FOURIER

PRESS RELEASE

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FOURIER project: innovation and sustainability for the energy transition

In a context of profound transformation of the national energy system, driven by European and national policies to fight climate change and relaunch the economy after the crisis caused by COVID-19, rising prices, and the consequences of the war in Ukraine, there are great opportunities for the development of the Italian photovoltaic industry.

Buildings represent a major challenge in the energy transition. In light of their poor thermal insulation, they are one of the main consumers of energy, increasing dependence on fossil fuels resulting in greenhouse gas emissions.
To resolve this situation, the regulations will push not only to zero consumption, but also towards concepts that go beyond nZEB (Nearly Zero Energy Building), calling for positive energy balances at building and/or district level.

Improving the efficiency of buildings is, therefore, essential: thanks to technological innovation they can become a strategic resource, particularly important for energy communities, because they can make a significant contribution to local renewable energy production.

Integrating photovoltaic modules in an urban environment can help create structures with almost zero energy requirements, or even able to produce more than they consume.
It is expected, therefore, that the BIPV (Building-Integrated PhotoVoltaic) market will become increasingly important, especially in the case of multi-storey buildings such as apartment blocks, where roof space is limited, and the structural integration of modules is crucial.

In this context arises the need to develop a new type of modular photovoltaic system, based on mass-customization, and adaptable to a wide range of projects for the construction or renovation of multi-storey building facades, both in terms of installation, and management and maintenance.

To achieve these objectives, CSEA (Cassa per i servizi energetici e ambientali) has published a call for proposals aimed at financing research projects focused on technical and technological innovation of interest to the electricity sector.

The winner of the call was the project "FOURIER" FotovOltaico efficiente in facciata per il fUturo pRossimo della rEte elettRica (Efficient photovoltaic facade for the near future of the electricity grid), proposed by Camlin Italy (leader) (Henesis Srl office) and other strategic partners, including two Italian companies of worldwide importance: Focchi Group, specialised in constructing facades for large buildings, and Applied Materials Italia S.r.l., a leading supplier of machines used in the production of solar cells. They are joined by two research institutes of particular importance, IMEM-CNR and Eurac Research, the former an expert in the development of photovoltaic cells based on chalcogenides, and the latter an expert in the study of photovoltaic system reliability, in the analysis of solar resources and in the support for integration of these technologies in buildings and electricity networks.

The FOURIER project is an innovative experiment in a new "hybrid" construction-energy supply chain. It is born from the awareness, common to all proposers, that the business opportunities resulting from the transition to renewable energy require a qualitative leap in the type of products to be put on the market, from the sustainability of their means of production, to their ease of access and use by those who conceive, manage and/or carry out building renovation.

The key outputs of the project are three:

- A high efficiency photovoltaic module, designed on the basis of functional, structural and aesthetic specifications dictated by the industrial partner that operates directly on the market of innovative facades
- A mock-up facade that demonstrates the added value of module-facade integrated design
- A 4-terminal tandem photovoltaic cell demonstrator based on innovative technology developed in collaboration with the IMEM-CNR Institute, and conceived by Camlin Italy (Henesis Srl office) as a key component for a future version 2.0 of the highest efficiency module

The collaboration between Camlin Italy (Henesis Srl office) and IMEM-CNR has led to the development of a low-cost and highly scalable technology for the design of thin film solar cells based on chalcogenides, suitable for optical coupling with highly efficient silicon cells.

The IMEM-CNR institute has a long tradition in the synthesis of innovative materials using techniques that operate from ultra-high vacuum to very high pressures and, at the same time, in a wide range of temperatures. In the FOURIER project, the use of mechanochemical techniques to synthesise photovoltaic chalcogenides makes it possible to obtain high-purity micro- and nanoparticulate inks, thereby significantly reducing production costs. The inks can be deposited through various printing techniques on conductive substrates to obtain the semi-transparent photovoltaic layer. The first measures have already shown promising results, marking an important starting point for future developments.

"The synergic work between Camlin Italy (Henesis Srl office) and IMEM-CNR has given rise to the joint Sinergy Lab laboratory and has proven to be fundamental to overcoming the most complex technical challenges in the field of research and development. The first activity provided by the FOURIER plan was carried out within the laboratory, focusing on the design of a photovoltaic technology successfully verified by Camlin Italy (Henesis Srl office) and considered suitable to achieve in the future a version of tandem photovoltaic module with high efficiencies suitable for the BIPV sector," says Konstantin Koshmak, Senior Research Scientist and Project Manager of the FOURIER project.

"At Camlin Italy (Henesis Srl office) we are used to adopting an open-innovation approach, working with industrial realities and research centres. With FOURIER we have the opportunity to involve important partners, with whom we share visions and R&D perspectives in Italy, helping to create together innovative and sustainable solutions for the electricity sector in this and other future projects".

In this project phase, the technological support of Applied Materials Italia S.r.l is fundamental for the design and prototyping of single and double junction photovoltaic devices (tandem cells) with high efficiency for the BIPV market.

In order to integrate the application of high efficiency tandem photovoltaic cells in the architectural context, Camlin Italy (Henesis Srl office) turned to the exclusive expertise of the Focchi Group for the production of mock-facade and Eurac for the study of prototypes in a laboratory specialized in the BIPV sector that can simplify the path to certification and insertion of the product in the market.

The Focchi Group studies solutions of unique façade walls for each building, managing the project globally, from design and production, to installation on site. As a partner of the FOURIER project, the Focchi Group offers its knowledge of the façade world for the integration of photovoltaic panels. Specifically, Focchi's work included an initial phase of mapping out the most suitable technologies, the study of the façade system with integrated photovoltaic, and the executive design of the BIPV face.

The applied research centre Eurac Research is involved in the development of the modelling environment and in the experimental part of the controls that will be performed in the outdoor laboratory "PV Integration Lab", where tests are conducted on infrastructure for the integration of photovoltaic systems in buildings and networks at the NOI Techpark in Bolzano. The aim will be to develop a technological photovoltaic system integrated in the façade, pursuing flexibility, ease of assembly-disassembly and a "design for reuse".

In conclusion, the FOURIER project represents an important initiative for the development of the strategic sector that is the Italian photovoltaic industry, in a context of the renewable energy transition. The joint work of these companies, which have been selected from the most emerging in their respective areas of expertise, is a unique opportunity for technological and technical innovation in the electricity sector.

The results of the project, which will be presented at the end of 2024, including the high-efficiency photovoltaic module and the 4-terminal tandem photovoltaic cell technology, play a key role in the definition of a new hybrid construction supply chain, promoting sustainable and accessible production for the world's energy transition.

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