GÉANT

global collaboration

GÉANT and CAREN: delivering a brighter future for Turkmenistan

High-speed networks underpin solar technology collaboration between Central Asia and Europe

Developing alternative, greener energy sources is a key priority across the world. However many countries simply don't have the infrastructure and skills needed to create renewable energy industries from scratch. Technology, and in particular research networks, can help develop these skills, transferring knowledge to train a new generation of local engineers, making it possible to harness freely available natural resources.

Focus on solar power

The government of Turkmenistan has made solar power its strategic focus and to develop the engineering skills and technology needed it is working closely with European experts to deliver distance learning, skills transfer and solar cell performance monitoring. All of this information and data exchange relies on the high speed, capacity and reliability of the pan-European GÉANT and Central Asian CAREN research networks, enabling seamless intercontinental collaboration.

Solar collaboration began in 2009 with a three year, EU-funded TEMPUS project. This brought together experts from universities in Spain, Germany and Portugal, sharing know-how with their counterparts at the Gün (Sun) Institute. This is the centrepiece of the Turkmen solar programme and has been created by the Turkmenistan Academy of Sciences which also runs the TuRENA academic network. The project aimed to bridge the skills gap, training local engineers through distance learning as well as laying the foundations of larger scale international collaboration.

The Challenge

Help to develop the solar power industry in Turkmenistan through skills transfer and performance monitoring.

The Solution

The high-speed GÉANT and CAREN networks enable close collaboration between European and Turkmen institutions, creating a powerful e-learning platform to train local engineers and enabling the real-time transmission of solar performance monitoring data.

Key Benefits

Turkmenistan's Gün Institute has developed into a centre of excellence in solar power, with over 700 people trained, creating the foundations of a vibrant local solar industry.

CAREN   TuRENA   DFN Deutsches Forschungsnetz   FCCN Fundação para a Computação Científica Nacional / Foundation for National Scientific Computing   TUHH Technische Universität Hamburg-Harburg   universidade de aveiro

Real-time performance monitoring

The project's first objective was to study the local performance of solar technology through the Gün Institute's solar pavilion which provides a real-time testbed to study the effects of temperature, radiation, wind speed and dust on energy production. An integral web box measures data on metrics such as solar strength, power output, temperature and atmospheric conditions.

Sharing this information with European researchers continuously during daytime hours is vital, allowing real-time operational changes to be made locally to the equipment to maximise performance. GÉANT and CAREN provide the international and regional links to safely transfer this data in real time from TuRENA to European researchers, without any interruptions, network congestion or data loss that could disrupt results.

e-training: taking the distance out of distance learning

The project used the knowledge gained through performance monitoring to create e-sapak, an ICT-based e-learning platform that allows specialists from Europe to train local engineers in solar technology skills. Through e-sapak, which relies on the TuRENA, GÉANT and CAREN networks, the latest content, lessons, video conferencing and learning resources are quickly delivered from Europe to Turkmenistan. Since its introduction over 700 people have been trained, providing a core of skilled local personnel.
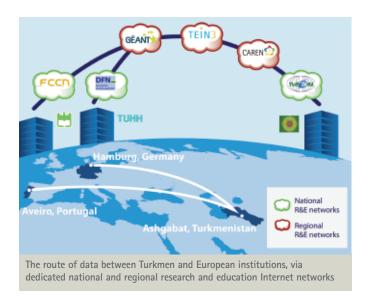
The initial three year TEMPUS project has ended, but the collaboration between Turkmen and European scientists is only just beginning. Both groups are studying the performance of the solar testbed, with local students carrying out post-graduate research and colleagues in Europe conducting data analysis to shape future developments. Real-time performance data will be integral to a planned advanced control and monitoring system, which will allow operational changes to be made remotely (from both Europe and Turkmenistan) to ensure smooth running of the solar panels.

Together, the combination of e-learning and monitoring is enabling Turkmenistan to build a vibrant solar power industry. All of this relies on high-speed networks to enable the transfer of knowledge and information, bringing Europe and Turkmenistan together to deliver green energy.

The route of data between Turkmen and European institutions, via dedicated national and regional research and education Internet networks

> **This project provides a perfect opportunity to study the performance of solar technology in Turkmenistan's unique climate. Working with our colleagues we can see how solar equipment functions in very different conditions to Europe, enabling us to improve operational efficiency. To do this, monitoring data must reach Europe quickly and reliably, which makes the GÉANT and CAREN networks critical to our success.**
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> *Prof. Dr. Hanno Schaumburg, Hamburg University of Technology (TUHH), Germany*

> **Developing an innovative solar power industry is a key strategic goal for Turkmenistan. Collaboration is essential – GÉANT and CAREN are at the heart of our partnership with European institutions. It is enabling us to create a centre of excellence in green power that will benefit Turkmenistan, the wider region and the whole renewables sector.**
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> *Prof. Amansahedov Charyyar, Head of TuRENA, Turkmenistan*

connect • communicate • collaborate

The world is criss-crossed with high-capacity data communications networks, connecting and serving research and academic institutions across the globe. The most advanced of these is GÉANT, serving Europe. GÉANT interconnects with counterparts across the world, such as CAREN in Central Asia to enable international research collaboration.

Separate from the public internet for reasons of security and performance, many of these networks are designed, deployed and run by the networking organisation DANTE and make an enormous practical contribution to research in a wide variety of areas – saving lives, building knowledge, establishing realtime collaboration between scientists all over the world.

GÉANT and CAREN provide Turkmen solar researchers with the ability to work closely with colleagues in Europe, sharing data and enabling skills transfer through e-learning. This requires a combination of high speed, high capacity, reliable links to connect project participants in real-time and without access to the GÉANT and CAREN networks this seamless collaboration would not have been possible.