PRESS RELEASE

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European H2020 Research & Innovation Project

LD-SAFE

Laser Dismantling Environmental and Safety Assessment

INTRODUCTION

Already 2 years have been spent on the ambitious LD-SAFE project which aims to demonstrate that both the in-air and underwater laser cutting technologies are effectively operational for the dismantling of the most challenging components of power nuclear reactors (Reactor Pressure Vessel and Internals).

Great efforts have been made up to now by the LD-SAFE Consortium (ONET Technologies as coordinator, CEA, IRSN, Tecnatom, EQUANS and Vysus Group) and with the contribution of the external stakeholders from the Advisory Board (Expert Group, End User Group and Support Group) to progress accurately and in the right direction on the studies which will feed as inputs the demonstrator building.

REMINDER

The main technical activities of LD-SAFE are split as follows:

- The Laser technology analysis in operational reactor environment;
- Laboratory tests/calculations in order to assess and mitigate the environmental and safety impacts;
- The Protection of the workers and the environment;
- The Safety assessment for the implementation of the laser technology;
- The development of demonstrators for the validation of the implementation and the use of laser cutting technology in a representative reactor environment.

The objective, at the end of LD-SAFE, is to highlight the suitability of the laser cutting technology to address the challenges of the dismantling power nuclear reactor and its capability to improve safety, radioactive waste, time and cost aspects.

PROGRESS

At first, an analysis of reactor dismantling with laser cutting has been completed (first milestone achieved). As starting point, an overview of all the common techniques of cutting the internals of a nuclear reactor has been done which included a description of the use of the different techniques and a comprehensive comparison. For proposing new cutting techniques, it requires to know how the dismantling of the highly radioactive structures of nuclear facilities is performed today by looking at the various types of cutting equipment (divided into three types: thermal, mechanical and hydraulic) that

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have been applied in past dismantling projects. The objective is to present the most common cutting tools for cutting PWR and BWR reactor internals and to build a database in order to compare them with laser cutting. This comparison highlights the key challenges to be checked during the laboratory tests to assess the risks by using laser cutting technology in reactor environment, but also during the demonstrator at the end.

Then, and as inputs, the previous activities allowed performing laser cutting tests in laboratory conditions to assess three safety topics:

- Laser beam residual power (applicable in air cutting),
- Secondary emissions: aerosols (applicable to both in air and underwater cutting),
- Hydrogen gas generation during underwater emerging laser cutting.

Up to now, the first cutting tests campaign has been completed (second milestone achieved) and the compilation of the results highlighted safety challenges to be implemented in the Generic Safety Assessment (which will be available to the public in June 2022).

In the meantime, and with the contribution of all partners, a Technology Appraisal of laser cutting technology has been performed to assess the maturity of the system (the technology itself and its implementation for dismantling of nuclear facilities) and the risks to mitigate (identified in a Qualification Plan). These qualification activities (actions to mitigate risks defined with success) allow the project to reach a new milestone. These activities participated to the input effort for the safety analysis (generic one) but also for the guidelines (redaction already started) for implementing and using laser cutting technology in a reactor environment. At the end, a Technology Qualification Certificate will highlight that laser comply with the protection of the workers and of the environment.

Moreover, in the Safety part of the project, a first risk analysis with the use of laser cutting technology has been conducted (at the beginning of LD-SAFE) to take into account preliminary data/evaluation and assumptions. All uncertainties have been eliminated or reduced during the compilation of the tests results in laboratory conditions and those from qualification activities (with a clear monitoring of all actions performed to reduce the risks identified in the laser appraisal). These inputs will feed a first version of the Generic Safety Assessment (document shared to the public). This contribution, as the guidelines mentioned above, will reduce the licensing effort of operators by selecting laser cutting technology for the next dismantling projects.

Finally, and on the basis of all previous activities, the studies of the demonstrator started (in two phases: in-air environment at first and then underwater). The development of the demonstrator is focused on:

- The design and procurement of the complete laser system and the cold representative mock-ups (of the most complex components),
- The adaptation or the building of facilities for the implementation of all laser equipment,
- The demonstration itself by performing laser cutting tests in a representative environment (validation of the performance, the ease of use and the compliance about safety).

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CONCLUSION

Important steps have been reached by the accomplishment of three milestones on time. In the next two years, the consortium will continue its effort in LD-SAFE by finalizing the Generic Safety Assessment with its improvement by an independent review (and the compilation of additional cutting tests in laboratory conditions). Moreover, an accurate monitoring of all qualification actions will permit delivering a Technology Qualification Certificate. And finally, the achievement of the 2 demonstrators will highlight the performance, the ease-of-use, the relevancy of the safety systems of laser cutting technology without forgetting the demonstration of its economic advantage. By being a success, this project will allow operators to use laser as an alternative to the conventional cutting techniques including less licensing effort.

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