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Clean energy solutions offer new spark for Europe's small island nations

Malta and Cyprus team up with larger EU countries to increase their clean energy capacity.

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For many Europeans, Cyprus and Malta represent a distant Mediterranean paradise. But despite their sunny climate, the two are less able to capitalise on their wealth of sunshine and potential clean energy than one may expect.

One solution has been for these small island nations to partner up with expert research partners from bigger EU countries, which are largely ahead in moving toward a low-carbon economy and clean mobility.

Professor George Georghiou and his team at the FOSS Research Centre for Sustainable Energy at the University of Cyprus have been working since 2016 alongside fellow researchers from the Austrian Institute of Technology (AIT) and the Technical University of Denmark (DTU) – both established experts in the field of photovoltaic (PV) and smart energy grids – as part of an EU-funded research initiative called TwinPV.

Their shared goal was to explore how Cyprus could better use PV energy to meet its growing electricity needs and drive research and innovation linked to this renewable energy resource.

The research partners ran a number of case studies focused on the entire solar energy cycle, from PV cells and energy storage to smart electricity grids and energy forecasting. The overall aim was to find ways to use more renewable energy on the island and end Cyprus' reliance on crude oil. This required addressing challenges unique to small island nations like Cyprus.

Power of the sun

Cyprus receives more than 3 300 hours of sunlight per year, which makes it an ideal place to harness solar energy. Yet, it still imports most of its energy, in the form of fossil fuels. In 2019, just 13.8% of its energy came from solar and wind energy, well below the 19.7% European average, according to Eurostat. The obvious question is: why?

The challenge is that renewable energies, such as solar energy, are unpredictable and do not allow the country to react to its changing energy needs. On average, Cyprus receives four million tourists annually, most of them arriving during a few short months. Energy needs on the island then surge from 300 megawatts in the spring to 1 200 megawatts.

Methods for storing renewable energy are still complicated and costly, making it difficult to use it as the primary energy source. A significant amount of surplus energy is therefore not stored for later use, but is instead lost. This is because there is as yet no connection with power grids in mainland Europe, making it hard to export surplus energy.

'In the rest of Europe, if you produce a lot of electricity, you can always send it to a neighbouring country, but Cyprus is an island, not connected to the European energy market,' explained Georghiou. 'We cannot transfer our energy, and we also cannot store it because it is too costly.'

As a result, Cyprus primarily relies on three fuel oil-burning stations, and electricity prices in the country are constantly rising, leaving much of the population threatened by energy poverty.

'Cyprus is an isolated network, which makes it difficult for the country to rely solely on solar energy,' said Georghiou.

Capacity building

The help of more experienced partners was crucial and Georghiou acknowledges that the TwinPV collaboration contributed significantly to building research capacity in Cyprus.

'We gained a lot of knowledge and expertise from our more advanced partners. The project helped us to expand our capabilities and produce relevant research into solar energy, smart grids and the integration of renewable energy sources.'

One significant result for Cyprus was the upgrading of the FOSS research centre into the PHAETHON Research and Innovation Centre of Excellence (CoE) for Intelligent, Efficient and Sustainable Energy Solutions starting in 2024. This transformation, supported by the EU, will create a new regional CoE in sustainable energy.

It has also led to plans to turn the University of Cyprus campus completely 'green', said Georghiou. A major new solar park with battery storage is currently being built, which should meet a significant part of the university's electricity needs.

Overall, the use of distributed renewable energy is expanding in Cyprus, which hopes to boost its share of renewable energy to 23% by 2030 as part of its National Energy and Climate Plan. Promisingly, the number of photovoltaic systems in Cyprus rose by 66% in 2023 and this trend is expected to continue.

Even though TwinPV ended in December 2018, all the researchers involved have continued to work together.

'We have formed strategic partnerships and created a win-win situation,' said Georghiou.

eMobility connection

On the western side of the Mediterranean Sea, Dr Brian Azzopardi, senior lecturer at the Malta College for Arts, Science and Technology (MCAST) and founding chair of the MCAST Energy Research Group, tells a similar story.

As part of another EU twinning project, NEEMO, which ran for four years until 2023, Malta has been able to significantly boost its research into electric mobility and clean energy.

As part of this collaborative effort, MCAST also joined forces with the Austrian Institute of Technology (AIT), as well as with the French Alternative Energies and Atomic Energy Commission (CEA) and the Nicosia Development Agency (ANEL) in Cyprus.

‘The purpose was to enhance and build research capacity in electric mobility – or eMobility – and its operations in Malta,’ said Azzopardi, who coordinated the project.

The NEEMO experts investigated the specific challenges for eMobility in Malta, including its physical limitations. As the island is only 27 kilometres long, most journeys are short and there were not enough charging points, particularly during the busy tourist periods.

NEEMO’s focus on micromobility solutions aimed to help improve access to transport for all citizens, including those with limited mobility or limited access to public transport.

‘We cannot solve all problems of eMobility, but we made substantial contributions to ongoing research,’ said Azzopardi.

This included research work into so-called bidirectional power flow. This is when charging goes both ways – into the vehicle, as the primary aim, but also allowing electricity stored in the EV’s battery to flow back to a house or the power grid. This can help stabilise the grids, particularly as they restart after blackouts.

‘This benefits our inhabitants because it helps to improve conditions for electric mobility, which is becoming increasingly popular here in Malta,’ he said.

In parallel with the work of NEEMO researchers on e-Mobility, the Maltese government has tapped into EU funds to roll out new grants for the purchase of electric vehicles. The island’s transport authority reported last August a ‘significant increase’ in the sale of electric and plug-in hybrid cars.

Foundation for research

Like TwinPV, the international collaboration initiated through NEEMO has led to significant advances in the research and innovation capacity of the island. In particular, through the launch of the Foundation for Innovation and Research Malta (FiR.mt), which has helped to bridge the gap between industry, research and the academic community, said Azzopardi.

‘Until the establishment of FiR, there was no research centre in Malta,’ said Azzopardi. ‘This has definitely been a success, especially in terms of research capacity building.’

Azzopardi also credits NEEMO with the fact that Malta’s MCAST college was accepted into the European Automotive Research Partners Association (EARPA), which brings together Europe’s most prominent independent R&D providers in the automotive sector.

‘All this is the legacy of NEEMO. The collaboration jumpstarted a lot of initiatives,’ he said. In return, Malta offers unique opportunities for larger EU countries he believes.

‘Malta is manageable and reachable. It offers a good environment for nationwide research experiments, which can then be deployed on mainland Europe.’

Both Georghiou and Azzopardi concur that these international partnerships, which proved crucial for reducing the gap in research with more advanced countries, would have been difficult without EU funding and support.

‘There is a lot of talent in our countries, but sometimes a little bit of guidance is needed,’ said Georghiou.

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- NEEMO
- EU Twinning for research
- EU energy research and innovation