NATURAL INNOVATION FOUNDATION

Technology in service of the planet and its peoples

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MY BACKGROUND

- Co-founded an ISP in 1985
- Co-founded apc.org in 1989
- Involved in authoring internet standards like HTTP, URL, VRML etc
- Last 10 years commercialising green technologies
  - Solar; Bio-plastic; paper from bananas etc
- Now running a NGO.

Last year, I was advising a fund on investments in technologies, both ones they'd found and ones I'd found.

Every investor has a checklist – in the head if not formally, and most of the highest impact innovations I came across did't make the grade.

Typically this was because the Intellectual Property was public domain or for some other reason un-protectable, or because the inventor was based in a developing country or marketing to people who earned a few dollars a day, and so couldn't charge the high margins that would be required to achieve Venture Capital (10x) returns.

The Natural Innovation Foundation was formed to create a support mechanism for early stage inventors with a high impact who cannot, or choose not to, go down the traditional Venture Capital route. We bring the financial, and as importantly non-financial resources to build prototypes, de-risk and then scale the ideas in much the same way as I used to work with commercial innovations.

Lets look at a few examples of innovations we are currently working with.


NATURAL INNOVATION'S ROLE
Finding interesting technologies
Supporting tech & biz development
Finance raising
Strategic partnerships
Volunteers
Introductions
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Small scale hydro is an effective source of reliable energy in many places, however it usually requires at least 2meters of head (the difference between the source of water, and where it is returned to the river),

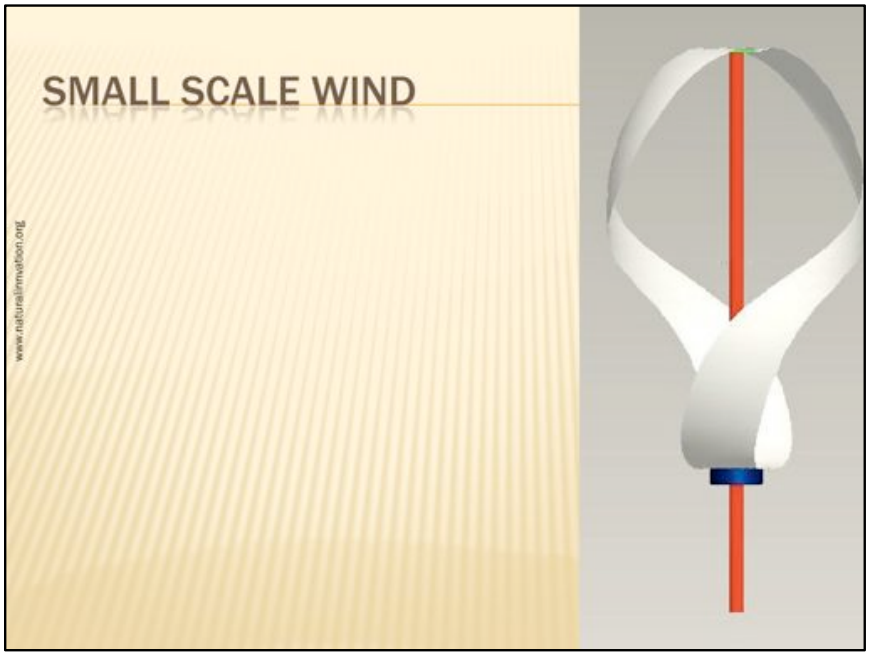
The innovators we are working with have developed a system that requires just 1m of head enabling an order of magnitude more potential sites.

Its ideally suited to rural villages with a typical system being about 40kw, or 400 houses at a targeted cost of around $60m in a low labor cost environment, and paying back its cost in about 3 years.

Its major weakness, and its major advantage is that its easy to copy, requiring mostly concrete and rebar.

There are no bearings, or seals or electrics in the water, and power can be extracted with cheaply available alternators or synchronous motors.

They've raised about $60k for the first commercial system, and we are trying to raise about another $100k to enable the development of appropriate training and documentation to allow it to be widely replicated.

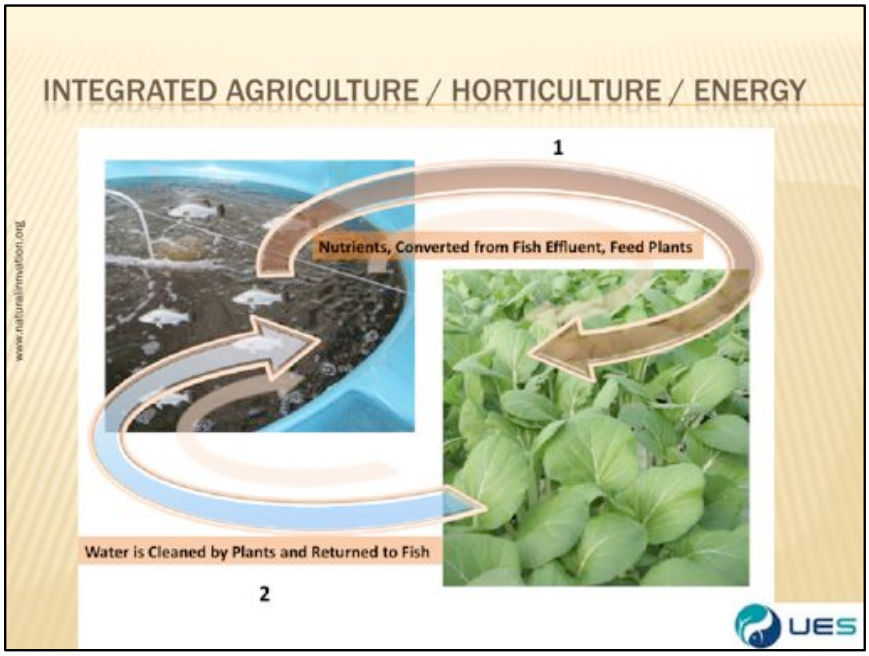


We are working Sustainable Living Institute who are developing a small scale wind turbine, intended to be mounted directly on houses & commercial buildings.

To work on buildings requires low-vibration, turbines that are effective in turbulent winds. To be cost effective in rural india designs have to be significantly smaller and cheaper than current designs in the west.

The good news is that many patents have expired so the innovators are designing a royalty free design that will be mass-produced in India

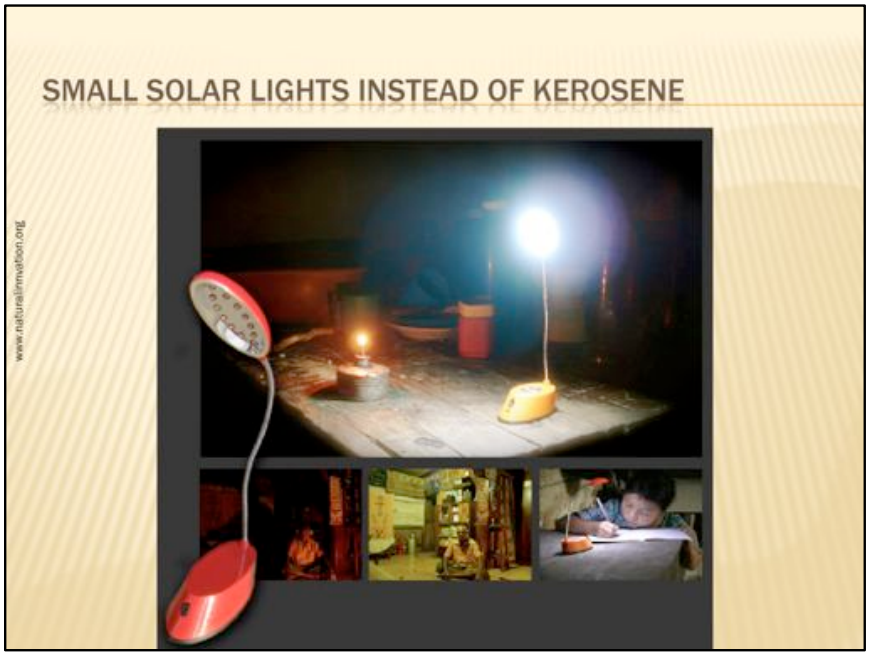
To help with transition finance we have been introducing them to other products they can manufacture or distribute.



I've been working with Urban Ecological Systems for a while, they have designed a system that integrates aquaculture with intensive, organic, horticulture. It has high yields and low operating costs. The first commercial system is under construction in Sydney, its 3000 m^2 .

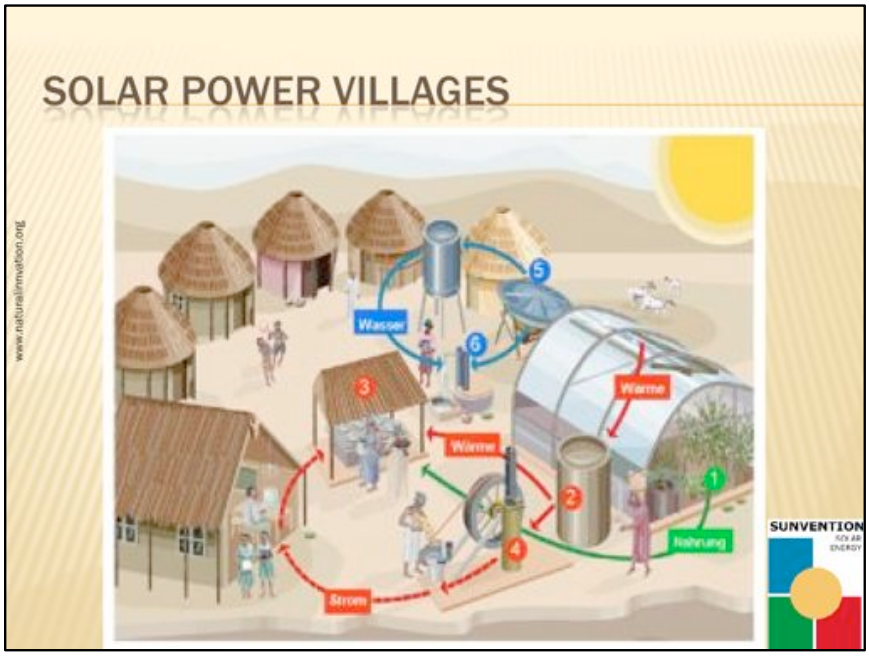
The concept is equally applicable in the developing world, and we are working with UES to raise finance to design a system that is more appropriate to a high-labor, low-maintenance environment at a smaller scale.

The Sydney system will integrate its energy requirements on-site with a goal of carbon-positivity, i.e. supplying clean power back to the grid.



Barefoot Power have developed low cost solar lights and a business model incorporating all the micro-financing to enable distribution. They launched their model in Uganda, expanded to Kenya and are now launching in India. They are growing rapidly with growth only constrained by capital availability.

We've been helping Barefoot Power with their business plan so that they can raise more capital.

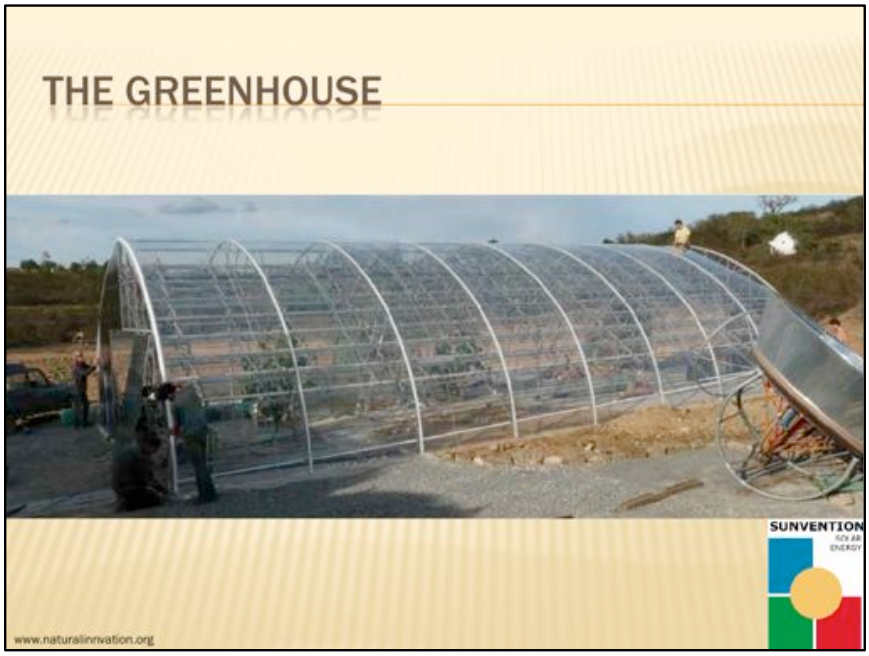


Sunvention's concept is to meet the energy needs of rural villages from solar power, mostly solar thermal.

Collecting heat in a greenhouse, storing in a tank, and using it for cooking and to drive a generator, pumps, and other machines.

Here we see their test site that shows the greenhouse – the storage and a stand-alone pump, all of which I'll cover later.

Another view – the hot oil tank is shown clearly – that looks like about about 6000 liters which can hold about 215kwh of heat.



In the background of this shot is Sunvention's concentrating solar thermal system.

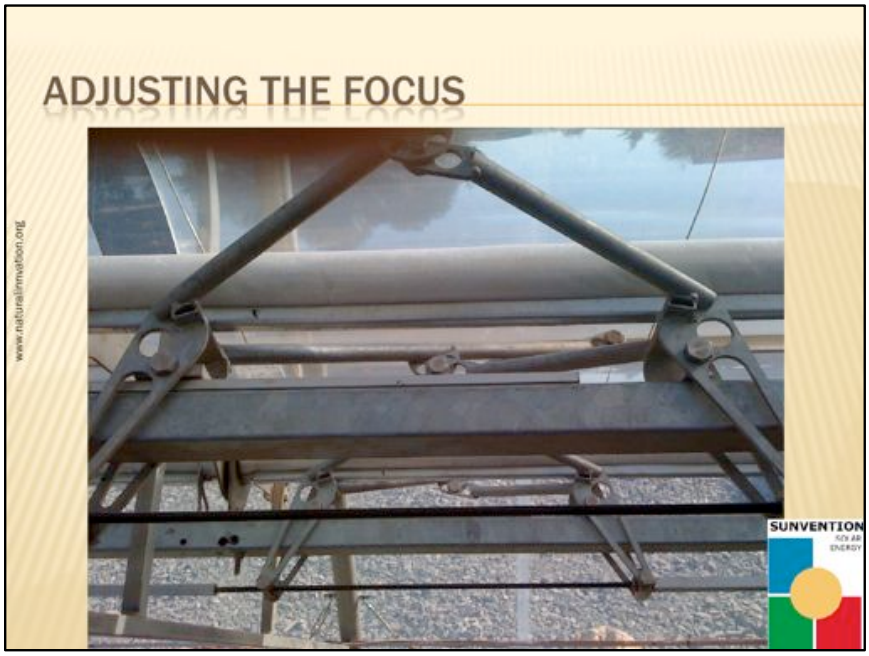
We introduced this to Urban Ecological Systems – the aquaponics developer – and they are now collaborating on the Sydney farm I just mentioned.

Looking inside you can see the horizontal lines are the heat collectors

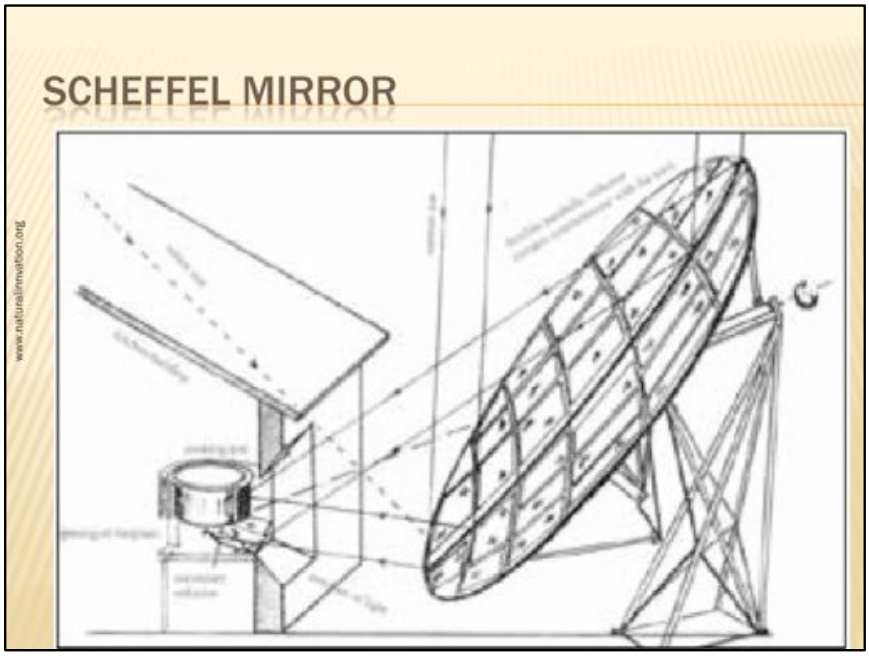
one of the most expensive parts of a Concentrating Solar system (thermal of photovoltaic) is engineering for extreme weather, by integrating inside a greenhouse this protection comes for free

So the lenses can be lightweight, steerable Fresnel Lens

And hear we see a detail of the heat collector system, showing the mechanics needed to achieve tracking

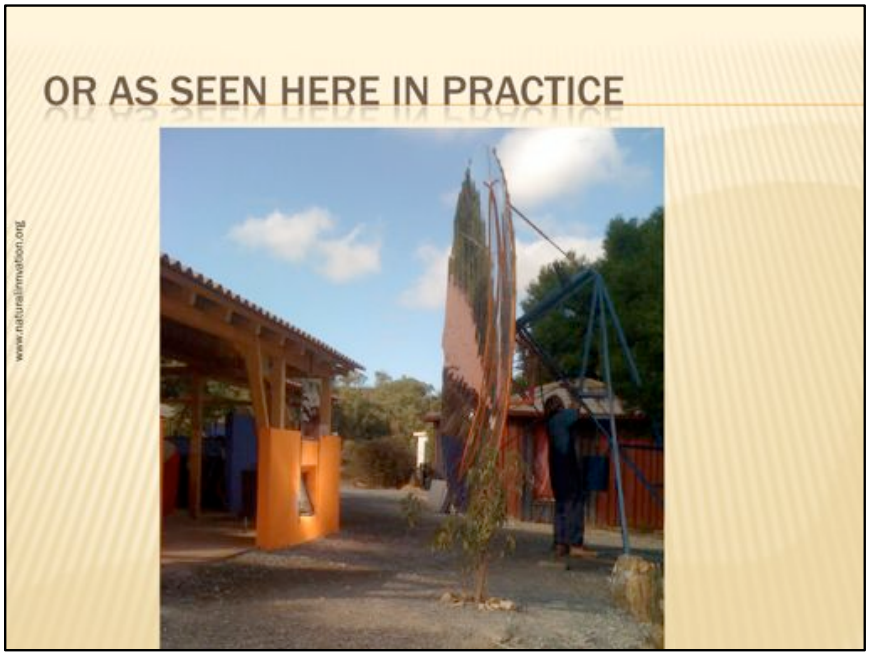


And here we see the coal length adjustment.

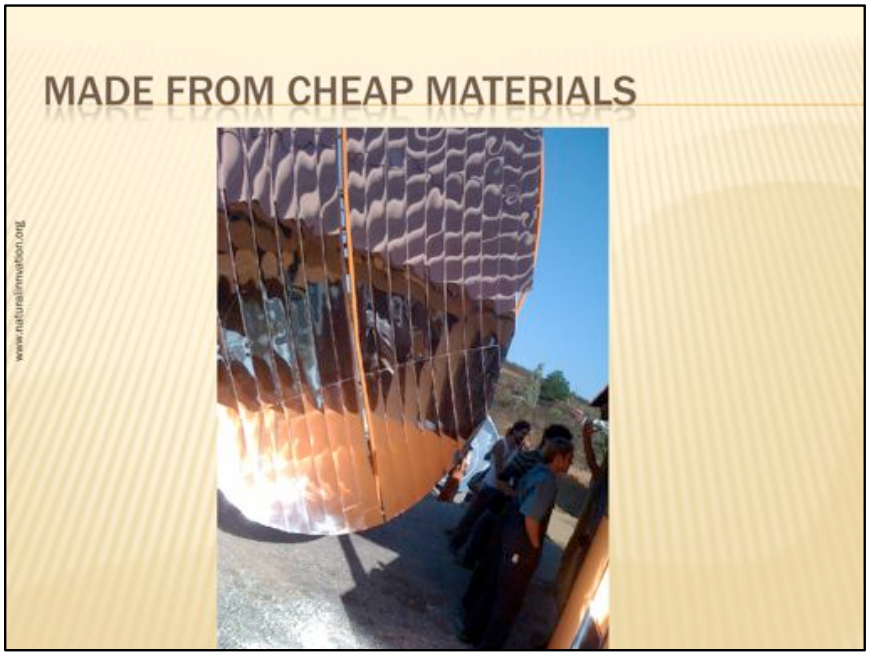


Looking at a different technoloy

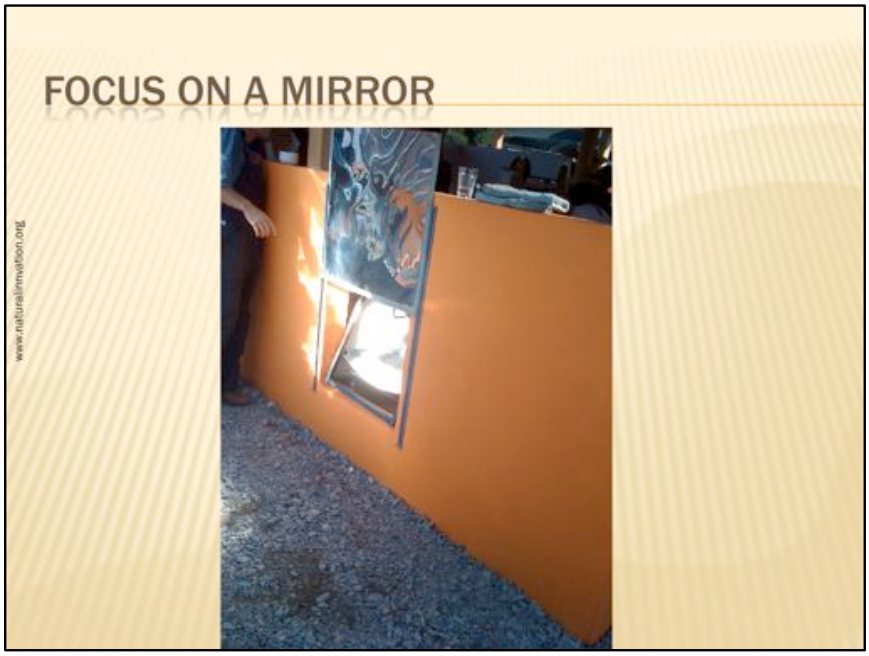
Scheffel Mirrors are lightweight structures, not quite parabola's in that the focal point is off to one side.



Which we see here more clearly

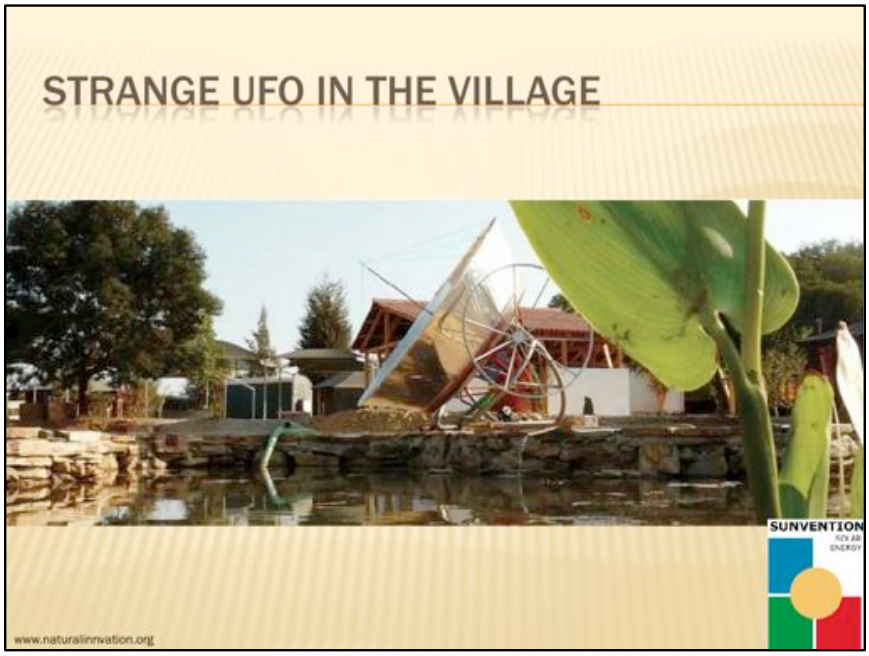


They are made of cheap materials including welded angle iron, bathroom mirroring, and a steering system made from bicycle components.

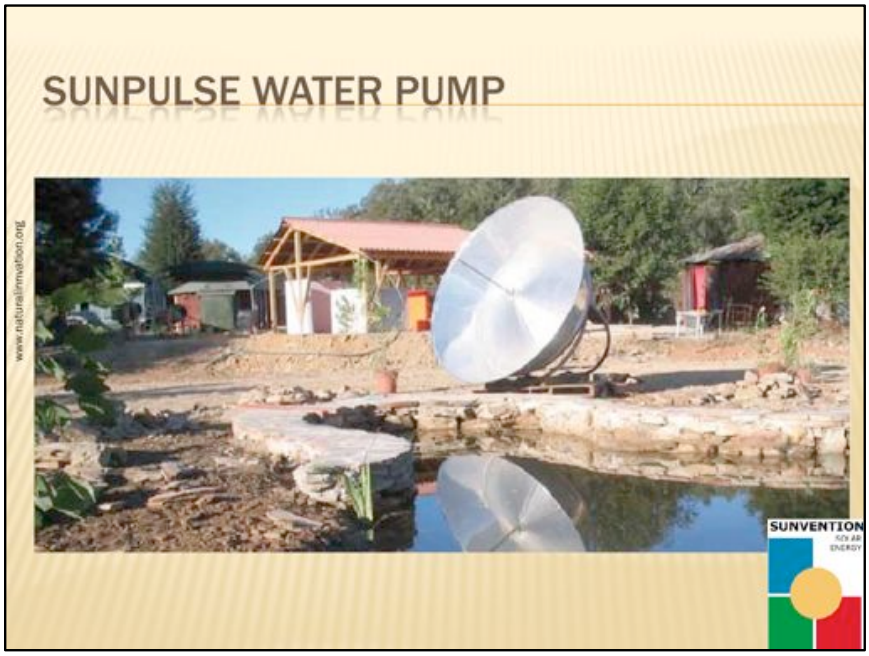


The focal point here is directed onto another mirror

Which is reflected onto cookers, though here we are seeing a cooker driven by the hot-oil from the tank we saw earlier.

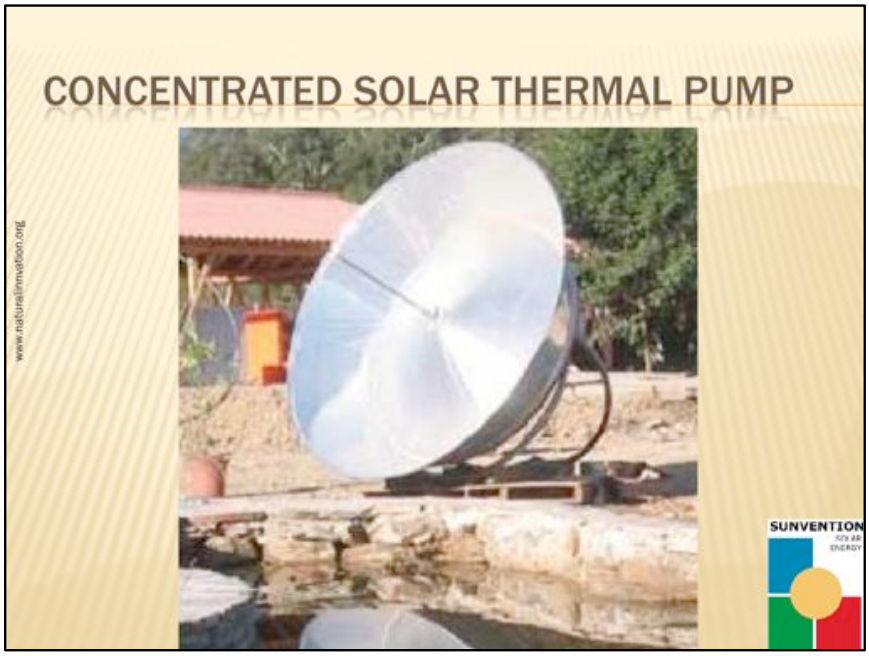


If we looked around the village we'd likely see this strange UFO.



Which is suspiciously close to the pond.

It's the SunPulse Water, which integrates solar thermal collection, a stirling engine and pumping.



In a day, the unit here could pump 80,000 liters from a depth of 10 meters (or 400,000 liters into a field, or 17,000 liters from a 50m bore).

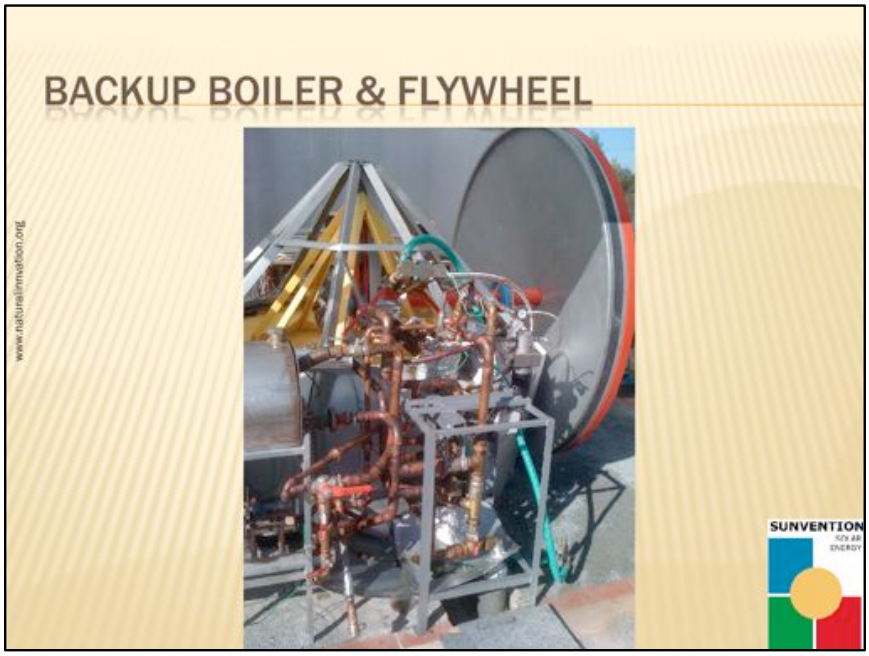
Looking at the rear you can see the static parts (orange) the part that pulses (red) at a slow 1hz rate, and the blue wheel that converts linear in-and-out pulsing into rotary movement which drives the pump (silver).

The key point is that this is field maintainable by any village mechanic, requiring no precision parts, or rare gases or high-pressure seals.

Another UFO found in the village is the SunPulse Electric,

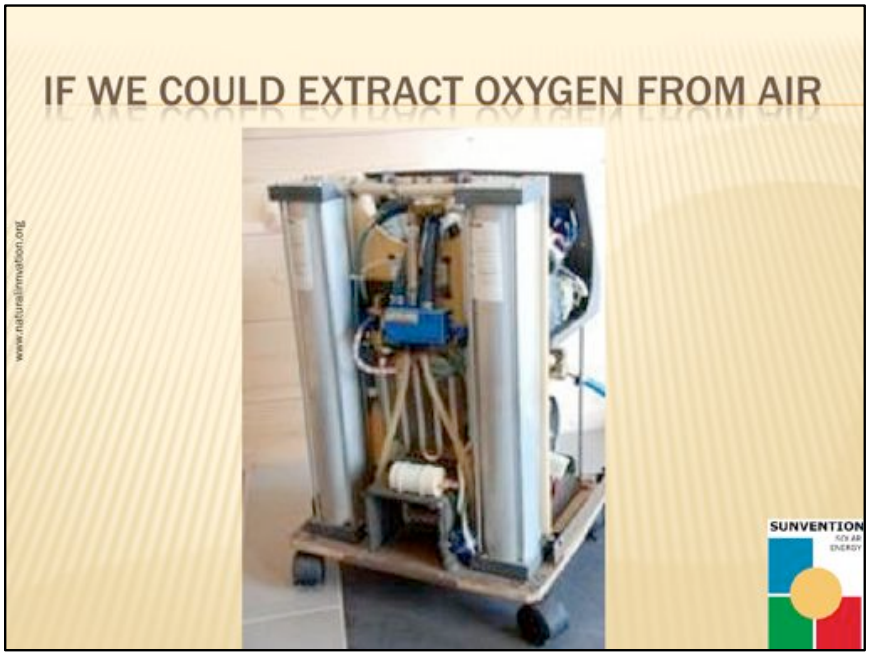
It uses hot oil – as stored from the greenhouse to generate motion and electricity.

With the cover removed you can see a similar mechanism to the SunPulse Water. This one is using about 7.5kw of heat to generate about 1.5kw (electrical),



This is a backup generator – burning a biofuel – that can be used at times when there is no heat stolen.

And connecting all the parts together, you also see the flywheel which makes sure the power is the same at each step of the cycle.



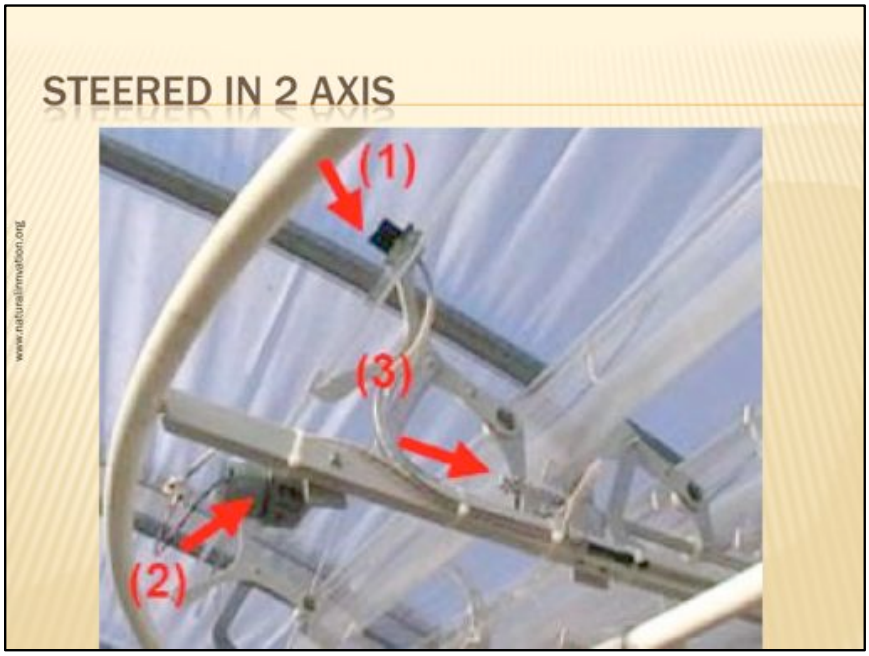
This machine extracts oxygen from air, using heat, it turns out that – unlike getting oxygen out of water – it doesn't take much energy to do this.

The oxygen can be used either to create a very hot flame – notice the white hot flame from burning ordinary wood here – this is useful for high temperature uses such as ceramics where otherwise you'd use energy expensive fans.

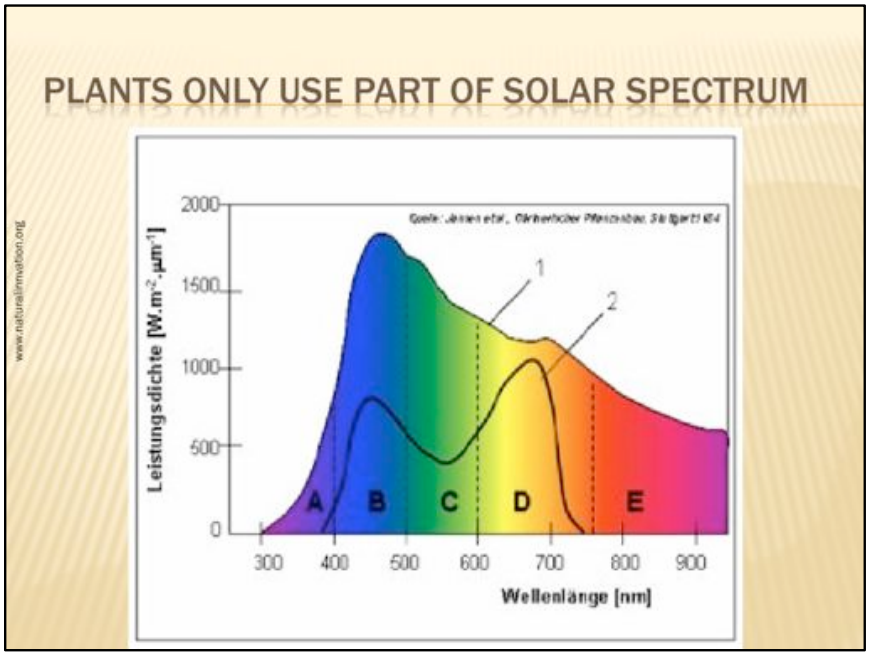
Or … you can burn wet biomass, which is abundant in many places that dry biomass isn't. And the heat from burning the biomass can be used to generate more oxygen.

The third UFO in the village is here in the roof of the greenhouse,

Its similar to the horizontal lenses but sits under any horizontal clear roof.

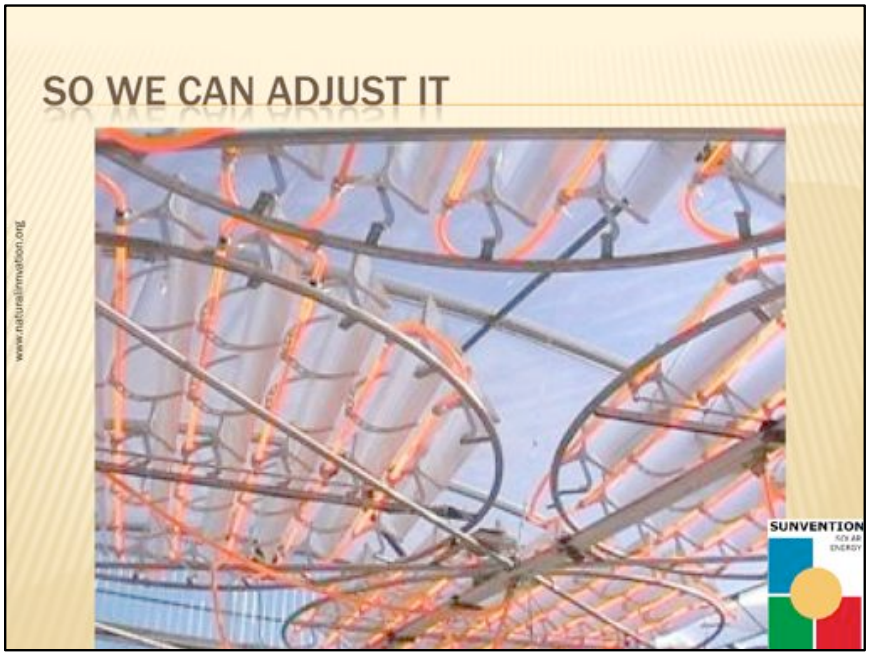


Its steered in two axis – “1” is the sensor, 2 and 3 are tracking motors.



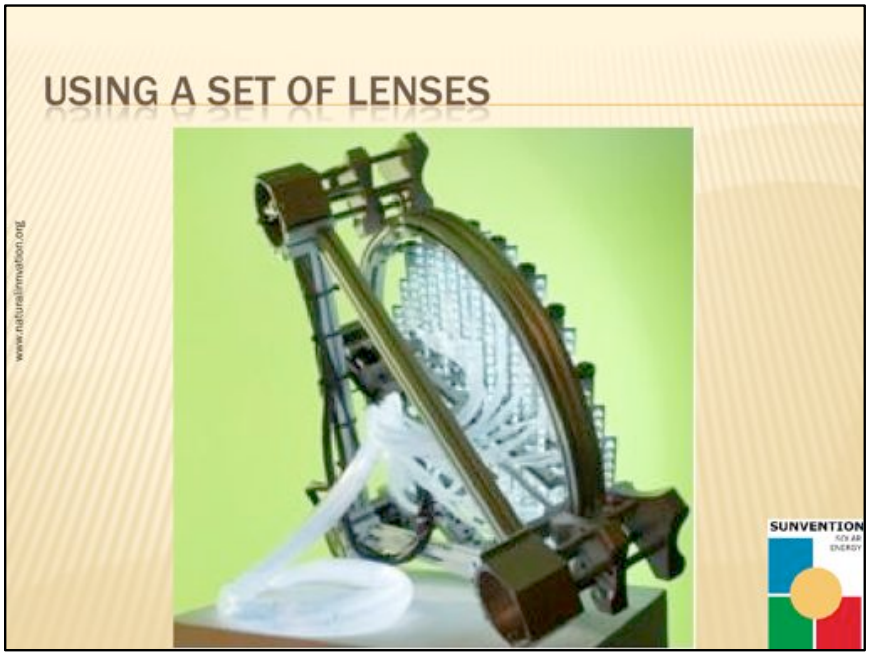
It turns out that plants don't use all the visible spectrum – shown here as the rainbow, you'll see they don't use Green, which is why plants look green.

If we could move the energy from green to red, we could get more light especially in northern latitudes or where light is scarce.



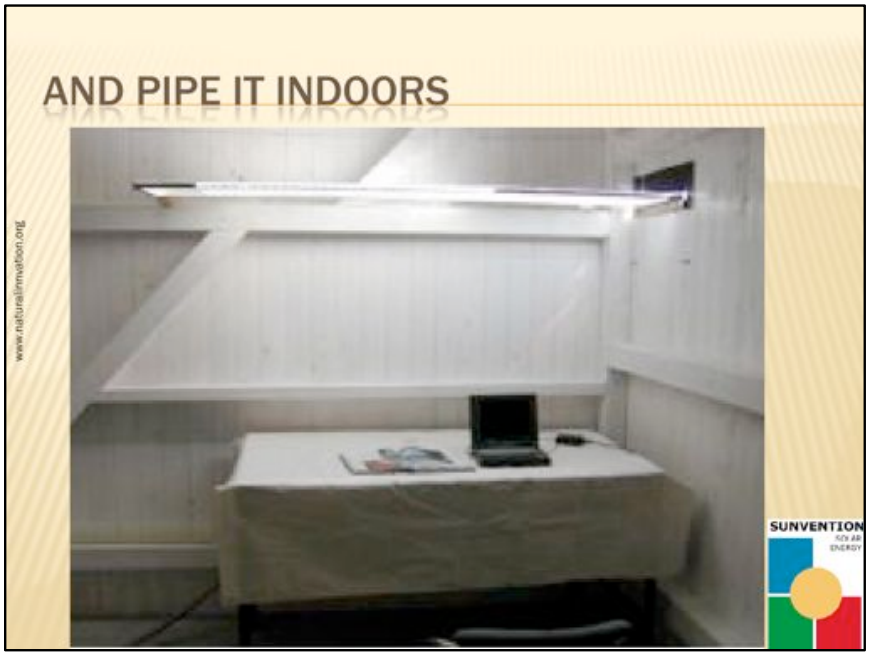
See here where a fluorescing liquid is incorporated in the SunFlower to re-broadcast in red.

Ok – what else could we do with light, much of it is reflected uselessly, what if we could gather it and channel it where we want – such as with this steerable funnel.



Looking inside the funnel we find the “Gecko” where a set of lenses connect to flouro-polymer fibers.

Or here where lenses on an outside structure collect the light.



And funnel it into a room, where its diffused through a clever semi-transparent sheet.

Maybe not quite bright enough for glasses, but a surprising amount of the light is transmitted.

Another use for this light, is to bring it into tanks containing algae,

Growing algae for fuel economically is a problem that is still to solved, but one of the challenges is that algae only grows at the top layer close to the light.

We can use the light-pipes to channel light into the tanks enabling growth throughout the tank.

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