WP 2

Advanced Cryogenic Lab

Paolo Gorla

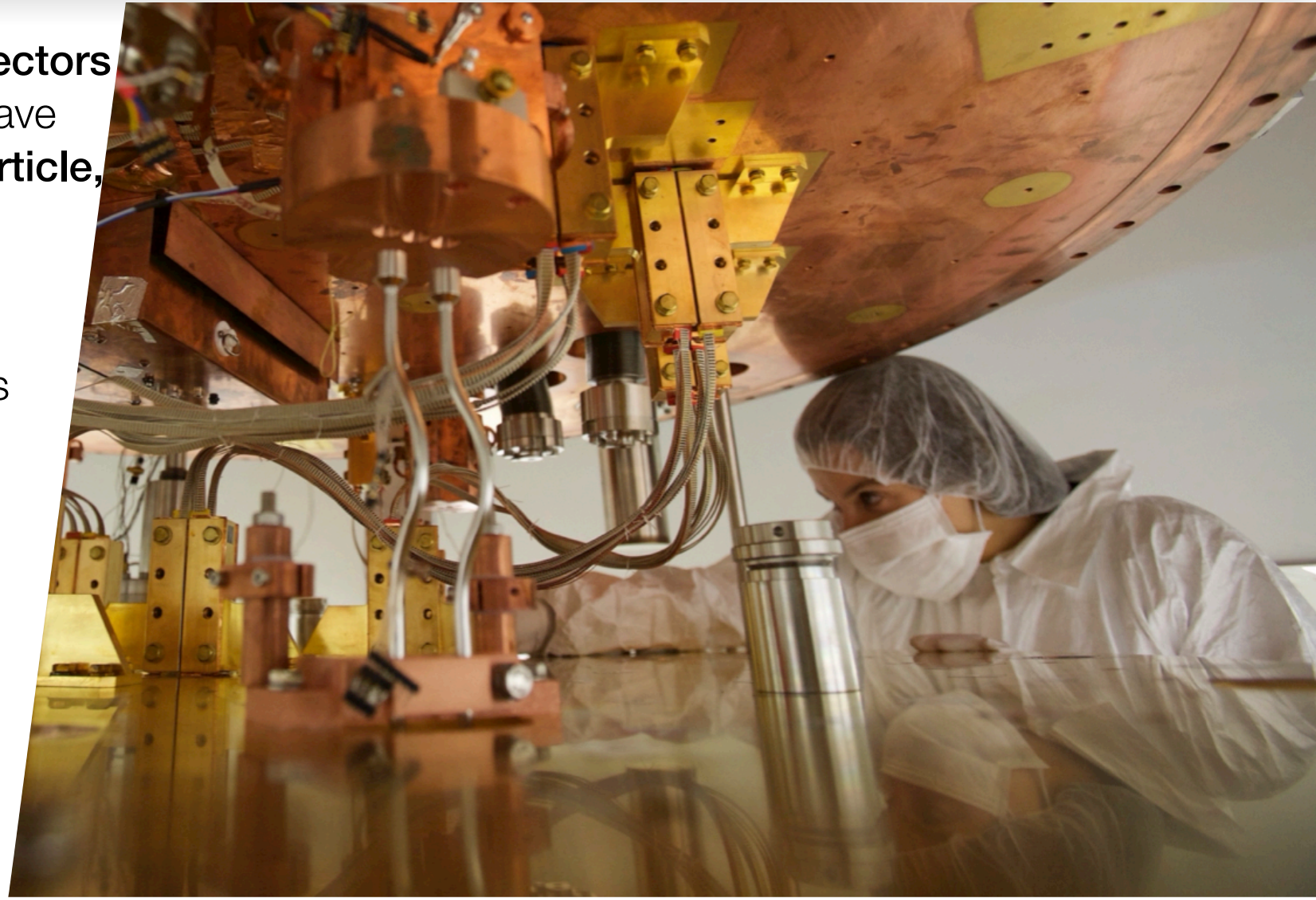
Progetto LNGS-FUTURE - IR0000024 - Avviso pubblico “Rafforzamento e creazione di Infrastrutture di Ricerca” PNRR, Decreto n. 3264 del 28.12.2021 – Missione 4 Componente 2, Linea di investimento 3.1 - finanziato dall’Unione Europea – NextGenerationEU - CUP I19D22000090007

Advance Cryogenic Lab

In recent years, **low-temperature detectors and low-temperature applications** have become more and more relevant in **particle, astroparticle, and nuclear physics.**

The presence of state-of-the-art infrastructure and qualified personnel is pivotal to promoting the application of such technologies.

The Advanced Cryogenic Laboratory's primary goal is to support cryogenic technologies' development, application, and improvement.



CRYO-Platform

CRYO-P will host the largest underground **cryogenic open-access facility for mK detectors**.

Peer-reviewed experiments and R&Ds will profit from a state-of-the-art facility designed to offer a low background and low-noise environment.

CRYO-P will act as an incubator of projects that may constitute the next generation of experiments in LNGS.

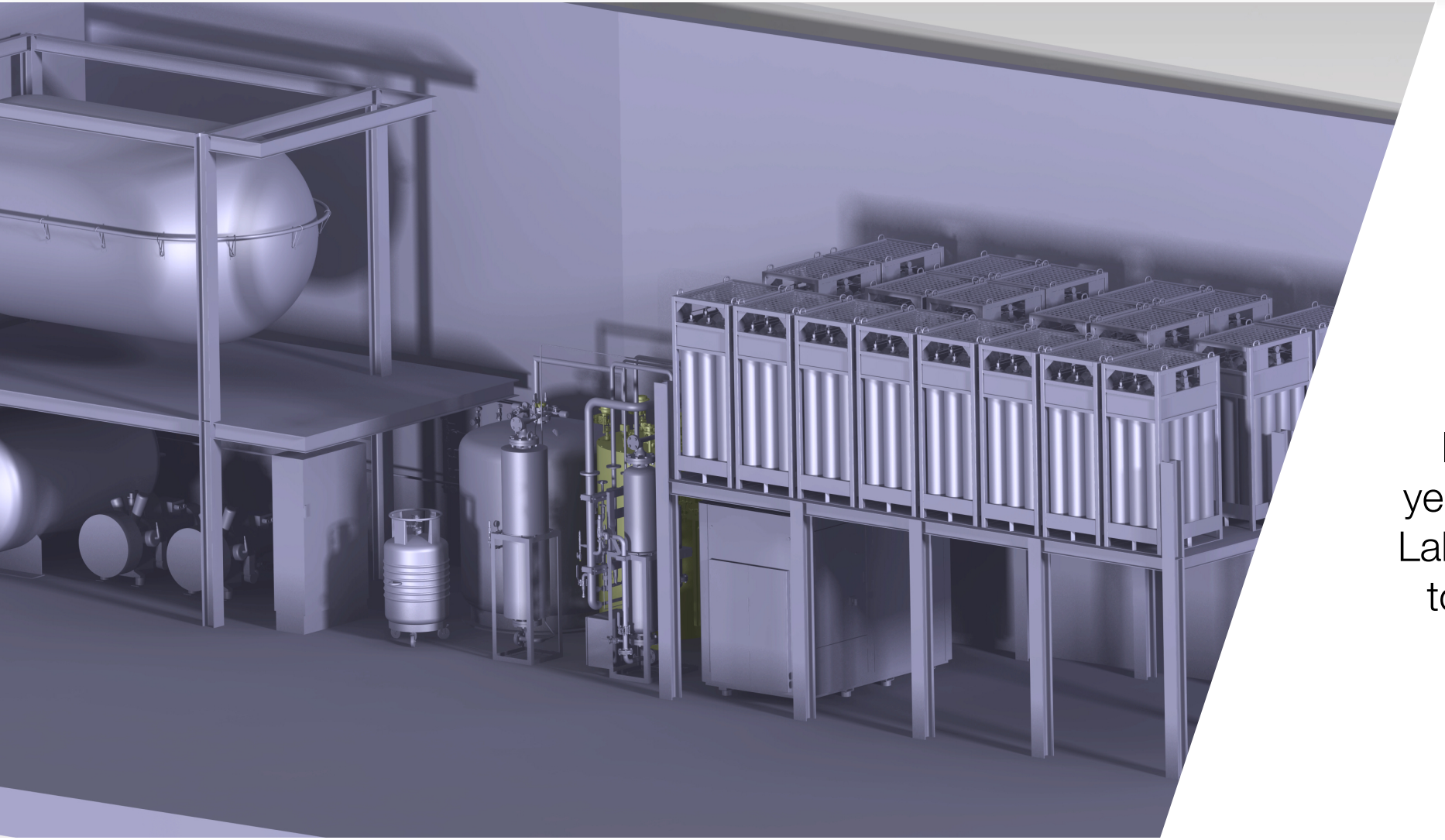
ACryL

The **Advanced Cryogenic Laboratory**, hosted in the Assergi Campus of LNGS, will be the twin companion of CRYO-P, offering a unique cryogenic environment for the development and characterization of cryogenic sensors, detectors, and components.

ACryL will be **equipped with mK cryostat as well as a few Kelvin experimental facilities** to face different requirements from the cryogenic community.

ACryL is designed to be ready to host a wide range of different research and measurement fields, from temperature characterization to radiation identification, to sample scanning, to quantum sensing…

Helium Liquefier



The LNGS underground site currently hosts four liquid helium based Dilution Refrigerators

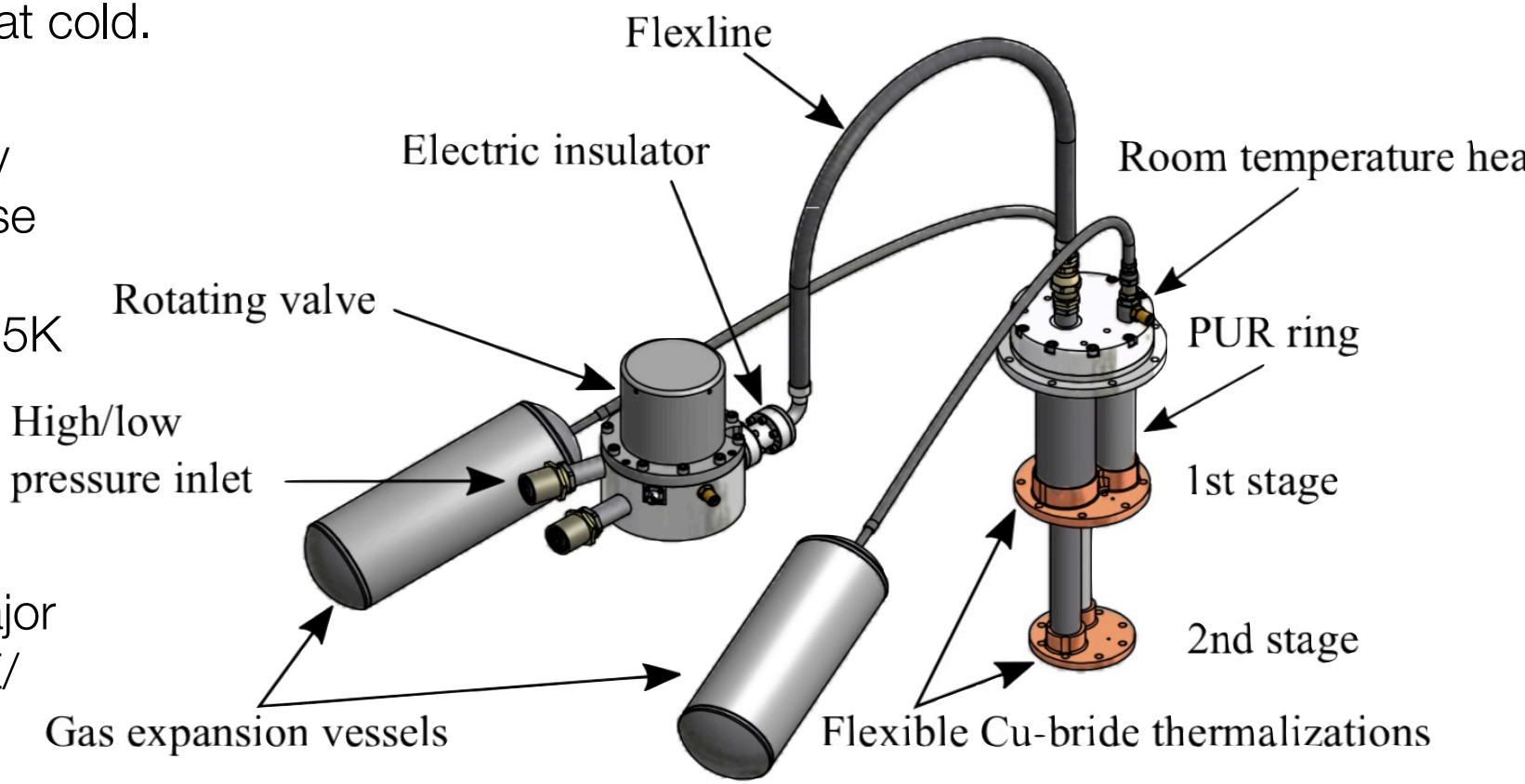
The new **Liquid Helium liquefier** will upgrade the 30-years-old system present in the Lab transforming it into a facility to support all the needs of the LNGS community.

Pulse Tubes for Research

Pulse Tube cryocoolers brought a revolution in the field of Low Temperature as they can reach temperature O(few K) with high cooling power and no movable parts at cold.

The **CUORE/CUPID** projects to study the Majorana nature of the neutrino use the largest Dilution Refrigerator worldwide that uses 5 PTs to reach 3.5K to allow the Dilution Unit to operate.

The installation of new high-cooling-power and low-noise PTs will be a major upgrade for the operations of CUORE/CUPID



Innovation and ideas

The operation of CRYO-P, ACryL, and Helium Liquefier requires **highly specialized personnel** at any level.

Scientists, technicians, and support personnel play a major role not only in running the facility but also in promoting and supporting users' ideas to reach and match scientific goals.