PIACE NEWSLETTER

Issue 2

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Message from the Coordinator

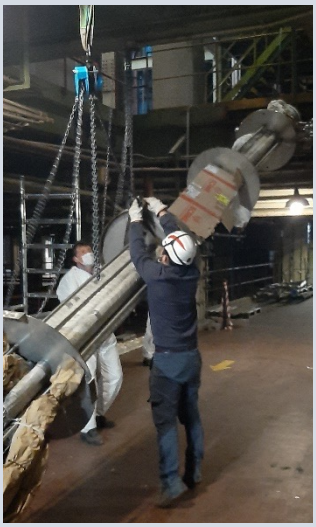
"…In general we look for new law by the following process, first we guess it, then we compute the consequences of the guess to see if it is right, if this law that we guessed is right we see what it implies and then we compare those computation results to nature, to experiments or experience. We compare it directly with observation to see if it works. If it disagrees with experiments, it is wrong. In that simple statement is the key of science. It doesn't make difference how beautiful your guess is, it doesn't make even as smart you are, who made the guess or what his name is. If it disagrees with experiment it's wrong…". This funny sentence was said by Richard Feynman in a lecture about the scientific method. Funny but completely full of true. We could have had not exempt from this law, indeed the natural second steps in the PIACE project, after the previous evaluation with numerical codes, has been the experimental campaign to proof the applicability of this new concept of a Decay Heat Removal System with non-condensable gases to different reactor technologies. Four out of five reactors technologies analysed in the project have been tested on the SIRIO facility, properly updated to reproduce the related conditions. The results were comforting. The new system shown the expected behaviour in the different conditions analysed. An important step on the way of the proof of this new concept.

SIRIO Commissioning

SIET workshop is one of the pillars of the Italian and international experimental nuclear research and development. Over the years, the different floors of the building have seen the succession of different experimental plants that have guaranteed evidence for the certification and licensing of nuclear power plants both under construction and currently in operation. The latest system added to the illustrious list of successes is SIRIO. Initially designed to demonstrate the operation of ALFRED passive decay heat removal system, it was recently considered as a potential demonstrator of passive decay heat removal system also for reactors currently in operation and of the LFR type, thanks to its ability to passively control the power removed to the environment. Procurement, installation and commissioning activities were terribly impacted by the global pandemic conditions, causing delays in the supply of carpentry materials and components, but thanks to the resolute work of the team it was possible to reach the completion of the plant. The SIRIO steam generator, with a total height of more than 6 meters and 11 heat transfer bayonets, was built near Rome and before reaching the site in PIACENZA it has traveled to the ENEA research center in Brasimone for final assembly of instrumentation and pressure testing.

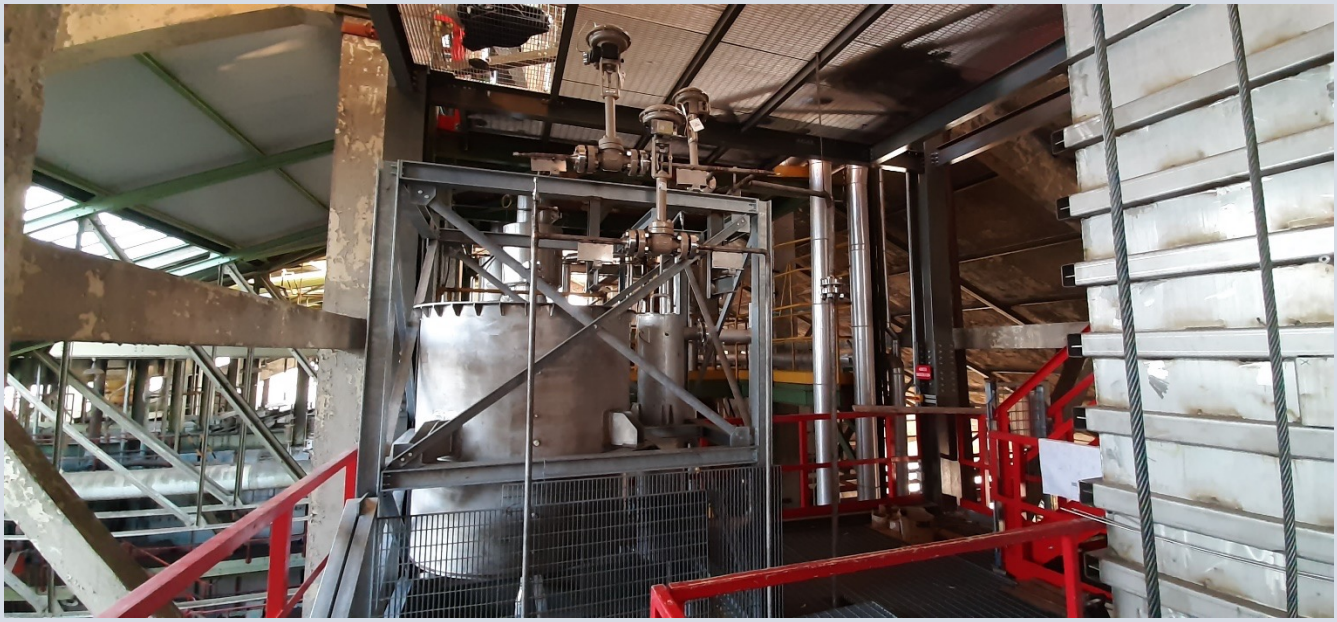
The on-site assembly activities required particular attention due to the dimension of the component and provided for the lifting of the steam generator with the crane available at the site and the positioning inside the scaffolding.

The power heart of the system consists of the power supply panel for the heating cables which supply the thermal power to the steam generator. The equipment was installed near the steam generator.

The other components of major importance for SIRIO are the isolation condenser and the bypass heat exchanger. They too were built in workshops near Rome and were installed at the highest point of the infrastructure, needing to find an optimal solution also to avoid interference issues with the crane hook.


The heat extraction group was installed in its own infrastructure designed specifically for them, which also includes the control and actuation valves. Through them, the system can operate in nominal conditions, or activate the test sequence.



All installation activities were followed by the project team through periodic meetings, in which ENEA and SIET put at the project disposal the enormous expertise on research plants, SRS carried out the activities in the field in close contact with the work teams while Ansaldo Nucleare verified the compliance between the experimental plant and the main requirements of the full scale system, also providing analytical support through numerical analyses. Once the installation phases of the main mechanical and electrical components were completed, the instrumentation was placed and finally the insulation was positioned to reduce thermal losses. After this phase, commissioning activities were carried out: volumetric measurement through filling and draining was performed to evaluate the real volume of the system, the exact position of all the instruments was measured through the as built activities, the actual thermal losses of the system and the hydraulic characterization through dedicated tests were performed. The final commissioning included power transients to bring the system to temperature and pressure according to the nominal conditions, and the valves have been tested for actuation and closure.

SIRIO is now ready to start the engines for its first experimental campaign.

Training Activities on SIRIO Facilities

The view of one of the participants in the training: Pietro Cioli Puviani.

The Training on the SIRIO facility took place in Piacenza in May of this year. Thanks to PIACE community, I had the opportunity to dedicate a week to deepen my knowledge on the experimental research in the nuclear field and the role of computational analysis for supporting the development of innovative technologies and comprehending the involved phenomena.

The days passed in the SIET center were divided between the presentation and operation on the SIRIO experimental facility and the adoption of the System Thermal Hydraulic code RELAP5 for the numerical analysis of the facility itself. The combination of the two parts gave me and my colleagues the possibility to take a closer look at the structures, instruments and components that, at the same time, we were analyzing on the code.

In this way, we could acquire the sensitivity of the real experiment, learning how the facility is operated and which are the attentions to be paid for the definition of an effective campaign.

The feedback from the code on the status and the phenomena going on inside the facility favored the comprehension on what is really happening inside SIRIO.

I spent the entire week together with other 6 colleagues in a welcoming atmosphere, in which we had the possibility to get to know each other, talk about our previous experiences and work as a team on the project.

Even if in the training the level of complexity reached in the RELAP5 exercises did not reach the real complexity of the facility and, for the experimental activities, we were driven by Marco Cauzzi, experimentalist in SIET, the experience was sufficient to really put our hands on the facility and see how operation are carried out for the demonstration of innovative nuclear systems.

The overall training was an interesting and valuable experience that will be a wonderful memory during my PhD research activity.

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