

Project Name: International Joint Research on Solid Oxide Reversible Electrolyzer Cells (2020–2023)

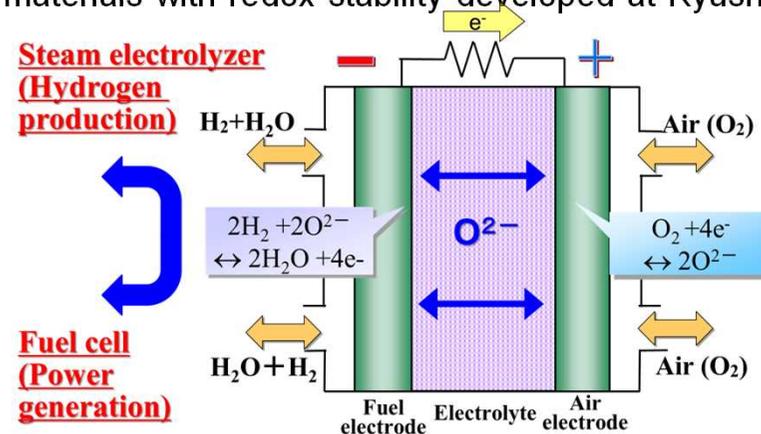
Entrusted party: Kyushu University



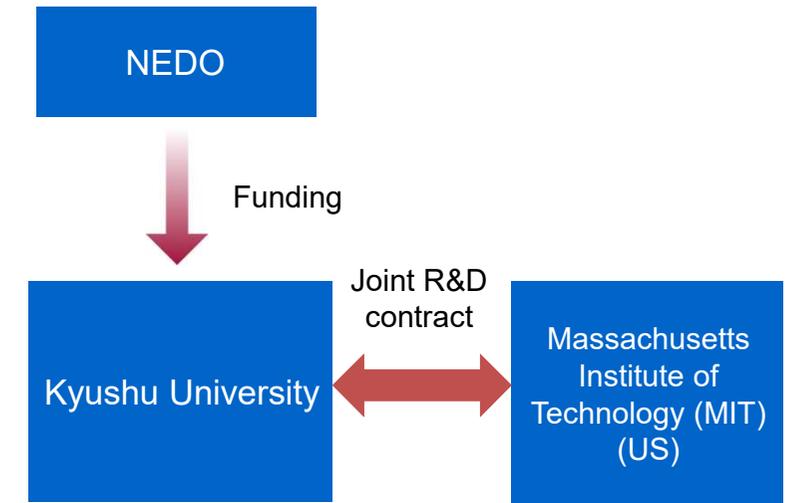
Outline of the project

- **Background:** Hydrogen can be regarded as an energy carrier for storing excess renewable energy. A reversible energy system that can act as a solid oxide electrolyzer for hydrogen production and act as a fuel cell for power generation would be an ideal technology for decarbonization energy.
- **Aim of this project:** Fundamental technologies will be developed to realize solid oxide reversible cells (SORCs), which have a reversible 1000 cycle durability and 40,000 hours durability, by demonstrating their reversible operation both in electrolysis mode and in fuel cell mode.
- **Context of this research project:** SORCS will be developed by applying alternative fuel electrode materials with redox stability developed at Kyushu University.

Such cells flexibly enable hydrogen production (energy storage), power generation (energy conversion), and reversible operation (energy management).



Project scheme



Expected outcomes

- **Images of social implementation beyond 2030** Hydrogen can be widely used as a buffer for flexible renewable energy storage by utilizing these newly developed reversible energy systems.
- **CO₂ reduction potential** Hydrogen may contribute globally to the annual reduction of CO₂ emissions by 6 Giga tons. Half of this hydrogen would be produced by electrolyzers, and a half of the electrolysis hydrogen could be produced by these reversible cells. (Energy saving equivalent to 600 million KLs crude oil.)
- **Economic contribution** Introduction of more renewables into society.

Significance of international R&D

- **Importance of international R&D** Understanding materials and electrochemical properties is important to realizing such new electrochemical devices, which will enable the establishment of materials design concepts towards global standard cells.
- **Collaboration with international partners** An active MIT research team on solid state electrochemistry has a laboratory in the Next-Generation Fuel Cell Research Center at Kyushu University for long-term collaboration.