



"The initiative is implemented with co-financing of the European Union with funds from NOP Research and Innovation 2014-2020"

The ecological transition starts with citizens

The south of Italy is the setting of an innovative project uniting cutting-edge technology and territorial involvement

The ecological transition, in its variation of energy transition, also passes through the ComESTo project - Community Energy Storage: Aggregate Management of Energy Storage Systems in Power Cloud - funded by MIUR and by the European Union as part of the NOP 2015-2020, for approximately 10 million. Thanks to this significant funding, the Università della Calabria as scientific lead, and E-Distribuzione in the role of project leader, drive a rich partnership towards the goal of developing integrated systems - DC nanoGrids, renewable sources, accumulation systems - creating the opportunity to lay the foundations to implement energy storage systems from distributed renewable sources, to support the creation of the Renewable Energy Community (REC), as conceived and defined by the new European and national regulatory framework. The project, among other things, aims to define a shared process of sociotechnical innovation which, starting from the bottom up, involves citizens/users in creating new ways to satisfy their energy needs. Modes of cooperation in the generation, rational use and marketing of energy deriving from renewable sources which - despite their lack of programmability and some difficul-

ty in their predictability - consider new challenges relating to network planning, especially distribution networks, and everything related to the continuous "pursuit" of a condition of equilibrium between energy generation and load. A mixture of needs for which the project intends to provide an organic response, and which proceed to ensure that national electrical systems continue to have the standard requirements of reliability and therefore adequacy, safety and resilience. To encourage aggregation, the project is developing a hardware and software platform, referred to as the ComESTo Platform. "The purpose of the platform is to manage, in an integrated manner, generation and storage distributed throughout the territory to support energy sharing (trading) functions within the Community and to supply dispatching services to DSOs in a smart grid configuration, taking into account management and intelligent planning of distribution networks supporting the exchanges", highlights Nicola Sorrentino, researcher and professor at the Università della Calabria. The ComESTo Platform, which is based on the application system already developed by benefit corporation Evolvere Spa, by virtue of its consolidated experience in the aggregated management of res-

idential utilities, is the local and territorial evolution of "Virtual Power Plants" (Vpp) which, not only goes hand in hand with the advantage of being able to gradually "decommission" traditional fossil fuel power plants and therefore respond to decarbonisation needs referred to repeatedly in Europe and nationally - but also makes the territory and local development its keystone. Based on these premises, the territory can therefore become an active and effective player in a process of sustainable technological innovation and, to encourage the change of pace in energy, ComESTo "proposes new models of energy management, suggests new market rules, introduces new technologies and innovative integrated management systems for the generation and storage (even 'non-conventional') of energy, as well as implementing mechanisms for interacting with users (Demand-Response) using advanced methods and those currently being studied to overcome ancient problems that accompany generation from renewable sources", explains Anna Pinnarelli, researcher and professor at the Università della Calabria. Therefore, the project considers territorial physical details, resource availability and the need to invest in network infrastructure. All this has

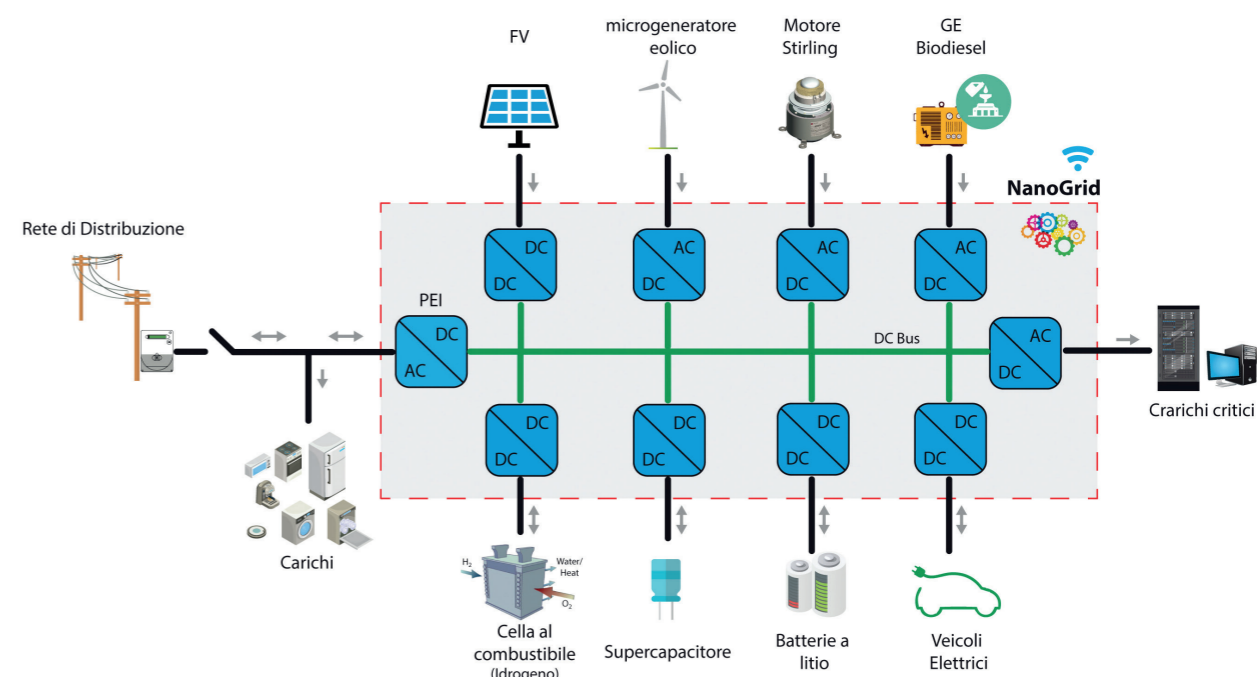
entailed strong attention to public opinion to raise awareness as per the project's importance and actively involve the public in achieving the relative goals. An important challenge in terms of acceptance and propensity on the part of citizens who consciously choose to host a growing number of generation systems and/or storage systems distributed across the territory. Choices, therefore, made by the most invisible part of the complex energy system, the consumer, who from passive "on-looker", becomes "actor" and therefore a key player in the complex process of energy transition. "In this context, the DC nanoGrid is a strategic element for the correct use of storage systems, encouraging penetration of renewable resources, or releasing them from their original defects (discontinuity and low density), and permits the citizen/user to become the protagonist in energy transition towards a low carbon economy" states professor Riccardo Basosi, Italian Energy representative of H2020, MIUR delegate for the Set Plan. If, in fact, on the one side we have those who have chosen to equip themselves with small plants using renewable sources (especially PV) - which according to data published by the GSE (ener-

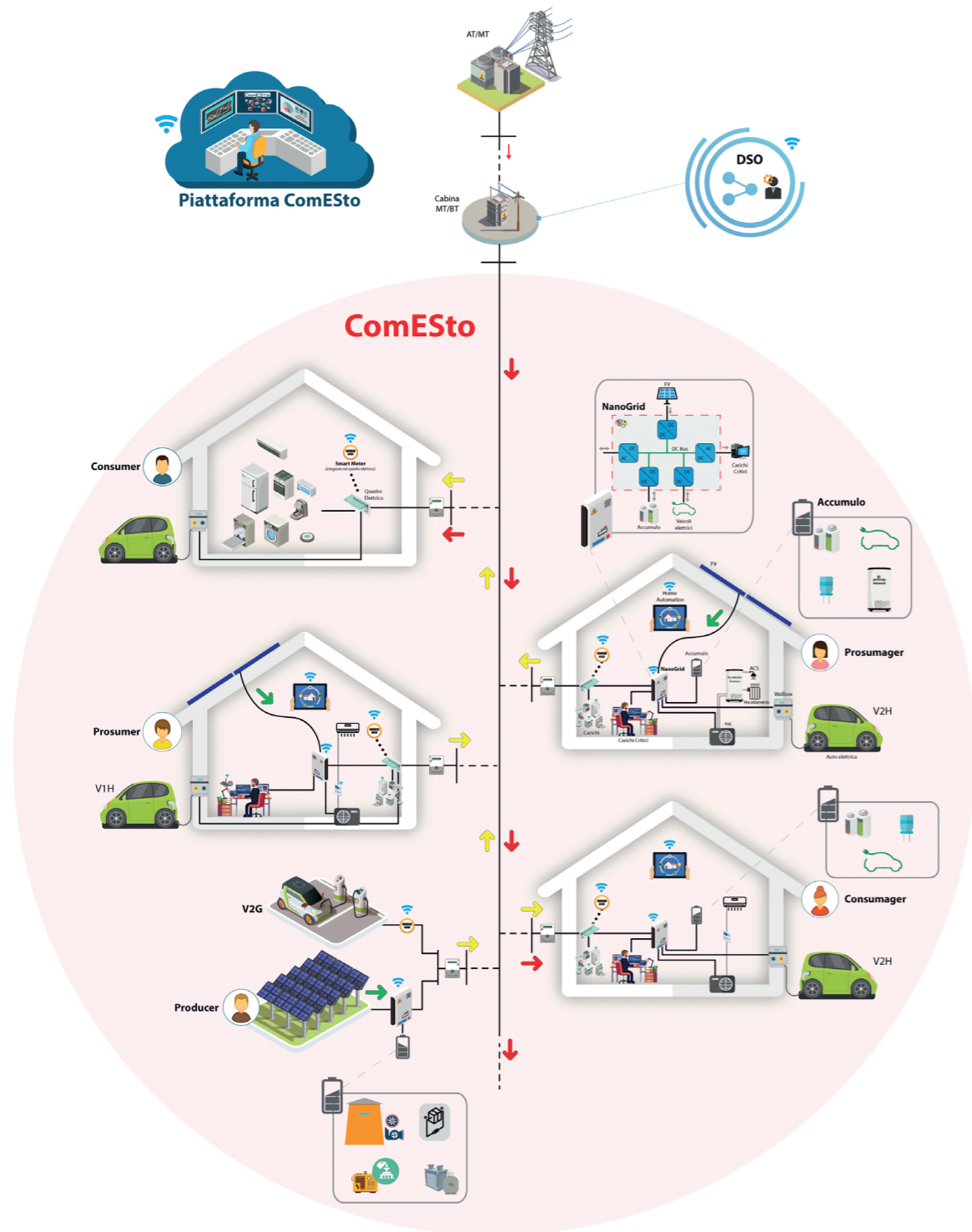
NanoGrid, the heart of the project

The heart of the project is the integration of various technologies for the generation and storage of energy through the use of DC nanoGrids, "enabling technologies", allowing the implementation of "Energy Communities" which go beyond the concept of a "Zero Net Energy Community". By using DC nanoGrids, coordinated by the "ComESTo Platform", indeed, it is possible to create a "Zero Net Power Renewable Energy Community" (Znprec). The DC nanoGrids, a reduced-scale variation of the better-known DC microgrids, connected to the distribution network and managed through the "ComESTo Platform" allow us to maximise that which in Italy is defined as "sharing of electrical energy" by an Energy Community. "Thanks to the use of multiple DC nanoGrids coordinated with each other and the 'smartening' of distribution networks - explains Daniele Menniti, full professor of Electrical Systems for Energy and scientific head of ComESTo - it is thus possible to conceive and create ZNPRECs, contributing to overcoming ancient problems associated with lack of programmability of renewable sources, difficulties related to forecasting generation capacity and lack of temporal coincidence between production and demand linked to final uses of energy. The citizens forming the ZNPREC Energy Communities can thus actively contribute "from the bottom up" to overcoming problems associated with growing penetration of generation from renewable sources and, therefore, facilitate the transition process towards complete autonomy from fossil fuels".

gy services operator) are undergoing constant growth - and which therefore are potential actors in creating an Energy Community, on the other side we have an impressive number of consumers who cannot equip themselves as such, due to a lack of

space or bureaucratic limits. However, the possibility to actively participate in creating the community remains open to them, by using energy storage systems recharged by plants located even at a great distance and managed remotely through the





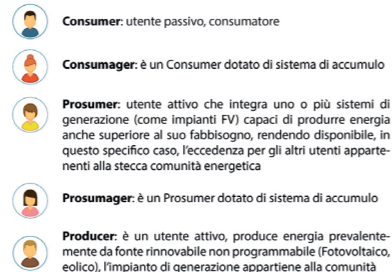
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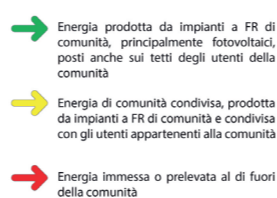
SISTEMI DI ACCUMULO



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ComESto platform. Without disregarding the added value of the potential expressed by the use of electric vehicles which, depending on whether you choose to use it in “Vehicle to Grid” or in “Vehicle to Home” mode, can directly contribute to powering the network or be used, should the need arise, as a reserve to power the electrical energy of a home. A complex network of technologies - DC nanoGrids, conventional and nonconventional storage systems, electric mobility, Power Clouds, artificial intelligence, Machine Learning, and more - deeply rooted within a network of expertise and diverse experiences, with the shared goal of taking action and defining a path for sustainable and desirable energy change.

The decades-long experience of the Università della Calabria in the research and development of innovative and sustainable energy systems, through the Department of Mechanical, Energy and Management Engineering, the Department of Computer Science, Modelling, Electronics and Systems Engineering, and the Department of Environmental Engineering, combined with the experience gained by the Department of Chemistry and Chemical Technologies, the Department of Physics, the Department of Business Administration and Law and the Department of Political and Social Sciences, in fact, measures itself against and is enriched by its cooperation with E-Distribuzione, project leader and major Italian electricity distribution and metering company, with 31.5 million users and the continuous development of technological innovation solutions, and provides the partnership the experience it has gained in “doing” and in “researching”.

Thanks to its continuous effort in the R&D sector, E-Distribuzione has become a global leader in the field of smart grids and smart cities, a position consolidated by implement-

ing ambitious projects of the calibre of the Puglia Active Network, thanks to which it has been possible to create the world’s first “smart region” in Puglia, integrating the energy generated by renewable plants distributed across the territory and ensuring customers have continuous access to information regarding patterns of consumption. Within the ComESto project, the development of an innovative network planning tool based on artificial intelligence and machine learning algorithms is the main goal of E-Distribuzione, in collaboration with the Università di Bari. “The most rewarding aspect of coordinating an articulated and high-profile partnership like ComESto - states project manager, Simone Tegas - is the conviction that the contribution provided by the community in terms of funding goes back to the territory through an offer characterised by a high level of technological maturity. This, in addition to the development of scientific expertise in regions of the South which have a lot to offer our country, may also translate into tangible benefits for a heterogeneous audience of stakeholders: from operators of electrical networks to final users, through a series of consolidated and emerging businesses within the sector. A perfect example of circularity which has the feeling of the community”.

An expert and articulate partnership

The partnership relies on the strong experience of Enel Global Infrastructure and Networks and Tim, on Evolvere Spa, a benefit corporation which has coordinated an aggregation of over 12,000 prosumers for some years now via their cloud platform and field devices, in addition to a rich and strategic team of SMEs, with deep skills in the field of energy: Green Energy Storage Srl - which has developed an innovative

system of green, safe and economical flow batteries, able to tackle challenges posed by energy transition, Ocima Srl, Spintel Srl, Ten Project Srl, GreenEnergy Spa. Joining them is the Università di Siena - the Department of Excellence of Biotechnology, Chemistry and Pharmacy - which will conduct Life Cycle Assessment analyses (quantifying environmental impact of a product or process from the production to decommissioning phase, including any recycling) on the technologies involved in the project, with the goal of achieving an increase in the eco-efficiency of products created compared to the current state; the Università di Bari, operator of the DHITECH (High Tech Technology District) consortium, which is developing its own research activities on artificial intelligence and machine learning through the Knowledge Discovery and Engineering research group of the Department of Computer Science; the Università Politecnica delle Marche, with vast experience in the subject of electric mobility and development of virtual power plants.

There is no shortage of renowned research institutions: Enea - the Smart Grid and Energy Networks Laboratory of the Solar Thermal, Thermodynamic and Smart Networks Division of the Energy Technologies Department - with activities for the development of technologies and methodologies for modelling and implementing nanoGrids in the presence of distributed polygeneration and energy storage systems, also developing the relative management and optimisation strategies; lastly, the Fondazione Bruno Kessler which, with the Sustainable Energy Centre, expert in energy systems and technologies inherent to energy vectors and network flexibility, proceeds with experimentation and integration of conventional and nonconventional energy storage into the nanoGrid. ■