Unit 301: Understand the fundamental principles and requirements of environmental technology systems

Worksheet 7: Micro-hydro (Tutor)

Using your notes and the internet (refer to Resource 1, 'Micro-renewable energies') answer the following questions:

1. In small groups and using the internet, discuss the planning requirements, including Building for micro-hydro systems.

Will need planning permission for system and associated buildings; the buildings will also require Building Regulations.

The Environmental will need to be contacted so that environmental issues can be investigated.

Also, an Abstraction Licence will usually be required from the Environmental Agency even if the water is returned to the watercourse.

Permission from adjoining landowners required if any of the works (eg penstock, leat) need to cross their land and/or the ownership of the watercourse is shared.

2. A micro-hydro system has a flow rate of 30 litres/second passing through the turbine fed from an effective head of 7 metres. The effective efficiency of the turbine is 65%.

Calculate the mechanical power produced at the turbine shaft.

Calculate the electrical power generated if the electrical generator has an efficiency of 60%.

a) **1.34kW**

b) **0.8kW**

3. What is the purpose of the 'forebay tank' in a micro-hydro system?

Before descending to the turbine, the water passes through a settling tank or 'forebay' in which the water is slowed down sufficiently for suspended particles to settle out thus reducing wear and possible blocking of the penstock and the turbine.

4. List **six** advantages of micro-hydro systems.

- **Efficient energy source**
- **A hydro system can generate 24 hours a day, often generating all the electricity the consumer needs and more.**
- **Reliable electricity source; hydro produces a continuous supply of electrical energy in comparison to other small-scale renewable technologies.**
- **If eligible, the consumer will get payments from the feed in tariff for all the electricity generated, as well as for any surplus electricity sold back to the grid.**
- **Hydroelectricity is green, renewable energy and doesn't release any harmful carbon dioxide or other pollutants.**
- **No reservoir for 'run of river' installations required.**

5. List **five** disadvantages of micro-hydro systems.

- **Large initial capital outlay.**
- **Suitable site characteristics required.**
- **Energy expansion not possible; the size and flow of small streams may restrict future site expansion as the power demand increases.**
- **Low power in the summer months.**
- **Environmental impact.**