success in the use of P.V. (domestic and on public buildings) a comprehensive desktop analysis of the potential for P.V. on Council owned domestic properties was carried out by Edison Energy. This identified that potentially 3000 Council owned homes could benefit from the installation of this technology.

3.3 An investment in panels on 3000 properties had the potential to generate £7m over the 20 year lifespan of the systems. The UK Government's announcement in mid-September that the Feed In Tariff (F.I.T.) will be

¹ SPRUCE FUND - a source of funding for regeneration and energy efficiency projects within targeted areas, of which Clackmannan is included. <http://www.ambergreenspruce.co.uk/>

withdrawn in January 2016 has required this proposal to be restricted to the numbers that can be commissioned by the proposed cut off date.

- 3.4 Whilst 1500 installations could be completed within 3 months the procurement journey will reduce the time available for installation, and so between 350 and 500 installs is a more likely figure.
- 3.5 The properties must have a south facing aspect with a pitch angle between 10 and 35 degrees to maximise generation potential.
- 3.6 Whilst none of the roofs have been tested for structural loading this will be assessed prior to commissioning and any unsuitable will be excluded.
- 3.7 These installs will generate income from the F.I.T. This is a set financial rate paid by the energy supplier for each unit of electricity that is generated from the Solar P.V. system, and is made of up two payments.
 - 3.7.1. Generation tariff:- a set rate paid per kWh (presently £0.1163) of electricity generated to the installer/owner of the equipment eligible for F.I.T. The rate is dependent on the capacity of apparatus installed and date of installation.
 - 3.7.2. Export tariff: - the energy supplier will also pay the owner of the FIT equipment a rate (currently £0.485) per kWh of electricity which is exported to the electricity grid (i.e. not used onsite).
- 3.8 The tariffs are index-linked for inflation and following registration of a system, the tariff levels are currently guaranteed for a 20 year period.

4.0 Financial Situation

- 4.1 A loan of up to £1.71M to the HRA is required to fund the panels. It is recommended that this is borrowed from the Scottish Partnership for Regeneration in Urban Centres (SPRUCE) Fund.
- 4.2 The SPRUCE fund has been established with funding from the Scottish Government and the European Regional Development Fund. The fund provides affordable, and flexible loans to project sponsors. Eligible projects must be within one of the 13 local authority areas as determined by the Scottish Index of Multiple Deprivation.
- 4.3 SPRUCE will lend the Council the full project amount, at an indicative rate of 2% interest, for 8 years (the current limit on the funding period). The rate is fixed for the period. There are no particularly onerous fees or conditions and no breakage costs should the Council wish to pay off the loan earlier than planned.
- 4.4 A loan of 2% is favourable to a Public Works Loan Board (PWLB) loan which at today's rates would be 3.53%. After the initial 8 year period, whilst refinancing with SPRUCE may be an option, it isn't guaranteed. Therefore a loan from PWLB to cover the remaining 5 years could be required. Whilst the PWLB forecasts are not known that far in advance the rate at 2018 is forecast to be 4.1%. This rate, plus 1%, was included in the funding model for the period beyond the SPRUCE loan.
- 4.5 Based on the funding model the project will generate a profit in the region of between £724,800 and £884,964 for 350 installs and between £1,035,429 and £1,264,235 for 500 installations over 20 years. The loan will be repaid in 13 years.

5.0 Resident Benefits and Impact.

- 5.1 The project will potentially save each tenant included in the scheme up to £200 per year in energy costs. This is based on the actual figures obtained from the installations carried out in Clackmannanshire Council homes to date.
- 5.2 Given solar panels will not be available to all tenants, it is recommended that during the annual rent consultation, tenants are also asked for their views on amending the current rent structure to add up to £1 per week to the rents of those properties that are to benefit from solar panels. The figure would be based on house size, (as larger properties using the most electricity will save more with the panels) with, for example, 1 beds paying 25p extra; 2 beds 50p extra and 3 or more bedrooms paying 75p. Income generated in this way would then be used to fund energy efficiency measures to other properties.
- 5.3 There is little inconvenience to tenants involved in the installation process, and no regular servicing is required.
- 5.4 The systems require no action from the householder other than to adjust how they use their energy to obtain maximum benefit from the system. The Council's Home Energy Team will be trained to provide individual support and guidance and a handbook will be provided for easy reference.

6.0 Edison Energy - Solar P.V. installations

- 6.1 Under the Scottish Government's 2014/15 Home Energy Efficiency Programme (HEEPS), Edison secured a contract with the Council to install between 350 and 500 Solar P.V. systems onto domestic properties (owner occupiers and Council tenants) which had energy efficiency measures installed under the HEEPS scheme. There is no cost to the Council but Edison will benefit from the F.I.T.
- 6.2 Edison Energy are committed to installing these P.V. systems prior to the Government's F.I.T. changes in January 2016. However, they may withdraw from the project if the F.I.T. proposals impact negatively upon their investment.
- 6.3 Although the Council will not benefit from the F.I.T., this initiative will generate many positive benefits such as carbon reduction, potential job opportunities, and reduction in fuel poverty.

7.0 Additional Considerations

- 7.1 *Planning considerations* - Planning permission is not required for the vast majority of domestic Solar P.V. installations. However, listed building consent will require to be sought for any listed buildings under consideration
- 7.2 *Monitoring* - Each P.V. system will be monitored to ensure that the systems work to a minimum of 98% efficiency. This will help to make certain that the free energy that is generated for the householder is maximised. The Council will be provided with full access to the monitoring system.
- 7.3 *Maintenance* - The panels have no moving parts and require minimal maintenance. The panels are bolted through the roof structure and the structure sealed to prevent water ingress. There are established methods of securing the panels through their widespread use throughout Europe. Whilst

the panels are self-cleaning for optimal performance periodic cleaning might be required.

- 7.4 An allowance for maintenance is made in the financial model and it is intended to train staff within the Property Contracts Unit in the cleaning, operation and maintenance of the panels.

8.0 Risk Assessment

- 8.1 Key Risk factors were considered and a summary of the outcomes presented below. The risks that were identified by our external auditors for our Public Building P.V. initiative are built into the financial model and a sensitivity analysis undertaken by Grant Thornton on the key risks (marked *).

Risk	Status	Mitigation
<p>1. Less than predicted sunshine hours in a financial year following installation of PV panels</p> <p><i>SOURCE Solar GIS UK -</i></p> <p><i>Global horizontal irradiation is the most important parameter for evaluation of solar energy potential of a particular region and the most basic value for PV simulations. Data collected over a 20 year + period and utilised by DECC and Ofgem</i></p>	Low	<p>Modzel based on 20 year average in Clackmannanshire</p> <p><i>Source - European Commission, Joint Research Centre, Institute for Energy and Transport</i></p>
2. Tariff costs rising by less than 5%*	Low	<p>Base case 5% considered reasonable based on public trends</p> <p><i>Source - Comparison figures Ofgem</i></p>
3. Energy use reducing in buildings	Low	Historically there is an annual upward trend in energy demand from new technology.
4. Performance of PV panel drops*	Medium	1% p.a. built in
5. Government retrospective tariff review	Low	None
6. Delays in installation programme	High	A combination of different Tender packages and strict monitoring of performance
7. Higher than expected capital costs *	Medium	Costs are considered to be current and project will not progress beyond tender if capital costs make unaffordable
8. Higher than expected maintenance costs *	Low	Low maintenance expected within established technology
9. Inflation increase *	Medium	Costs modelled to increase at RPI + 1%

- 8.2 A sensitivity analysis of key risks has been undertaken. It showed variable reduced returns for individual risks but even with an unlikely combined

scenario of 4, 7 and 9 above the project remained financially viable. In summary, it is considered that the potential benefits significantly outweigh the risks involved.

9.0 Summary

- 9.1 Generation of renewable energy will allow the Council to offset against Carbon Reduction Commitments (CRC).
- 9.2 The initiative provides a positive financial return.
- 9.3 Tenants will save up to £200 per year in energy bills, helping with fuel poverty.
- 9.4 The installation of Solar PV will make a significant contribution towards making the council compliant with the upgraded Scottish Housing Quality Standard (the Energy Efficiency Standard in Social Housing (EESH)) which will be introduced in 2016.
- 9.5 The Edison Energy contract will compliment the Council's investment into the P.V. market and will increase the benefits to the community

10.0 Sustainability Implications

- 10.1 This project helps to address fuel poverty, and reduces the Council's carbon emissions and contributes to wider emissions reduction by producing 'green' electricity for wider consumption to the grid.

11.0 Resource Implications

Financial Details

- 11.1 The capital outlay to complete the work on all the suitable council owned housing is estimated at a maximum of £1.71m.
- 11.2 The PV arrays to be funded and installed by the Council will generate significant income.

Finance

- 11.3 Finance have been consulted and have agreed the financial implications as set out in the report.

Staffing

- 11.4 There is no staffing impact.

12.0 Exempt Reports

- 12.1 Is this report exempt? Yes (please detail the reasons for exemption below) No

13.0 Declarations

The recommendations contained within this report support or implement our Corporate Priorities and Council Policies.

(1) **Our Priorities** (Please double click on the check box)

- | | |
|--|-------------------------------------|
| The area has a positive image and attracts people and businesses | <input checked="" type="checkbox"/> |
| Our communities are more cohesive and inclusive | <input type="checkbox"/> |
| People are better skilled, trained and ready for learning and employment | <input checked="" type="checkbox"/> |
| Our communities are safer | <input type="checkbox"/> |
| Vulnerable people and families are supported | <input checked="" type="checkbox"/> |
| Substance misuse and its effects are reduced | <input type="checkbox"/> |
| Health is improving and health inequalities are reducing | <input checked="" type="checkbox"/> |
| The environment is protected and enhanced for all | <input checked="" type="checkbox"/> |
| The Council is effective, efficient and recognised for excellence | <input checked="" type="checkbox"/> |

(2) **Council Policies** (Please detail)

- This initiative compliments and supports the four strategic priorities of the Council's Climate Change and sustainability strategy:
 - climate change;
 - creating sustainable communities;
 - sustainable consumption and production; and
 - protecting our natural resources and enhancing our environment.
- Supports the Council's Carbon Management Strategy and implementation Plan commitments
- Supports the Council's fuel poverty strategy which is to reduce fuel poverty as far as is reasonably practicable by 2016.

14.0 Equalities Impact

- 14.1 Have you undertaken the required equalities impact assessment to ensure that no groups are adversely affected by the recommendations?
Yes No

15.0 Legality

- 15.1 It has been confirmed that in adopting the recommendations contained in this report, the Council is acting within its legal powers. Yes

16.0 Appendices

- 16.1 Appendix 1 - Frequently Asked Questions

17.0 Background Papers

- 17.1 Have you used other documents to compile your report? (All documents must be kept available by the author for public inspection for four years from the date of meeting at which the report is considered)
Yes (please list the documents below) No

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Photo Voltaics - Frequently Asked Questions

What is Solar PV?

Solar PV is a renewable energy system which uses photovoltaic modules, usually on the roof of a building, to convert daylight into electricity. Photovoltaic cells are made up of thin layers of semi-conducting material (usually crystalline silicon) which generate an electrical charge when exposed to direct or diffuse daylight.

How do photovoltaics work?

Sunlight hits the photovoltaic cells and is converted to electricity. The inverter converts the electricity from direct to alternating current, so that it may be combined with the electricity being imported from the mains, and used to power appliances in your home. When the solar energy system produces more power than is needed, it is exported into the national electricity grid. At night, power is imported from the national electricity grid in the usual manner.

What is a unit or kWh (kilowatt hour) of electricity?

Units are how you are billed for electricity. To run a 100 watt lightbulb for 10 hours, you require 1,000 watt hours or 1 kilowatt hour (1 unit) of electricity.

What are the key benefits of a PV system?

Once installed and commissioned the Council owns the system, having control of a long-term free source of electricity that is exempt from price increases. You are not only saving money but actively saving the environment at the time. A PV system makes no noise, has no moving parts, requires minimal maintenance, has a long lifespan and generates no CO2 emissions. Basically, it produces clean energy for years to come.

Where can I install PV modules?

The location of your PV array (group of PV modules) is vitally important. The modules should receive the maximum amount of daylight possible, so it is not advisable to install the modules in situations where surrounding buildings or trees may cast shadows. The best location for a PV array in the UK is on a south-facing roof angled at 30 degrees.

How do the panels perform at different angles and orientations?

Tilt of	Orientation of				
	SOUTH	SE/SW	E/W	NE/NW	NORTH
HORIZONTAL	90%				
30 DEGREES	100%	96%	85%	73%	68%
45 DEGREES	98%	93%	80%	64%	60%
60 DEGREES	92%	86%	72%	56%	47%
VERTICAL	69%	66%	54%	41%	35%

If the optimum angle is not achievable, over 90% of the maximum annual energy can still be achieved at 10 degree and 50 degree tilts. South-facing vertical facades generate around 70% of the maximum.

What are the effects of shade?

Shading is critical. Minor shading can result in significant loss of energy. Since PV modules are linked together in series, the module with the lowest amount of irradiation falling upon it determines the operating voltage of the string in which it is connected.

Does PV work in Scotland?

YES. The PV modules only require daylight to work, and so will generate energy on cloudy and even rainy days. Temperature is also a factor when determining how much electricity a pv system will generate. The efficiency of a PV module decreases by a fraction for every degree the temperature is above 25 degrees Celsius. Therefore, a clear cold day is perfect, because PV modules operate better at cooler temperatures. The UK has similar irradiance levels to Germany where PV has

proved extremely popular given their tariff structure, which is now also available within the UK under the Feed in Tariff.

What maintenance and cleaning do the PV systems need?

A Solar PV systems is silent in operation, has no moving parts and requires minimal maintenance. Most of the time the rain will keep the modules clean. However, a build up of dirt can effect system performance. The degree of soiling will depend on the location but usually dust accumulation and self-cleaning reach a steady state after a few weeks if the array tilt is at least 15 degrees. In extreme cases, dust may cause a power reduction of about 10%. The design of the system should aim to minimise uneven soiling. The modules can be cleaned once a year if desired with either a hose or, if possible, soapy water and a non-abrasive cloth.

What if we produce more energy than I need?

Whenever the panels are producing more electricity than the building is using, it will flow back into the grid for other buildings to use.

As long as you have an meter that measures the amount of electricity exported, you are eligible to receive a credit for this electricity. This will lower our tenants electricity bills and ensure none of the green electricity will be wasted.

Does the system need batteries?

No. The proposed PV systems are connected to the national grid. In the night, when the cells are not generating energy, electricity is bought from the utility company in the normal way. Any excess electricity generated during the day is sold back to the utility company.

What happens if there is a power cut?

If there is a power cut, the system is automatically switched off. This is a safety measure designed to stop electricity leaking on to the national grid and to protect individuals who may be working to restore the power supply.

Which electricity supplier will we use?

Due to the Feed-in Tariff, all electricity retailers will be obliged to offer the same generation and export credits for micro generation systems to their customers so we may choose whichever electricity retailer we, subject to procurement.

Can we sell the electricity we make?

Yes. On top of the generation tariff we will receive £0.0485 pence for every unit we generate (increased by RPI)..

How soon will a PV system pay back the cost of installation?

The Government estimates that a system installed during the Feed-in Tariff Scheme will be paid back in 11 to 13 years. However, in addition, we will carry on receiving a tariff or cashback for a further 7 - 9 years and will benefit from free electricity for years to come after that.

How long will it take to install a system?

PV systems can be installed and ready to produce electricity in 2-8 weeks from the time the design has been agreed. The actual installation will take approximately one day per kilowatt installed depending upon your building type.

What are the lifetimes of PV products?

Currently products carry a 20 -25 year 'performance' warranty which can be insured.

Who is eligible?

Both private and commercial premises are eligible.

How long will it last?

The Government has committed to pay the tariff for 20 years for photovoltaic installations.

Will the tariff change?

Once the tariff is agreed with the Government it will not decrease. The current tariff will stay the same until 1/10/15. It will then drop quarterly for future installations. This is to encourage early uptake. The Government announced it will be linked to inflation and tariffs will be inflated annually.

Why is the Government doing this?

The UK is way behind other European countries on commitments to reduce carbon emissions and to secure against future oil supplies. This is one way it can catch up. The UK currently produces 5.5% of electricity from renewables, this is expected to rise to 30% to meet the 15% 2020 target for all energy. Feed-in tariffs have been introduced successfully in many countries around the world, including Spain and Germany. It has encouraged huge growth in PV and created many jobs.

How will it be implemented?

Ofgem will administer the feed-in tariff. Suppliers will be responsible for paying the reward to their customers.

Is VAT payable?

VAT at 5% is payable on domestic installations. New Builds are often VAT exempt. Commercial buildings will pay standard VAT rates.

How the scheme works

Those eligible to receive the FIT benefit in 3 ways:

1. **Generation tariff** – a set rate paid by the energy supplier for each unit (or kWh) of electricity you generate. This rate will change periodically within the year for new entrants to the scheme, but once you join you will continue on the same tariff for 20 years in the case of solar electricity (PV).
2. **Export tariff** - the Council will receive a further £0.0485/kWh from our energy supplier for each unit we export back to the electricity grid, that is when it isn't used on site. The export rate is the same for all technologies.
3. **Energy bill savings** – tenants involved in this scheme will make savings on their electricity bills, because generating electricity to power their appliances means they don't have to buy as much electricity from their energy supplier. The amount they save will vary depending how much of the electricity they use on site.

Solar photovoltaic (PV) panels have been tried and tested and demonstrated to be cost effective and productive in the UK. Local authorities are in a position to develop a scheme: they have buildings suitable for installation of PV equipment, employees able to undertake the work and the capacity to borrow money to fund such works" **source The Association for Public Service Excellence (APSE)²**

² The virtuous green circle: creating a revolving fund for local authority solar energy - The Association for Public Service Excellence (APSE)

