governments are going to have most of the responsibility for building resilience and vulnerability reduction. They have to work with those who are at risk. Most are incapable of doing so or choose not to do so."

One thing we must not forget is that our population situation could be much worse, says Hania Zlotnik, director of the Population Division at the UN Department of Economic and Social Affairs. Family planning programmes around the world have helped birth rates to fall much more quickly than if left to their own devices. "We could have ten billion, and we only have seven," she says. "If there's an area where there has been incredible success, it's population."

But even though ours could have been a more crowded planet, our current running total of seven billion is still a formidable number. "Providing resources for those people to live well is already a challenge," says Zlotnik. ❐

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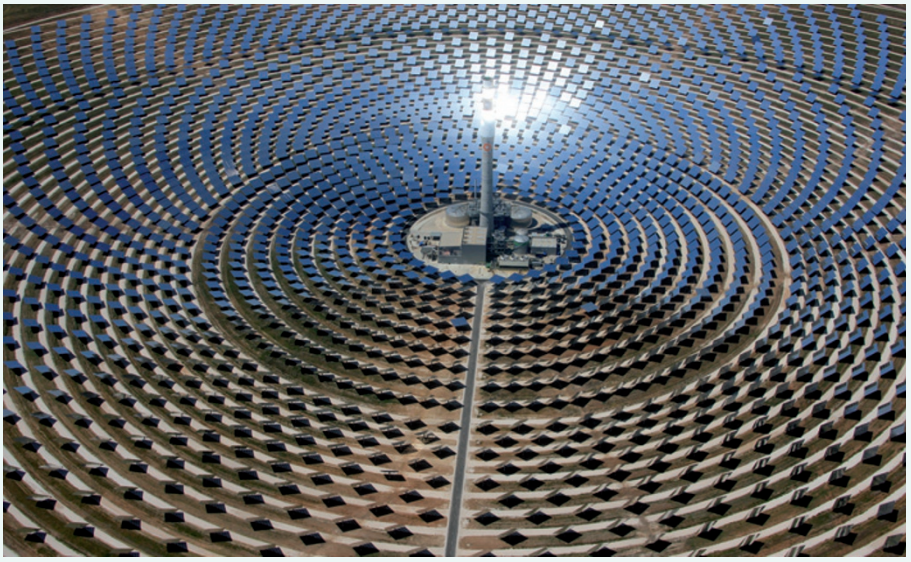
SNAPSHOT

A diamond in the rough

The first solar power plant that is capable of providing uninterrupted electricity generation throughout the day and night has started to supply the Spanish grid from a location near Seville, in Andalusia.

The Gemasolar plant jumps out of its semi-arid farmland surroundings like a giant patch of sequins. It is composed of a central tower, standing at 140 metres tall, and 185-hectare field of 2,650 carefully arranged flat mirrors, known as heliosats. These focus the Sun's rays onto a receiver at the top of the tower. Nitrate, pumped up the tower from a tank, circulates inside the receiver, where it is heated quickly and intensely to 565 °C, before being sent to the plant's hot storage tank. When the grid demands power, nitrate in the hot storage tank is pumped to a heat exchanger, which, as in traditional power stations, generates steam that turns a turbine, and produces electricity.

This system can supply continuous power for 15 hours after the Sun has set on a summer day. Furthermore, it produces a more even supply of power than photovoltaic solar cells — the effect on power output of a large, dark cloud that obscures the Sun is both damped down and delayed for between 6 and 15 hours. Most solar plants heat oil, which doesn't get as hot as nitrate, so they can't generate as much after-dark energy. Gemasolar's output, however, can be varied according to the regional grid demand, which peaks shortly after sunset, says Oihana Casas, spokesperson for SENER engineering group, majority shareholder of Torresol Energy, which owns Gemasolar.



Gemasolar's 19.9 MW turbine is expected to meet the electricity needs of 25,000 Spanish households through the substation of Villanueva del Rey. Were the same amount of energy to be produced by burning fossil fuels, 218,000 barrels of crude oil or 38,600 tons of lignite (low-grade coal) per year would be needed, emitting 30,000 tons of carbon dioxide.

Similar projects to Gemasolar are in the pipeline, but most are planned for the western United States where renewable-portfolio-standard targets have strongly encouraged utility companies to sign deals with solar developers.

In October 2010, a company called BrightSource Energy, based in Oakland, California, started building a solar plant about five miles from California's border with Nevada, in the Mojave Desert, that will make Gemasolar look puny. Ivanpah One, as the plant is known, will have 173,000 heliosats and supply 140,000 homes. BrightSource has even more ambitious plans for a 3,277-hectare patch of land 45 miles west of Las Vegas, Nevada. There, CEO John Woolard says he wants to build a truly massive central tower, almost 230 metres high, and create a solar plant with twice the power-generation capacity of Ivanpah One.

ANNA PETHERICK