

Development of an Integrated Copper-Chlorine Cycle for Efficient Hydrogen Production from Nuclear and Renewable Energy Sources

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Objective: Demonstrate the practicality of the copper-chlorine cycle to produce hydrogen and generate data to determine its potential scale-up and cost

Background: Hydrogen economy will require large quantities of hydrogen. This copper-chlorine cycle (HCuTECTM) has the potential to produce hydrogen at large scales and is compatible with most SMRs owing to the process conditions

FY 2018-2019:

- Demonstration of Individual Steps
- Summary of performance of process steps
- Report on materials compatibility with process conditions

FY 2019-2020

- Process Integration
- Report on the model development for the Cu-Cl process
- Safety assessment on the integrated Cu-Cl process

FY 2020-21

- Process Testing & Optimization
- Report on the test results of the integrated Cu-Cl cycle
- Report on the process/cost models

Expected Outcome: An integrated Cu-Cl process capable of producing hydrogen at 100 g/day

Activities in First Six Months:

- Characterized the membranes exposed to the chemical conditions during electrolysis.
- Identified method and equipment to connect the electrolysis step to two neighboring steps.
- Developed a process model for the integrated system.

Major Achievements:

- Secured a location to house the integrated Cu-Cl to meet the process requirements.
- Identified methods for connecting the electrolysis step to the separation and thermolysis steps.
- Refined thermodynamic-based process model and pinch analysis method for the integrated system.

Future Work:

- Continue commissioning equipment and complete integration.
- Start economic assessment of the integrated system.
- Test and optimize the integrated Cu-Cl system.