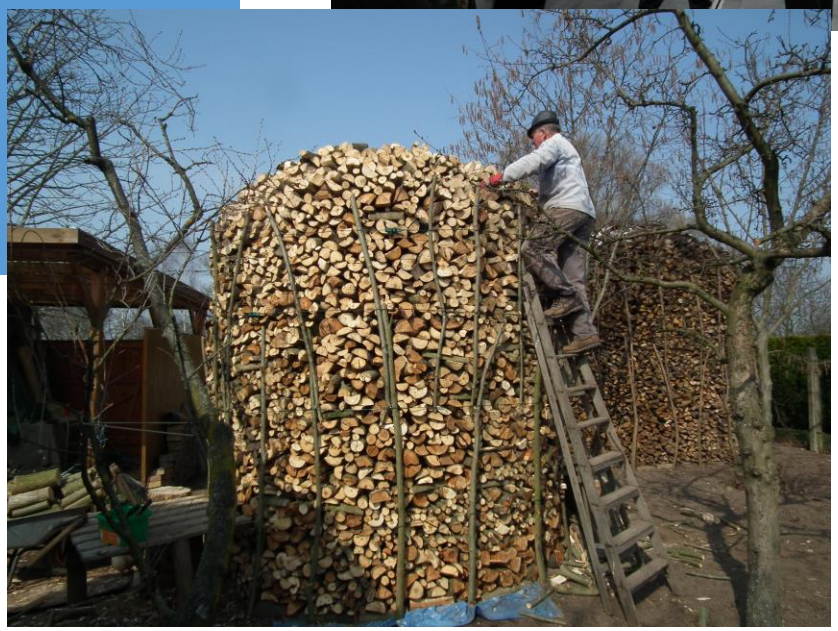
RURAL ENERGY

Lifelong Learning Programme

UNIT 2.

SUSTAINABLE RURAL DEVELOPMENT – FOCUS ON CULTURE AND NATURE



Green Village

Exploring Sustainable Aspects of Village Life in Europe

Introduction

The module 'Rural Energy' was created within the 'Leonardo da Vinci – Development of Innovation' project 'Green Village'. It is vocational module and we consider it to be IVT (Initial Vocational Training).

In Green Village, the Dübener Heide Naturpark (Germany), CNR-IVALSA (Italy), NAVE (Iceland) and Grampus Heritage (UK), worked together to deliver three community interactive rural energy actions, which tested ideas and training models. The Icelanders separately focused on geothermal and hydroelectric power. Before any community can be empowered, it must be engaged and Satul Verde in Romania ran Work Package 1, 'Engaging Communities', which guided and informed all the partners on how to engage with a rural community.

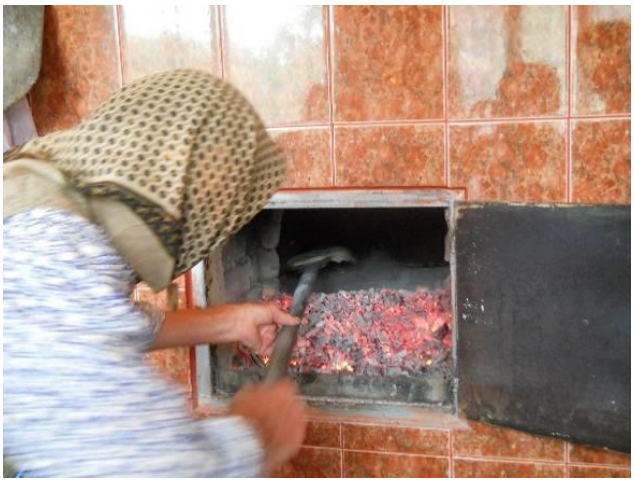
The work of Green Village resulted in this module, which has three alternative elements. Learners select one of these three depending on the nature of their college/University course topic or personal training plan. Also the country they are mobilised to. The three alternative elements are….

i) GEOTHERMAL & HYDROELECTRIC POWER

ii) HEATING & COOKING WITH WOOD

iii) UNDERSTANDING SOLAR POWER

This module booklet describes each element and lists learning outcomes. Learning resources are to be found on the Green Village web-site.http://www.greenvillage-europe.com



i) GEOTHERMAL & HYDROELECTRIC POWER

Introduction

This version of the module was specifically developed in Iceland. With preparation it can be delivered within 'Green Village' in the United Kingdom and Germany. The module requires 40 learner hours (5 days) and follows a pre-determined structure. Today we talk of 'energy as one of the new currencies'; it is topical and relevant to all. We expect young people to be excited by the module but also that older people will input sound advice, skills and knowledge – they can also complete the module of course, in the spirit of 'Lifelong Learning'. Iceland has a history of using these sustainable power sources that goes back to Viking times but has mainly been developed post 1945.

Pre-requisites

This module has a target audience of learners who study environmental management, energy systems, rural development and applied geography; learners are expected to have a basic understanding of energy.

The module also targets older learners and even teachers / trainers completing continuous professional development (CPD). In the case of the latter, a more complex and professional result might be expected.

Level

The Green Village partnership try to marry the National Qualification Frameworks (NQF) of their respective countries with the European Quality Framework (EQF) This module targets technical and vocational students at level 4 to 5 of the EQF. They may be completing a college diploma, foundation degree or in years 1 or 2 of a technical honours degree. For the higher level and CPD learner, Level 6 and 7 of the EQF may be applicable

Module Structure

DAY ONE

Meet with Icelandic community members to discuss the week ahead. Typical community members might include village leaders, horticulturalists, students, teachers, tourism practitioners and those who promote the village. The meeting is to discuss energy in Iceland and is held in the campus of the Agricultural University of Iceland in Hveragerði, a town and municipality in the south, 45 km to the east of Reykjavik. The surrounding area is part of the Hengill central volcano, and is geothermally active, experiencing frequent minor earthquakes. The town is known for its greenhouses, which are heated by hot water from volcanic hot springs.

After the meeting, attend a lecture about energy In Iceland, geothermal and hydroelectrical energy account for 97% of all power. The stakeholders include large state and private enterprises, municipal authorities, horticultural businesses, tourism businesses and householders.

Lunch is in the University's refectory and includes bread 'baked' using geothermally-heated water.

Afternoon visit to the local greenhouses to see production of salad vegetables and demonstrations of banana and coffee growing! Discuss productivity and the economics of production.

The day ends with a visit to the geothermal swimming baths; first a presentation about the development of the facility and its economy and management – then a (warm!) swim.

DAY TWO

The theme of Geothermal Energy continues; after breakfast at Gljũfur, the team of learners plus mentor meet in a 'hot tub' to reflect on this energy source. They discuss how the eight chalets at this tourism complex are heated by geothermal water.

There follows a three-hour visit to the Nesjavellir Geothermal Power Station, the second largest in Iceland. Learners see how drilling into the earth's crust has increased the quantity of hot water and also resulted in high pressure steam to drive turbines.

Carry on to Reykjavik to hear directly from Orkustofnun, the Energy Authority of Iceland, about their master plan.

DAY THREE

This is the main 'practical day' in the ethos of 'Green Village'. Learners spend all day completing a number of practical tasks from:

- Working in a geothermally heated greenhouse, collecting tomatoes and cucumbers.
- Working at the swimming pool in Hveragerði.
- Assisting in a routine maintenance inspection at the Nesjavellir Geothermal Power Station. Each learner creates a photo-archive of their day and discusses energy supply with the mentors and persons they work with and work-shadow.

DAY FOUR

A visit to one of Iceland's most important hydro-electric power plants at Búrfellsstöð, which generates 270 MW of electricity. Natural conditions in Iceland strongly favour hydroelectric power production, because of numerous glaciers and abundant rainfall. Tour of the plant and discussion about hydroelectrical power

Lunch is at a nearby reconstructed Viking-Age longhouse and the learners and their tutors discuss how the first settlers in Iceland used natural sources of energy.

The afternoon is made up of cultural visits to Geysir and Gulfoss, to see 'raw' power of a huge waterfall and the world famous erupting hot water plume.

DAY FIVE

Visit to an aluminium smelting plant; low cost energy has brought heavy industry to Iceland and has given a huge economic boost.

In the afternoon, discuss the relevance of what they have seen during the week, to their own countries. Most European states have under-utilised capacity for both geothermal and hydroelectical power. Iceland 'exports know-how; on a world-wide basis.

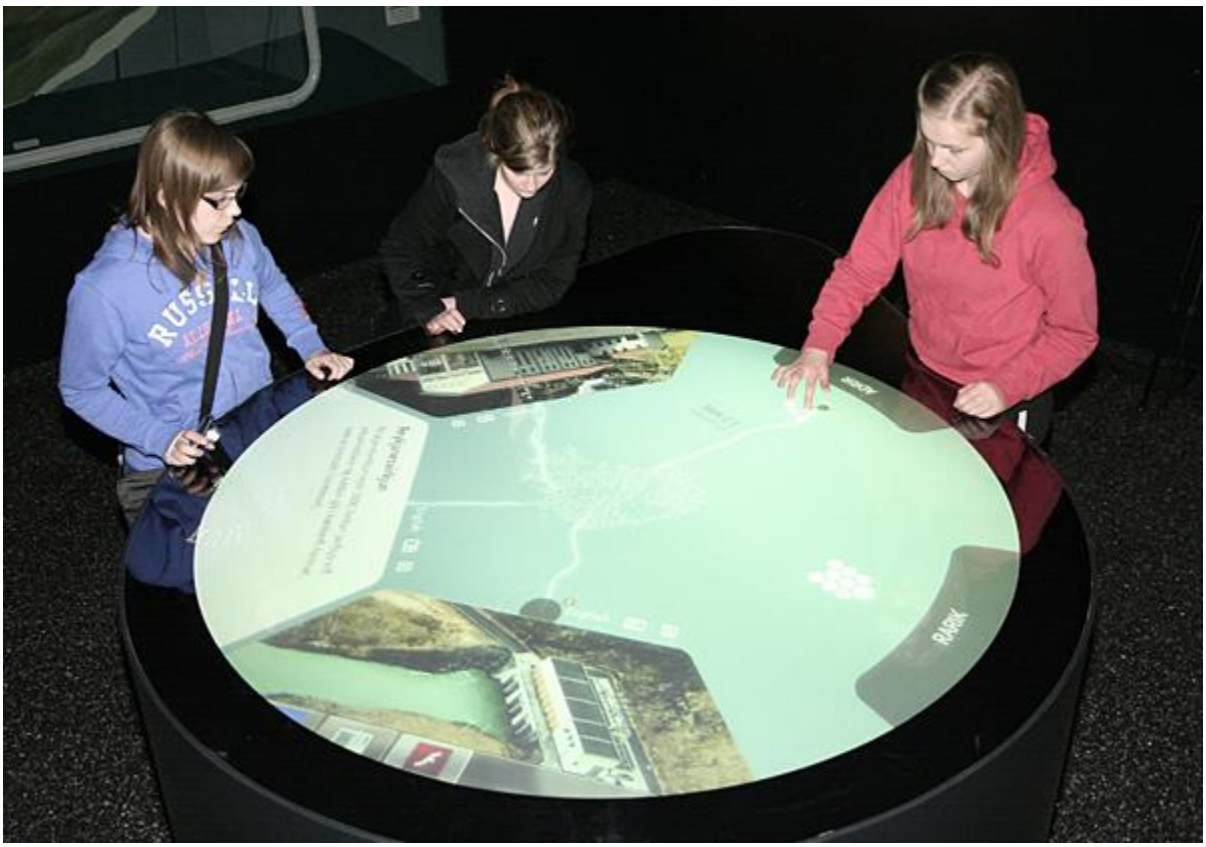
Assessment and feedback

Although not a formal part of the module, it is most usual to all go for a celebratory night out!

Learning outcomes

On completion of this module, the learner will be able to:

- Describe the basic process of power generation from geothermal sources
- Describe the basic process of power generation from hydroelectrical sources
- Carry out a routine practical task at a geothermally heated installation
- Discuss the relevance of these renewable power options in their own countries
- Work in a team and accept and respect the views of other team members
- Understand the economic benefits of these sources of power to householders
- Describe how a heavy industry like aluminium smelting, can be brought into a rural area – with positive and negative impacts



Education at the power plants at Búrfellsstöð

ii) HEATING & COOKING WITH WOOD

Introduction

This version of the module was specifically developed in Germany, the United Kingdom, Cyprus, Italy and Romania and was trialled and tested in Slovakia. The module requires 40 learner hours (5 days) and follows a pre-determined structure.

Pre-requisites

This module has a target audience of learners who study environmental management, rural development, forestry, land-use, energy systems, project management and European studies; learners are expected to have basic knowledge of wood as a material.

The module also targets older learners and even teachers / trainers completing continuous professional development (CPD). In the case of the latter, a more complex and professional result might be expected.

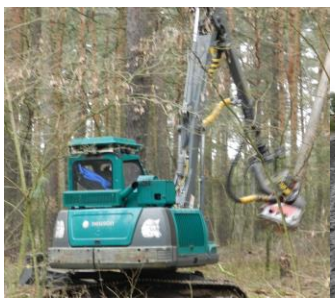
Level

The Green Village partnership try to marry the National Qualification Frameworks (NQF) of their respective countries with the European Quality Framework (EQF). This module targets technical and vocational students at level 4, 5 and (in some instances) 6 of the EQF. They may be completing a college diploma, foundation degree or in years 1 or 2 of a technical honours degree. For the higher level and CPD learner, Level 6 and 7 of the EQF may be applicable

Module Structure

DAY ONE

Meet with community members to discuss the basic energy needs of the rural community they live in and how wood meets those needs (or could do). Typical community members might include village leaders, special interest groups, householders, students, teachers, workers, youth clubs, the church/mosque, traders, museum practitioners and those who promote the village.



The forms of wood burning can be simple to complex. Within Green Village, we looked in detail at the following….

CYPRUS	GERMANY	ITALY	ROMANIA	SLOVAKIA	UNITED KINGDOM
Log Burning in the Home	Log Burning in the Home	Log Burning in the Home	Log Burning in the Home	Log Burning in the Home	Log Burning in the Home
Cooking with Wood (Clay/Brick Oven)	Local Scale Wood Gasification Plant	Chipping of Vineyard Prunings & Pelletisation	Central Heating from Wood Burning	Cooking in an Earth Oven Heated by Wood Burning	Woodchip Heated Office
Cooking with Wood (Grilling)	Heating a Village Hotel with Wood	Chipping of Forest Residues	Cooking (Baking) with Wood	Central Heating from Wood Burning	Wood Pellet Burning System

This module is delivered in all five countries – the focus is always rural but the technology level varies; in all cases it is the appropriate technology to the location.

Common to all countries is the log burning in the home – learners now go to 'light the stove'! Before doing this they learned from villagers about preferred species and dimension, level and method of drying. They chop some wood, prepare kindling and complete the task of lighting the stove.

They now heat / cook some food or make a drink; they are taught this skill by a villager.

After the meal, the afternoon is spent in the nearby forest. The type of forest depends on the country but in all cases, the forest in question will have a wood fuel generating function. They discuss management for wood fuel, silvicultural considerations, cutting regimes and extraction techniques. They also discuss with a forester, the law as it applies to fuel gathering.

DAY TWO

This day begins early; in all five countries it involves heating up a more complex cooking device / oven. Heating time varies depending on the food to be cooked – for meat dishes (i.e., Kleftiko in Cyprus), up to two hours is needed. The type of wood fuel varies but invariably small dimensioned wood is used in part of the process. The cooking process lasts the rest of the morning – lunch consists of the result!

The afternoon is spent gathering, sorting and making 'faggots' – bundles of small roundwood. The learners now know the significance of this wood fuel type and reflect on the calorific value and sustainability aspects of this low grade material, which is often wasted.

DAY THREE

This day is back into the field / outdoors. The technology level steps up, with a visit to a more mechanised wood burning system. The type depends on the location but in all cases some type of automation is installed and the heat generated has a further purpose than cooking. Water heating for

central heating will be a common feature but kilns for drying sawn wood and even systems for generating electricity and wood gasification may feature.

The learners examine the wood fuel types and gather samples of woodchips, briquettes, pellets, etc., at the same time learning about their production.

DAY FOUR

Another day in the field – activities are practical and follow a strict health and safety at work regime (in all Green Village Modules, Risk Assessments are in place). Tasks depend on location but include….

- Feeding woody residues into a wood-chipper
- Operating a simple vine prunings baling machine
- Work shadowing an operative on a pellet making machine
- Joining a routine maintenance programme of a wood burning system

At the end of the day the learners reflect on the system they worked with and consider the economics of the process and the product.

DAY FIVE

This day starts with another visit to the forest to assist in the gathering of wood fuel. They consider the cost of harvesting and extraction and what further stages are necessary before the wood is to be burnt.

In the afternoon they visit a sales outlet for wood fuel – they look at the quality of the product, its presentation, packaging and marketing; they begin to understand the complexity of the market.

The final session is dedicated to feedback and assessment. Each learner makes a brief presentation of their impressions of the week and what they have learned. Villagers are involved and add their input.

Assessment and feedback.

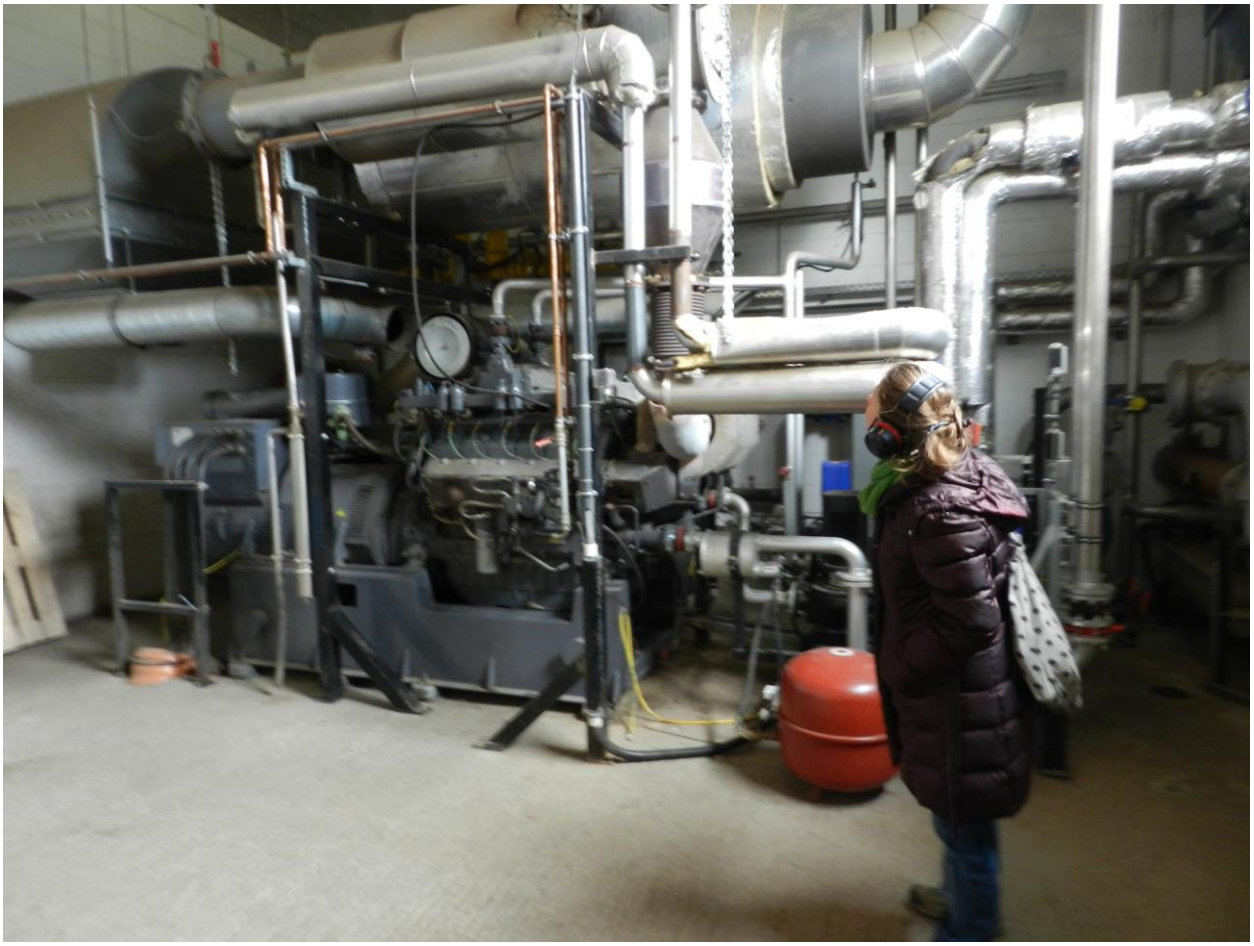
Although not a formal part of the module, it is most usual end to the week is a farewell meal together – visiting learners, moderators, teachers, experts, practitioners and villagers.

Learning outcomes

On completion of this module, the learner will be able to:

- Describe the importance of wood as a source of rural energy
- Draw simple diagrams to illustrate a low technology wood burning method and a higher technology one
- Cook food with wood as the fuel source
- Sort and chop wood for burning on a stove
- Light a wood burning system
- Make a ‘faggot’ from suitable small roundwood

- Carry out a routine task that concerns some mechanised process of wood fuel preparation or burning
- Classify wood species on the basis of their suitability for firewood
- Describe the value-adding process and the value of wood as a fuel in an unprocessed, processed and delivered state
- Work as part of a team, learning the appropriate key skills



Wood gasification plant in Germany

iii) UNDERSTANDING SOLAR POWER

Introduction

This version of the module was specifically developed in Cyprus and Italy with inputs from Slovakia. The module requires 40 learner hours (5 days) and follows a pre-determined structure.

Pre-requisites

This module has a target audience of learners who study environmental management, rural development, land-use, energy systems, project management and European studies; learners are expected to have basic knowledge of alternative energy sources.

The module also targets older learners and even teachers / trainers completing continuous professional development (CPD). In the case of the latter, a more complex and professional event might result.

Level

The Green Village partnership try to marry the National Qualification Frameworks (NQF) of their respective countries with the European Quality Framework (EQF). This module targets technical and vocational students at level 4, 5 and (in some instances) 6 of the EQF. They may be completing a college diploma, foundation degree or in years 1 or 2 of a technical honours degree. For the higher level and CPD learner, Level 6 and 7 of the EQF may be applicable

Module Structure

DAY ONE

Meet with community members to discuss the basic energy needs of the rural community they live in and how solar power meets those needs (or could do). Typical community members might include village leaders, special interest groups, householders, students, teachers, workers, youth clubs, the church/mosque, traders, museum practitioners and those who promote the village.

Solar farm in Cyprus, photovoltaic cells are on a rotating platform to track the suns path.

The forms of utilising solar power can be simple to complex. Within Green Village, we looked in detail at the following….

CYPRUS	**ITALY**	**SLOVAKIA**
Household water heating with solar power	Household water heating with solar power	Household water heating with solar power
Solar energy farms (photovoltaic cells)	Concentrating natural sunlight	Solar energy farms (photovoltaic cells)
Solar ovens	Solar ovens	Solar ovens

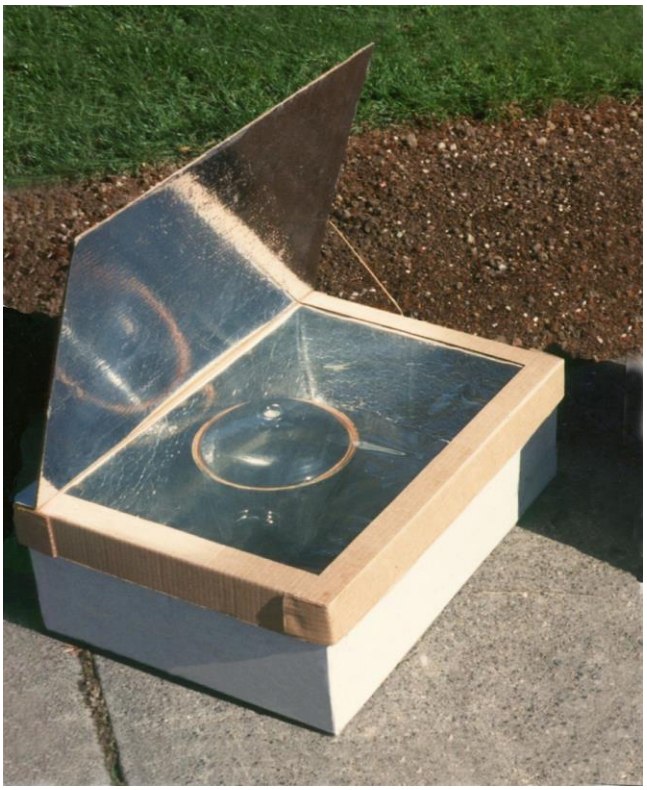
This module is delivered in all three countries and with preparation can be delivered in all eight Green Village partner countries.

Common to all countries is household water heating with solar power and the solar ovens.

After the initial village meeting, the learners visit a household where solar power is used to heat the water (active system). They examine the system, look at the siting of the solar panel and take part in a cleaning / maintenance process. They then have a shower – using the hot water.

The day ends with a discussion about the place in the market and the village of these simple solar systems

DAY TWO



On this day we set up and prepare a solar cooker/oven. The model is standard and was originally developed for use in Africa. Increased energy costs and re-assessment of potential (even climate change) mean the systems value in Europe becomes appreciated. The learners prepare a meal using only solar cooking.

Lunch is served! Villagers attend.

Minimal design solar cooker.

In the afternoon there is a visit to a solar farm. We meet a specialist engineer, who explains how the solar farm works, its location, aspect, etc., the power it generates and where it goes.

Learners join in a routine maintenance task such as oiling/greasing the moving parts – more sophisticated installations follow the track of the sun and panels move to optimise captured solar energy.

DAY THREE

After the visit to the solar farm, learners are now more familiar with photovoltaic cells. They saw how power was generated and used (the farm may be serving a factory, village, etc., or selling to the national grid – or a combination). Now they go back to household level and see how photovoltaic cells work for individual buildings.

They join a team who are installing a photovoltaic cell and take part in the installation process.

DAY FOUR

The morning is spent visiting small national installations such as road signs and street lighting, which use solar energy through photovoltaic cells. They may go to a more sophisticated municipal or state instillation, it depends on location (in Cyprus a desalination plant near Larnaca uses solar energy). In all cases, an engineer explains the process and importance.

They return to base in time to cook another 'solar meal'

DAY FIVE

This final day looks at inert systems which use mirrors to capture and concentrate sunlight, giving natural light and saving electricity.

They visit buildings with window systems designed to maximise sunlight entering but not heat – they discuss the need for light whilst maintaining a cool indoor temperature. This technology has advanced due to the need for less expensive air conditioning and building cooling systems.

Inert system for capturing and concentrating sunlight at a winery in Montepulciano, Italy

During the week, the learners have been gathering pictures and making notes, now they spend the afternoon setting up a 'solar exhibition' for villagers. The exhibition opens and visitors look at the learner's findings.

Assessment and feedback is linked to the exhibition.

Learning outcomes

On completion of this module, the learner will be able to:

- Describe the importance of solar power as a source of rural energy
- Draw simple diagrams to illustrate a low technology solar power capturing method and a higher technology one
- Cook food in a solar oven.
- Explain systems for concentrating sunlight but not heat, for space lighting and cooling
- Carry out a routine task that concerns some mechanised process of solar power collection
- Work as part of a team, learning the appropriate key skills

Solar-powered road signs