WeatherEnergy

As disconnected as we may now be from the elements, our lives are still deeply influenced by the sun, wind and the rain. This connection is best expressed in the daily ritual that is common to so many of us – listening to, or watching the weather forecast.

The sun and the wind, however, are not only meteorological elements, they are also renewable energy sources.

> ***WeatherEnergy*** *is part of the European EnergizAIR project, supported by the Intelligent Energy Europe Programme, led by the European Agency for Competiveness and Innovation (EACI). The project currently has partners in 11 European countries. Severn Wye Energy Agency is the UK partner.*

1. What is WeatherEnergy?

The aim behind WeatherEnergy is to show people the connection between the weather and its very real potential as a renewable home energy source. Based on meteorological data and the technical data of different renewable energy technologies, daily and weekly figures (indicators) are produced for different locations throughout the UK.

- Solar thermal: the indicators are a percentage (%) of how much of an average households hot water needs could potentially have been supplied by an average solar domestic hot water system the previous day or the previous week. Information is also provided on the gas, oil or electricity savings that would have been made by using solar heated water.
- Solar PV: as above, the indicators are also provided as percentages (%) but this time they are percentages of the average household's electricity demand that could have been met using an average household solar PV installation. Information is also provided on the number of appliances that could have been powered using the amount of energy generated.
- Wind energy: collective indicators are provided signifying the maximum number of households that could have been supplied with electricity using the country's wind turbine capacity. This number of households is then compared to a geographical area ie, 838,150 households - 3% of the UK population!

2. The Technical Stuff!

The indicators are generated by combining statistical consumption and population data for the UK with the technical production data of the three technologies. This data is then fed into the EnergizAIR software model, fondly termed as 'The Beast'.

Statistical Data

UK Population & Consumption Data

63,700,000 – UK population

2.3 - Average household size (UK weighted average)

3,790 kWh - Average electricity consumption per household per year

Renewable Technology Data

Solar

3kW - average size of household PV installation

35% - Roof tilt

South – facing roof

Solar Thermal

4.6m^2 - Size of average household solar thermal installation

210 litres - Average hot water tank

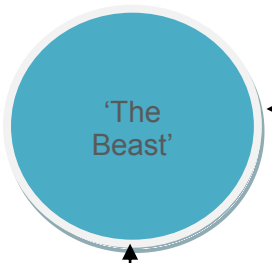
122 litres - Average hot water consumption per household per, per day

6 - Solar zones in UK

Wind

Live wind data from nearly 8GW of currently running wind farms.

Capacity factor of wind farms in each region of the country.



Monitoring and Modelling

Production Data

Monitoring & Modelling

The statistical data alone, however, could not provide us with the information we want, we need to combine it with meteorological monitoring data and a thermal model.

Photovoltaic data

The EnergizAIR software model uses the EPICES monitoring service to obtain irradiance data and daily or weekly "virtual" PV production points for any location in Europe. The UK has 58 'solar points' from Wick to Penzance; locations around the UK for which we receive this irradiation data. Combining the statistical data with the solar PV production data, a 'figure' is produced indicating how much solar energy could have been produced at each of the 58 solar points.

In order to check the accuracy of the EPICES data, the energy production of a real PV installation in Gloucester is also monitored and compared to the WeatherEnergy indicator.

EPICES monitoring system

EPICES is a solar PV monitoring service. Based on a dynamic hour by hour yield simulation, it is able to recreate daily PV production references, detect failures and publish information about PV systems and potential energy production. The inputs for this tool are daily climatic data (ground temperature database and satellite irradiation measurements) and a technical description of the renewable technologies. EPICES has been developed by HES, a subsidiary of HESPUL in France.

EnergizAIR takes a "modelling" approach (as opposed to a "monitoring" approach). This option allows a simplified homogenous treatment for a whole zone or region, from the climatic data acquisition to the energy model's outputs. However, the accuracy has deviations, which must be taken into account to yield more reliable results. This issue is known about, and the EPICES results are supplied with standard deviation estimates and minimum values. HESPUL is leading a study on this issue, to further assess the accuracy and confidence range. The first indications of accuracy estimation are from 93% to 107%, averaged over a one year period.

Climatic data sources: irradiation data is supplied by the HELIOCLIM 3 satellite database; ground temperature data by Meteotest; and the model itself is based on an enhanced profile of the PV-SAT2 method.

Solar Thermal data

Using the EPICES measuring system, insolation and temperature data [W/m²*h] are collected on an hourly basis for each of the virtual points. The production data is then calculated for the solar thermal technology by combining the insolation data to a thermal model specifically designed for this project.

The EnergizAIR model uses a 'unified method' based on an adapted version of the TRNSYS software for the simulation of solar thermal heat output. This method involves defining a standard solar thermal system for each climatic zone (*UK has 6 solar zones: South West Peninsula; South Coast and South Wales; Wales, Southern & Eastern England; Midlands & Northern Ireland; Northern & Southern Scotland; Scottish Highlands*) and simulates the heat production of the system based on real meteorological information (irradiance, temperature and presence of snow) provided by EPICES; the incoming cold water temperature, estimated from the ground temperature (statistics from Meteonorm); and on the average consumption of the user.

A highly regarded model improved for dynamic use

With the insolation and temperature data [W/m²*h] given by EPICES on an hourly basis for every virtual point, the production data is calculated for the solar thermal technology, by introducing the insolation data into a thermal model specifically designed for EnergizAIR.

This model is an adaptation of TRNSYS software which takes weather changes into consideration, it was created by APERe's ITeam, and modified for accuracy and speed. The new model has the advantage of being "licence free".

Wind data

Although wind energy – unlike solar – is generally a large-scale technology, not fitted directly to individual properties, its benefits can be shared.

In order to provide indicators for this technology, live wind energy output data is aggregated from nearly 8GW of grid-connected wind farms (using BMreports), together with data from UKWED which shows the capacity of wind energy installed in each UK region – both onshore and offshore. Government data reveals the 'capacity factor' of wind energy in each region, in other words, how much output is generated by a given amount of installed capacity. All of this data is combined by the EnergizAIR computer model to produce a realistic estimate of how much energy has been generated by the wind turbines in each region within the UK as a whole,

it then converts this into how many homes could have been provided by energy from wind power.

3. What do we do with the indicators?

Now we have our indicators, we need to get them seen and the best way to do this is through the weather forecast. Easily identifiable visual images have been developed for each of the renewable technologies. These will appear with the indicators in regular weather bulletins and will be briefly introduced and commented upon by the presenter of the weather forecast.

The aim of the WeatherEnergy project is to help the general public improve their understanding of how much energy renewable technologies can actually produce and what this could mean for their personal home energy consumption.

There is a WeatherEnergy website – www.weatherEnergy.co.uk – which provides information on the amount of energy generated by each of the renewable technologies at each of the selected locations, over the previous 24 hours. It also contains information on how the different technologies work and what financial incentives or support might be available for households to generate their own renewable energy.

To ensure maximum coverage, media relationships are sought with television companies, radio stations, newspapers, specialist journals and relevant websites.

4. What this means for home energy use

WeatherEnergy not only helps people develop a better understanding of the impact renewable energies could have for home energy consumption but it helps to trigger a more general interest in energy saving and an improvement in overall energy literacy.

Tools are currently being developed for the WeatherEnergy website that will allow the visitor to input their own personal energy consumption and see how it could be impacted by the production of renewable energy.

5. Partners

	APERe - Association pour la Promotion des Energies Renouvelables **Belgium**
	EALP - Agenzia Energetica della Provincia di Livorno **Italy**
	SE-F - Slovenski E-forum **Slovenia**
	Hespul - Energies renouvelables et efficacité énergétique **France**
	APREN - Portuguese Renewable Energy Association **Portugal**
	SevernWye - Severn Wye Energy Agency **UK**
	Reflex - Reflex Environmental Association **Hungary**
	Ecoserveis **Spain**
	GDE - Gavle Dala Energy Agency **Sweden**
	aiforia - Agency for Sustainability **Germany**

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