Dr Daniele M Trucchi is the coordinator of a project that seeks to create, validate and implement a highly efficient means of converting solar energy into electric energy. Below, he discusses challenges his team has overcome and the impact he hopes the project will have.

What are the key goals of the Production Method of Electrical Energy by Enhanced Thermal Electron Emission by the Use of Superior Semiconductors project (ProME3ThE2US2)?

The main goal of ProME3ThE2US2 is the development of high temperature solar cells that can provide high efficiency in solar concentrating systems. Standard solar cells have a low efficiency and, when operating at higher temperatures, can experience a further significant reduction in efficiency. What we are proposing with ProME3ThE2US2 is a completely new concept for a solar cell.

What inspired the name of the project?

I have always liked the idea of linking my interests in classic literature (spanning from the ancient Greek and Roman period through to 19th Century Russian novelists) to my passion for photoelectronic devices. I achieved this combination by applying acronyms to two European projects – one entitled Ephestus [a reference to Hephaestus, the Greek God of fire and technology], and another Prometheus. Both represent a particular attitude pertaining to the proposed innovation.

As Project Coordinator, can you explain what your key responsibilities are?

My duties include controlling the ongoing activities and the quality of results – smoothing every possible technical, scientific and management issue and providing a longer-term scientific vision to the consortium. As the Project Coordinator, I consider it a priority to personally communicate with the people working in my group and other organisations in the consortium. It is not always a simple task. Sharing information with all the collaborators quickly, convincing them about certain strategies, putting negative events into a positive light and, when necessary, being intransigent are all vital actions and attitudes for obtaining credibility. Another important consideration is finding a compromise between possible activities and the available budget.

How have you surmounted the challenges you face in your work?

The challenges in my work are continuous and sometimes insidious. Indeed, in R&D, a very fine line separates an excellent result from a technical or scientific defeat. Being devoted to the project and combining good methodology with creativity are essential in overcoming the challenges. I genuinely believe creativity is an important added value to the success of this project.

One challenge in ProME3ThE2US2 was to create a material able to withstand high temperatures, emit electrons efficiently and interact with sunlight. While both synthetic and natural diamonds are excellent at satisfying the first two conditions, they are transparent and so cannot be considered a useful material for converting sunlight. Nevertheless, with a sagacious use of nanotechnology, we developed black diamond – an incredible material capable of absorbing the solar radiation by maintaining the same physical properties of diamonds.

What do you hope the impact of your research will be?

My hope is to demonstrate that high-temperature solar cells are feasible and possible, thereby encouraging more and more companies to join forces with us to facilitate the realisation of their potential. I think that in ProME3ThE2US2 we have achieved several important results that should be adequately disseminated to attract the attention of stakeholders and investors.
The myth of Prometheus still radiates inspiration

ProME3ThE2US2 is a three-year project that aims to develop novel solar energy conversion technology. The team behind it is laying the foundations for future high-temperature solar cells that can operate efficiently and overcome the limitations of current technologies.

IN GREEK MYTHOLOGY, Prometheus is a Titan who stole fire from Mount Olympus then handed it over to mankind. The figure and myth of Prometheus has proved inspirational for many creators, with time; a poem by Shelley, a lyrical drama by Beetho, a tale by Kafka. This great protector and benefactor of mankind has proven grist to the mill of artistic endeavour over time; a poem by Goethe, a lyrical creation over time; a poem by Goethe, a lyrical creation.

Solar radiation provides an important means of satisfying the energy demands of Earth, though capturing it effectively and efficiently has proved beyond the scope of technology for a number of years. The ProME3ThE2US2 project has been established to develop greater methods and materials for converting concentrated solar radiation into electrical energy. Solar radiation is the largest energy source we have on Earth. Its more efficient and diffused exploitation means a higher energy availability with a minimal contribution to CO2 formation. The team’s black diamonds are exploitable for other electronic applications.

(CAPTURING ATTENTION AS THEY HAVE THE SUN)

Armed with this important, potentially revolutionary technology, the consortium aims to build upon its solid foundations until its maturity in the next few years. The hope is that by demonstrating the technology’s effectiveness and feasibility for solar radiation absorption, industrial partnerships will be formed to realise the potential of these exciting developments. Novel technologies for energy conversion are not acquiring the adequate attention by investors,” explains Trucchi. “The low price of petroleum and other hydrocarbon sources influences attention on economically safer, but far more polluting, investments in the energy market.”

However, the consortium is confident that, once the hydrocarbon prices increase, they will inevitably wish, interest in their technologies will significantly increase. Ultimately, the ProME3ThE2US2 project has already stolen the interest of several industrial, Italian and European R&D projects.

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DANIELE M TRUCCHI has a PhD in Electronic Engineering. Since 2002, he has organised the technical-scientific activity of the EU project ‘Diamond’ for Consiglio Nazionale delle Ricerche (CNR), with activities focused on the design and development of electronic devices and energy converters. Since 2010, he has managed the CNR DiaC2 Lab, where he coordinated the activities of the FP7 project E’PHESTUS, focused on the development of innovative conversion modules for solar concentrating systems. He was then Coordinator of the FET project ProME3ThE2US2 and of several industrial, Italian and European R&D projects.

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OBJECTIVE
To develop improved systems to convert solar energy into electric energy.

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