Large photovoltaic arrays

Snapshot: To date, there appears to be limited developer interest in Scotland for large photovoltaics (PV) arrays as a means of harnessing renewable energy and schemes tend to be limited to small numbers of units on roofs of domestic or commercial properties. However, large PV arrays across expanses of roofs and elevations, across fields of several hectares and on brownfield sites are commonplace in parts of the continent. Additionally, in July 2010, planning applications for two 'solar parks' with 2.2 Megawatts (MW) and 1.5MW capacity were submitted to Cornwall County Council. An increase in interest in large PV arrays in other parts of the UK is expected to be driven by an increase in the feed-in-tariff and the publication of the European Commission's global irradiation report. The main factors limiting the expansion of the Scottish market do not appear to centre on the levels of irradiation or the functional effectiveness of the units in our climate but appear to relate more to the historical pricing of the units which is now falling, the return from the Feed in Tariff, which has increased, and the profit in comparison to other forms of renewables, which may fall in certain locations as opportunities are taken up.

Suggested areas of focus for planning authorities:

- Consider identifying large arrays of ground mounted PV as appropriate uses for certain urban and rural area development plan land allocations
- Consider identifying large areas of commercial roofscape where large arrays of PV may be installed;
- Consider landscape, land use, biodiversity and built environment implications of large arrays of PV on roofscapes, elevations and open sites
- Detail criteria to be applied in assessing large arrays of ground mounted or roof mounted PV applications and new developments with PVs across elevations;
- Establish protocol for involving key consultees in pre-application enquiries on major proposals

Opportunities within Planning Processes for Planning Authorities:

Stage in Planning Process	**Actions for Large Arrays of Photovoltaic Units**
Monitoring and Evidence Base	• Identify long standing redundant brownfield sites, industrial sites where allocations have not been taken up in previous development plans, industrial/commercial sites with large available roofscapes and poor quality vacant agricultural land • Collate information on known landscape, nature conservation and built environment sensitivities
Spatial Planning	• Identify a 3km exclusion zone around aerodromes • Consider sites that may be suitable for large arrays of ground or roof-mounted PV, taking into account topography, access to grid and vehicular access. Assess whether spatial plans provide sufficient clarity to suggest locations where the technology could operate • Ensure full consultations have been carried out with key consultees to determine impacts, including Scottish Natural Heritage (SNH), Ministry of Defence (MOD), Civil Aviation Authority (CAA), National Air Traffic Services (NATS) and Historic Scotland (if proposals impact upon the setting of the historic environment).

Drafting Development Plan Policy	• Ensure that policies for large arrays of PVs cover landscape, urban design, land use, biodiversity, aviation, access, grid, security fencing and decommissioning issues • Ensure that design policies, particularly in urban areas, encourage applicants to explore possibilities for large arrays of elevational PVs
Securing Sufficient Information to Determine Planning Applications	• Develop supporting guidance notes to detail typical information needs for pre-application discussion and planning applications for large arrays of PV • Ensure that information needs are proportionate
Pre-Application Stage	• Ensure that key consultees are given the opportunity to be involved in pre-application meetings / site visits on major proposals • Ensure that early advice is given on whether schemes require an EIA • Determine information needs e.g. o visual receptors to assess visual impact if the arrays of PVs are to be prominent within a wider landscape o if the PV arrays involve tracking systems, particularly in areas close to known flight paths
Determining Planning Applications	• Ensure that key consultees are involved in meetings and site visits on major applications to help ensure that constraints are overcome where possible • MOD, CAA and NATS should be consulted at an early stage (see aviation matters below) • Technical information and guidance on typical issues associated with large arrays of PVs are provided below which planning authorities should draw upon in determining applications and designing appropriate local solutions

Technical information for Large Arrays of Photovoltaic Units

Global Irradiation and Solar Electricity Potential: A website for calculating performance of grid connected PV across Europe has been provided by the JRC European Commission:- [http://re.jrc.ec.europa.eu/pvgis/apps3/pvvest.php]. Currently, a 300kW PV panel in Edinburgh would be expected to secure a solar resource of 1030 kWh/m2, with an annual generation of 238,000 kWh, with an approximate financial payback of around 14.2 years (SGUR Energy presentation 30/9/10 – See Below).

Physical Works: The type of physical works will vary depending on where the large PV array is located. If the array is proposed as an integral element of the design of a new building or an addition to the roofscapes of existing buildings, site works would probably be limited to providing a connection to the grid. Proposals to erect large arrays of ground mounted PVs may however require a range of physical works. This may comprise the removal of existing structures, site levelling, the erection of the mounting structures for the PV panels, cabling, access tracks to service the panels, security fencing, lighting, pole mounted CCTV facilities, plant equipment and a means to connect with the grid.

Tracking Systems: Some solar PV arrays can track the daily movements of the sun across the sky in order to maximise solar gain by virtue of tracker systems.

Glint and Glare: Glint is produced as a direct reflection of the sun on the surface of the PV panel whereas glare is a continuous source of brightness, relative to diffused lighting reflected from the bright sky around the sun. Glare is significantly less intense than glint. Solar PV panels are designed to absorb not reflect solar irradiation, but glint and glare may still be a resultant impact.

Ground Maintenance: On greenfield sites, vegetation will grow under the solar panels and this will require management.

Typical Planning Considerations in Determining Planning Applications for Large PV Arrays

Landscape / Visual Impact: Large PV arrays of sited in open sensitive landscapes have the potential to create significant visual impact by virtue of their number, site coverage or layout, the effect they have on the colour of the landscape and degree of reflection, together with access tracks, security fencing and ancillary components such as substations and power lines. The ability of the landscape to absorb development often depends on the inherent characteristics of the landscape such as landform, ridges and vegetation. SNH is the Scottish Government's agency and statutory advisor on landscape matters and their guidance is expected to be secured in the first instance on major proposals in respect of landscape character appraisal, visual impact and site design. A cautious approach is necessary in relation to particular landscapes which are rare or valued, such as National Scenic Areas and National Parks, together with designed landscapes and the settings of the historic environment. Cumulative effects may also have to be considered where progressively more large arrays of PV are proposed in the area. Analysis of landscape impact normally requires the preparation of a zone of visual influence map, to show where it may be seen from, a viewpoint analysis based on key viewpoints throughout the surrounding area, computer modelling and photo or video montages.

Ecological Impacts: Fields of large PV arrays of have the capacity for both positive and negative effects on the natural environment. The production of renewable energy counters the damaging effects of climate change on wildlife, habitats, ecosystems and biodiversity, and there are potential local benefits from safeguarding parcels of land for ecological corridors and low level planting between units. However, there is also the potential for negative environmental effects, with possible loss of or damage to valuable habitat resulting from construction of the poles to mount PV units and the change in land management associated with a change of use to PVs, together with access tracks and other works.

Archaeology: Appropriate safeguards should be put in place to safeguard near surface archaeology which may be affected by pole mounted PV arrays or in providing grid connectivity.

Impact on Communities: Although such impacts are expected to be rare, there is the potential for glint and glare to impact on communities. If ground mounted PV become a more frequent land use, there might also be socio-economic implications of fields being lost from traditional land uses.

Glint and Glare Impacts: A glint and glare assessment would normally be required as part of a planning application for large PV arrays of and would be expected to be particularly important in cases where tracking systems are proposed.

Aviation Matters: Planning authorities have a statutory duty to consult the Ministry of Defence, the National Air Traffic Services, and certain civil Airport Operators about proposed development which could affect aviation sites of national importance. Large PV arrays of have the potential to cause reflection and glare which could have implications for aircraft navigation. Consultees may object to certain proposals on the basis of safety assessments having been conducted. If a planning authority proposes not to act on objections, or not to attach conditions requested by the consultee(s), it must notify Scottish Ministers. Planning authorities are also requested to supply

consultees with information about approved new development as soon as permission has been granted.

Decommissioning: Large arrays of ground mounted PVs can be decommissioned and sites cleared and restored easily and rapidly, provided that arrays are installed using pile-driven or screw foundations, as opposed to trenching and foundations. This should be considered in conditions and/or legal agreements accompanying the consent with decommissioning triggered by the expiry of a specified period. Planning authorities should satisfy themselves that funding for decommissioning will be available when required to restore site conditions or agricultural use. It is likely that the duration of the consent will be linked to the expected operational life of the PV units. However during this period, proposals may be forthcoming to extend the life of the project by re-equipping or to replace the original PV units with new ones. While there are obvious advantages in using established sites, such cases will have to be determined on merit and in the light of prevailing planning policy and other relevant considerations.

Useful References:

Informal Guidance: The Development of Large Scale Solar PV Arrays in Cornwall, Cornwall County Council

Interim CAA Guidance - Solar Photovoltaic Systems (December 2010)

Presentation at Smartest Energy- Are you FIT for the Generation Challenge: FiTs – A Consultant's View – Chris Parcell, SGUR Energy (not available as a web resource)