

# Feasibility Study of Fuel Debris Cutting and Dust Collection Technology for Innovative Approach

## ONET TECHNOLOGIES NUCLEAR DECOMMISSIONING

### Purpose and Goal

**The purpose** of the subsidized project is to assess the feasibility of YAG laser cutting and dust collection on fuel debris by remote means.

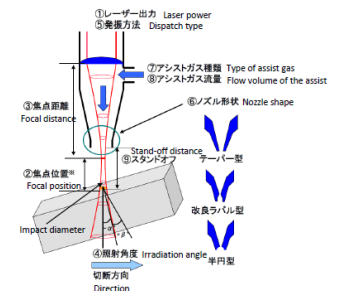
**Our objective** is to demonstrate this feasibility through the following steps:

- **Definition of the cutting equipment** (principle, radiation resistance, dust and fumes production and remote control adaptation).
- **Cutting tests on non-active material** (definition and provision of non-active simulants, tests of continuous cutting by fusion)
- **Analysis of application to Fukushima site** (deployment, constraints, potential issues)
- **Proposition of a R&D program** (task solving, test program, schedule and cost evaluation)

### Overview and Feature

The following tasks are implemented during the project:

- **Preliminary Tasks:**
  - Choice and justification of the simulant for the trials
  - Provision of the simulant and definition of the test plan
  - 3D modeling the RPV/PCV standard configuration
  - Functional analysis of the cutting operations
- **Cutting Trials:** Since high power laser cutting on such material is at R&D state, it is difficult to predict the behavior of the simulants. Our **test plan is in two steps**, to first assess the basic feasibility of continuous cutting on the simulants and then going more into details into the parameters and cutting possibilities.
- **Cutting Equipment Definition:**
  - Definition of the cutting principle and equipment main characteristics
  - Assessment of radiation resistance
  - Remote control adaptation
  - Dust and fume collection
- Based on issues identification, proposition of a draft R&D program to realize the technology.



The project is focusing on the demonstration by trials of the applicability of laser cutting to fuel debris simulants, using the CEA (subcontractor) following strong points:

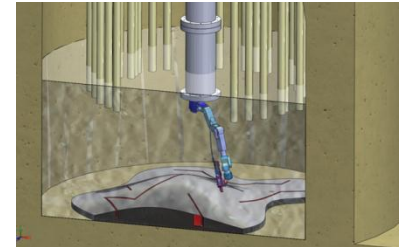
- **VULCANO Facility** existing fuel debris samples, that are used as simulants for the trials
- **CELENA laser cutting facility**, where the cutting tests are implemented

The project is also focusing on the **remote adaptation of the laser cutting** and the cutting strategy into the RPV / PCV, using **ONET strong experience** on remote handling and use of laser for nuclear decommissioning.

## Output so far/Output expected

### Outputs so far:

- Choice and representativeness justification of 3 simulants to be used during the cutting trials
- Functional analysis of the cutting equipment in its environment
- Phase 1 tests achieved with the result of a good behavior of the simulants during the cuts (full results cannot be disclosed). These tests have confirmed the good applicability of continuous laser cutting for fuel debris.



### Expected outputs:

- Defined parameters for the simulant cutting and associated performance
- Radiation resistance estimation of the laser cutting equipment
- Feasibility of the dust and fumes collection
- Proposal of scenarios for on-site application
- Summary of the challenges to be addressed in R&D phase, and proposal of a development program

## Overall Schedule

### Major December onwards:

- Completion of the preliminary tasks (incl. the choice and provision of the simulants and the functional analysis)
- Completion of the cutting tests phase 1
- Definition of the laser related components (torch, fiber, source)

