

# NOOR SOLAR PLANT

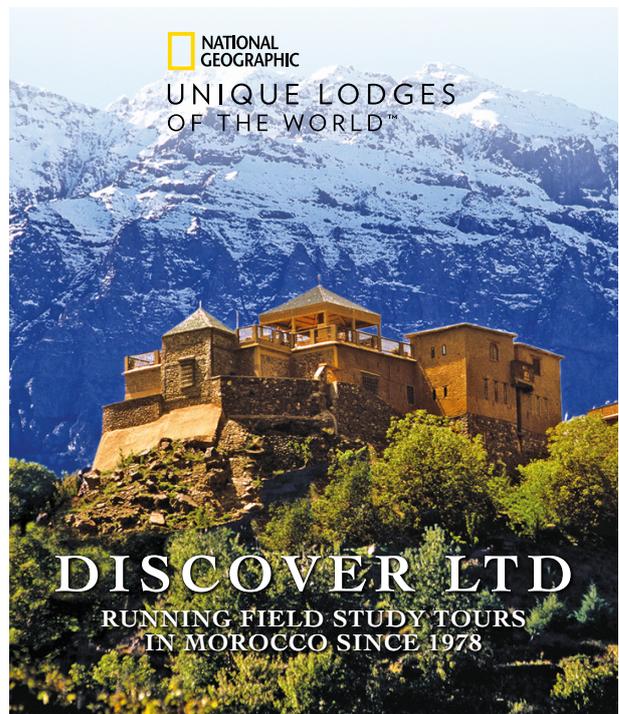
## OUARZAZATE

### OVERVIEW

NOOR: in Arabic it means "light". Capture the energy from the Sun and you have power to light your houses, heat your houses, cool your houses, drive your factories and drive your transport systems for as long as there is a planet Earth. It is almost natural. Clean power? Certainly no polluting gases (oil, gas and coal power) or waste products that cannot be processed or even buried (nuclear power), no permanently destroyed ecosystems (hydro power), no monocultures on land that would be better used for producing food or maintaining biodiversity (bio fuel) and no monstrous turbines scattered over the tops of many of the world's most beautiful wild places which work only when the wind blows between 27 and 56 kph and even then, with at best a 30% level of efficiency, never paying off even their carbon footprint. Infinite electrical energy, day and night, summer and winter at a fraction of the real cost of nuclear power? What are we waiting for? Oh! In Britain? The Sun?

**MOROCCO HAS NOT WAITED** but has constructed the world's biggest solar power station called NOOR, just outside Ouarzazate on the northern fringes of the Sahara Desert. Covering 3,200 hectares (6,178 acres) of dry stony desert land that has no agricultural and little environmental value and creating almost no visual pollution (only a single slim tower construction rising to 243 metres, and claiming to be the tallest tower in Africa, can be seen until you are almost within shouting distance of the mirrors which quietly

capture the incoming light radiation from the sun). It produces 200Gwh of electricity and can do this for up to seven hours AFTER the sun has gone down and will soon be capable of generating electricity throughout twelve hours of night, every night, without resorting to expensive and environmentally polluting battery storage. Is it magic? Is it the holy grail, the Golden Fleece, the never emptying glass of Guinness, or a pipe dream and blatant lies like so many other developments that will "save the world"?





So how does it work? Sunlight is reflected by curved mirrors to heat up water in a pipe which becomes steam which drives turbines which generate electricity. So really just like any other power station, but using the sun directly instead of coal, oil, gas, wood pellets or nuclear fission to generate the heat. But the magic part is that this heat is also stored during the day in wet and dry salt which can then continue to generate electricity after the sun has gone down. And this salt can be used over and over and over again.

You want the technical detail? There is plenty in a new language of physics. CSP, HTF, 130 bars of pressure, parabolic mirrors, heliostats, dry and wet cooling, hydraulic stress, CPV, DNR ..... . NOOR is already a world centre for solar research with experimental installations by Japan, China and South Korea. The tower, NOOR IV, is surrounded by 54 computer controlled sets of mirrors, each the size of a tennis court and containing 399 individual mirrors. NOOR I comprises half a million German built mirrors. Special vehicles had to be designed and built to keep the mirrors clean in a physical landscape which is frequently subjected to sand storms. NOOR also has photovoltaics.



NOOR has been built and is operational, not just on schedule, but ahead of its projected completion date and astonishingly within budget. It has provided employment for male and female technical engineers and labourers in an area where there are few job opportunities for anyone. 7000 jobs in the construction phase and 500 in operational mode, the latter for the next thirty years. It has brought infrastructure to a remote rural area, improving the lives of poor rural communities and thereby reducing rural out-migration. It will have paid for itself completely within 25 years, including interest on loans. Lifespan is estimated to be similar to wind turbines at thirty years, so it will actually be profitable, even without inflation. It is silent.

Perfect? Of course not. It consumes 2.2 million cubic metres of water per year and this is an arid environment with less than 250 mm of precipitation per year. But nearby is the Mansour Dam and reservoir which captures meltwater from the winter



snows of the High Atlas Mountains. Should this not be used for domestic consumption and agriculture? It is. That is why the dam was built, to store water for the date palmeries of the Draa valley to the south. NOOR consumes 0.5% of the reservoir's capacity compared with the 17% which is lost each year through evaporation.

And the real context for Moroccan energy as a whole? Morocco is a rapidly developing economy with no reserves of oil, natural gas or coal. Demand for electricity is escalating yet the country is confident that by 2020, 42% of demand will be met by renewables, with 40% of that coming from solar. Already a second solar plant of similar size is being constructed further north in the Middle Atlas Mountains near Midelt. Also on non-agricultural, non-personal or communal land and closer to the larger urban populations in northern Morocco.

So, no waste to dispose of, no air, water or land pollution, no noise, almost no visual impact. Electricity day and night, summer and winter. NOOR. Light. It does what it says on the tin. It lights Morocco at a

realistic cost, financial and environmental, which is more than can be said for Britain's efforts with wind turbines, biofuels and nuclear. Would investment in tidal power on a small island with thousands of suitable estuaries and bays have been a more enlightened approach?

The future? There were plans a few years ago to build a series of similar solar power stations in a line through southern Morocco, Algeria, Libya and Egypt to provide domestic electricity and have a surplus to export to Europe. The consortium pulled out after the disruption and unrest following the Arab Spring and the rising tide of terrorism. Only Morocco has persevered but the success of NOOR might just be an example to encourage others. Meanwhile, when you are at home or school, switch lights off, turn the central heating down and wear a jumper, walk or cycle rather than drive, use public transport, talk to others less well informed and set an example. As Morocco has demonstrated with NOOR, it is astonishing how much can be achieved when there is a will.

**Written by Trevor Rowell**

*With special thanks to everyone at NOOR and especially Mustapha Sellam, the Site Director.*



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