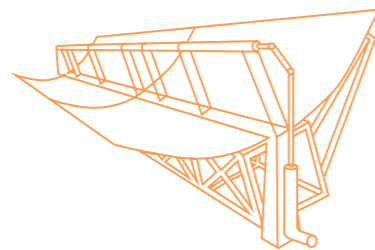


CATCHING MORE SUN

A drone flies steadily over the parabolic troughs of the Spanish Andasol solar power plant. Using a measuring camera, it captures every square centimetre of the mirrors from different angles. The mirrored parabolic troughs of the solar power plant have a total length of 90 kilometres, so it takes the drone two hours to complete its flight over the solar field, which has an area equivalent to 450 football pitches. The images are later assessed in detail by a computer program. Employees at the DLR spin-off CSP Services GmbH use such measurements on behalf of their customers to assess how efficiently the collectors in a solar field concentrate light, and how their operation can be optimised.



DLR spin-off company CSP Services has been optimising solar power plants for over 10 years

By Dorothee Bürkle

The Sun supplies the raw material for a solar power plant. The more precisely the mirrors concentrate its radiation, the more electricity the plant can feed into the grid. Based on these checks and the subsequent optimisation – for instance through the precise alignment of the collectors – CSP Services can increase a plant's yield by several percent. For the plant operators, this means important additional revenue in a highly competitive market. The measurement procedure and associated software QFly come from a DLR development project and has recently been licensed to CSP Services. "What would once have taken months can now be achieved in just a few days. That is an advantage that we now want to offer our customers all over the world," says Klaus Pottler, one of the two managing directors.

Expertise in the development of solar power plants

CSP Services was spun out of DLR in 2007 as a global service provider aimed at optimising solar power plants and increasing revenue. Since then, the company advises manufacturers, plant operators and investors on concentrating solar power plants and offers measurement techniques to inspect plants. The spin-off is based on licences, expert knowledge and results from the energy research conducted at DLR. As early as the 1980s, DLR began research on what are known as concentrating solar power (CSP) systems.



Fast data acquisition from the air. The parabolic mirrors of a solar power plant are measured using the flying camera system QFly. With the data, operations can be optimised and the yield can be increased.



The methods for the optimisation of solar power plants were developed within DLR's energy research programme. CSP Services is offering plant operators the licensed procedures.



In parabolic trough systems, curved mirrors reflect the Sun's rays onto a line in the focus of the trough. Located at this line is the solar receiver, which converts sunlight into heat. In solar tower power plants – which are used as an alternative – the Sun's rays are concentrated onto the top of a tower by a field of dual-axis tracking mirrors (heliostats). From this point onwards, a solar power plant functions in a similar way to a conventional gas- or coal-fired power plant, using heat energy for electricity generation. In this area of technology, DLR scientists have helped industrial partners to develop key components, such as mirrors and receivers.

Expert knowledge in demand by power plant operators

With their many years of expertise, DLR researchers have become increasingly important points of contact for plant manufacturers, operators and investors. "In 2005, when Spain started to promote solar power plants with high feed-in tariffs, there was great demand for DLR's expertise, and enquiries became more frequent," recalls Steffen Ulmer, founder and joint Managing Director of CSP Services and formerly a DLR researcher. It soon became clear to his former working group that these requests from industry could be better served by a spin-off company dedicated to that purpose. It was a great success that renewable power generation technology co-developed by DLR entered the market. The demand for their measurement technology grew. However, offering consulting services and optimising commercial power plants do not fit with the tasks of a research institution in the long term. At this point, three DLR energy researchers – Eckhard Lüpfer, Steffen Ulmer and Klaus Pottler – took the plunge and, together with two other partners, founded a company of their own. They received support from the Helmholtz Enterprise Funds (HEF) and DLR's Technology Marketing department and were awarded for their business plan with two major prizes by the start-up initiative Neues Unternehmertum Rheinland e.V. (NUK).

Despite this vote of confidence, the founders had their doubts: "We started out as researchers and wanted to tackle the subject in depth. Becoming entrepreneurs was not actually part of the plan," Ulmer recalls. Yet there was a lot to be said for taking this step: "We already

had our first customers, the industry was in an optimistic mood, we had good support from the DLR Technology Marketing department and an important safeguard: last but not least, a measure of security – we were able to reduce our work load at DLR, but initially retain our positions there."

This was followed by a period of intense work. In 2008, the founders opened two offices – one at DLR's headquarters in Cologne and the other near the Plataforma Solar de Almería (PSA) – the 'Silicon Valley' of solar energy research in southern Spain. The photogrammetric 'QFoto' 3D-measuring technology, which the founders had developed at DLR, was licensed to CSP Services by DLR and used commercially for the first time in an order for the Spanish power plant builder Abengoa. "Many things were new to us," Ulmer says in retrospect. "We had to focus on quite mundane things like offices and operational infrastructure, while also negotiating international contracts and familiarising ourselves with tax and insurance laws. Our systems were only available as prototypes, so we had to make them failure-proof and viable for industrial use. And on top of all that, we were also looking for new staff members."

Pottler remembers one of their first orders, which involved installing a measurement system for the quality assurance of the series production of collectors at the Kuraymat solar power plant, near Cairo in Egypt. The system was set up and ready to go, and their return flight for the following day had been booked. But when the backup copy was being created, the measurement computer malfunctioned and had to be restarted overnight. "We worked throughout the night under emergency lighting to fix the fault. The system was rebuilt by dawn. At one point during the night, the watchmen – hired Egyptian farmers from the area – invited us to sit at their campfire. We had a cup of tea together under the vast, starry Egyptian sky." Pottler is keen not to miss out on such experiences: "Contact with other cultures, religions and languages in far-flung rural areas of the world is at least as interesting as our work with solar technology."

In addition to handling their first orders, the entrepreneurs developed new measurement techniques during this phase. In 2009, CSP

expanded its range of services and launched the first automatic weather stations and the 'QDec' system – also licensed by DLR – onto the market. With their order books full, the founders and some other DLR employees also won the SolarPACES Technology Innovation Award in 2009, as well as the DLR Innovation Prize from the Gesellschaft von Freunden des DLR. In 2012, the company was nominated for the German Entrepreneur Award.

Sudden change – collapse of the Spanish market

At first, the start-up only experienced growth, and two and a half years after the foundation, it had 20 employees and was continuing to expand. But 2012 marked a turning point, when the Spanish government cut subsidies for solar power plants, even retroactively, in the wake of the economic crisis. Solar power plants were no longer lucrative, and the Spanish market largely disappeared. The economic crisis in Spain hit at a time when the market in North African countries was not developing as well as had been hoped as a result of the Arab Spring. In addition, investors preferred photovoltaic systems, which were rapidly becoming less expensive. "This was a pretty tough time of consolidation," Ulmer says. "Luckily, our customers were able to expand their business in countries like the United States, South Africa and Chile, so while order intake dropped, our company was able to keep on running." CSP Services shrank from about 30 staff members back to 20. At the same time, the company was also gaining new customers, particularly in China, where a programme for CSP power plants was launched. "Our strong position within the market saw us through this crisis in the end. If a power plant builder or investor is looking for sound quality assurance, then there really is no alternative to our offering," Ulmer says confidently.

An optimistic outlook

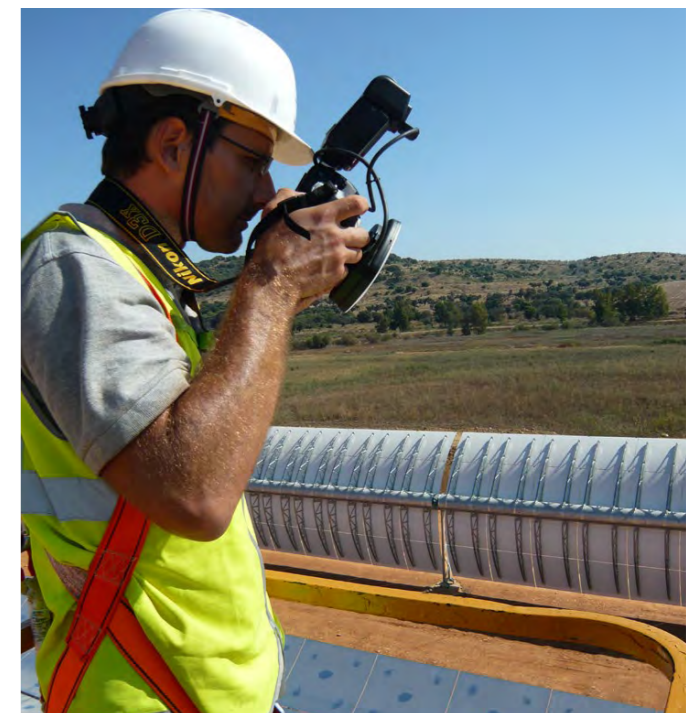
Currently, CSP Services – like the whole sector – is again more optimistic about the future. In Dubai, large CSP plants can now generate electricity for base loads at lower prices than gas-fired plants. Investors are increasingly appreciating the benefits of thermal solar power plants, which can produce round-the-clock electricity thanks to low-cost thermal storage, even though the technology still entails higher generation costs than photovoltaic systems. "There is growing recognition that we need controllable solar power plants to provide a higher proportion of energy from renewable sources," Pottler says. "In addition, a number of well-performing power plants have been constructed in the meantime. This means that investors see the risk as being far lower, so financing conditions have improved."

Global player with sleepless nights

The company's founders do not regret taking the step into self-employment one decade ago. "We established ourselves in the market, made a name for ourselves in the industry, and have gained confidence as a result," Pottler says. Today, the founders are working in an international environment and have come to know and understand different cultures and business practices. "In China, everything appears different at first and the language barrier is difficult to overcome, but when you look closer, you see that there are many parallels. Even there, company employees cannot fill up the fuel tank without getting a receipt for expenses," Pottler adds with a smile. Their wealth of experience makes up for the fact that they sometimes have to work around the clock and also on weekends: "Our customers often come from different time zones, and their public holidays do not coincide with those in Germany or Spain." But this is outweighed by the positives, Pottler explains: "We are free to decide how CSP Services will proceed in the future and what our priorities will be. As entrepreneurs, we have learned how to make decisions and we do not want to give up that kind of freedom."



Working where the Sun shines – CSP Services also opened an office in Almería, southern Spain.



Quality assurance from a height of 10 metres – the camera is always there to measure with sub-millimetre precision.



CSP Services Managing Directors Steffen Ulmer and Klaus Pottler: "We have learned to make decisions as entrepreneurs."