



Earth's physical resources: renewable energy.

Geothermal energy

Narrator:

Beneath the earth's surface, large quantities of heat are stored as geothermal energy. The heat comes from the decay of natural radioactive material and is transmitted to the surface from the molten core of the earth.

Some porous rocks contain underground reservoirs of geothermally heated water. These aquifers provide a renewable source of energy - provided the rate of heat extraction doesn't exceed the rate of replenishment.

In Tuscany and the Paris basin, hot water from aquifers is used mainly for space and water heating.

In parts of the western United States, the underlying rocks aren't porous but heavily fractured.

Water rising through the hot rocks into bore-holes provides an economically viable source of geothermal energy.

When the pressure's released, the superheated water turns into high pressure steam.

This is then piped to the geothermal power plant where it's used to turn turbines and generate electricity.

Just outside Soultz, near Alsace on the German border there's a project that aims to extract the heat from hot dry rocks to create electricity.

Roy Baria:

There is a vast amount of energy available, something like 70% of the earth's surface, has got granite at depth.

Granite's got a very good conductivity, therefore the heat transfer is much higher, an average conduction is something like thirty degrees per kilometre.

The idea is to create, a heat exchanger, in order to extract energy from underground.

Narrator:

But to extract the heat, the rocks must be fractured and water pumped through the fissures.

Roy Baria:

The first thing is you drill a borehole, to the depth of 5 kilometre, then you measure fundamental things like stress jointing, other geological properties. Once you understand it, then you inject fluid under high pressure, and you open up existing joint network. And you track where this open up joint network is by listening to it from seismic sensor.

Narrator:

Water is pumped into two wells and steam collected from a third. This will then drive the turbines.

Roy Baria:

This is only one module, there is absolutely no reason why you should not replicate this, to five six seven modules, and increase your output to up to say fifty megawatt if you want to.

Narrator:

Research continues backed by several European countries, in the hope that this energy source might become economically viable in the longer term.

John Doddrell:

The Government has created a market now for renewable energy through the renewables obligation and other measures, so the market opportunities are there for renewables. The challenge for us now is to make sure this market doesn't simply suck in imports from abroad, but that we develop an indigenous domestic industry to meet the opportunities and at the same time create jobs and employment for people here in the UK.

Narrator:

But renewables are only one of the building blocks needed to create a sustainable energy strategy.

Erik Lysen:

First of all, and foremost, it should look at energy efficiency. The energy should be used as efficiently as possible, and conserved of course. Secondly, use renewables as much as we can, and as fast as we can, thirdly, the remaining part should be covered by fossils, but as clean as possible.

Narrator:

If we adopt these approaches, won't that ultimately mean radical changes in the way we live?

Erik Lysen:

I'm convinced that we will find means to introduce renewables in such a way, that we will be able to do so, without completely changing our culture, behaviour or, we don't have to go back to the caves, absolutely not.

Narrator:

And finally, can sustainable energy satisfy the world's need for endless economic growth?

Roger Higman:

In the long run, however efficient technology we use, however clean our energy sources are, and no energy source is completely clean, we're going to run up against environmental limits, if we continue to grow, and continue to use more and more energy. That means we need to rethink, the the purpose of our of our economic strategies, instead of going endlessly for more and more economic growth, we need to think about, how our economies meet the needs of the people,