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核融合発電システム統合試験プラントUNITY　概要
Kyoto Fusioneering's Unique Integrated Testing Facility for Fusion Power Generation: UNITY, Overview of the project

田渕将人[1]、小川聰[1]、Colin Baus[1,2]、久米祥文[1]、杉山大志[1]、松永祥尚[1]、
井野孝[1]、武田秀太郎[1,3]、世古圭[1]、長尾昂[1]、小西哲之[1]
Masato Tabuchi[1], Satoshi Ogawa[1], Colin Baus[1,2], Yoshifumi Kume[1], Taishi Sugiyama[1], Yoshinao Matsunaga[1], Takashi Ino[1], Shutaro Takeda[1,3], Kiyoshi Seko[1], Taka Nagao[1], Satoshi Konishi[1]

[1]京都フュージョニアリング株式会社、[2]京都大学、[3]九州大学
[1]Kyoto Fusioneering Ltd., [2]Kyoto University, [3]Kyushu University

Background

One of the R&D challenges on the critical path to achieving a fusion pilot plant is demonstrating the viability of net power production from fusion. In particular, technology readiness levels (TRLs) of critical components need to be raised from 3 to 7 while ensuring reliability and simplicity, which are important criteria for commercial viability. This challenge spans across multiple engineering domains and requires an integrated approach. Kyoto Fusioneering Ltd (KF) has started a project to construct a world-first integrated testing facility for simulated fusion power generation in Japan. This facility is named UNITY (**UN**ique **I**ntegrated **T**esting facilit**Y**) to signify the bringing together of all critical components that will be tested in the facility.

Overview of the project

The project is backed by private equity as well as Japanese government grants, and is scheduled to be fully operational in 2024. The goals of the project are to test and demonstrate: 1) heat extraction from a breeding blanket, 2) heat transfer and exchange, 3) electricity generation, and 4) tritium extraction under commercially relevant conditions. These activities are to be ready in time for integration into the first fusion pilot plants. Figure 1 shows a mock-up of plasma core and high-temperature section of UNITY. A simple flow diagram of UNITY is shown in Figure 2. Key technologies developed for UNITY, such as SiC$_f$/SiC heat exchanger and pipework, will be valuable for various reactor concepts and not limited to those with conventional blanket structure but includes innovative blankets (e.g., liquid first wall designs). This presentation will outline the engineering design, progress, and expected outcomes, while detailing where and how the technology will have an impact, including within in Japan's national strategy for fusion R&D activities under the updated strategy.

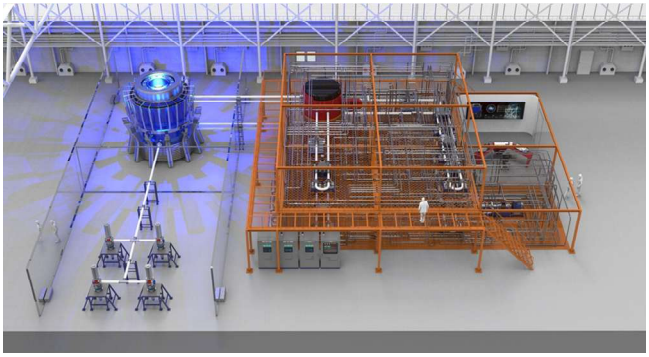

Figure 1 Mock-up of plasma core and high temperature section.

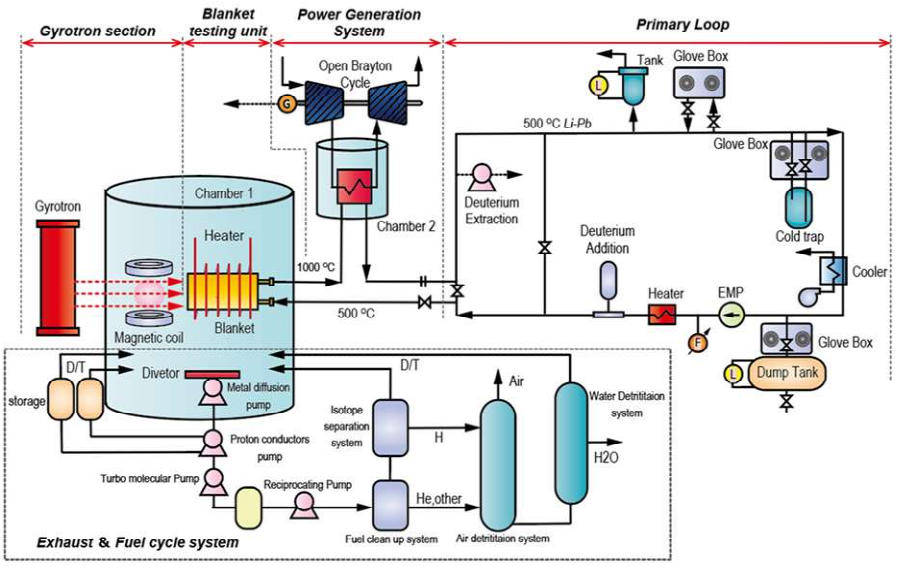

Figure 2 Schematic diagram of UNITY