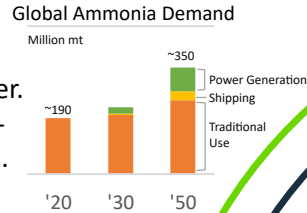


Introduction

Background

- Ammonia is a sustainable power source that could be used as a fuel and a hydrogen carrier.
- Electrolysis with nuclear power enables cost-effective hydrogen and ammonia production.



Purpose of the Research

- The research investigates the economic and environmental significance of a floating facility of GW-scale low-carbon hydrogen and ammonia production powered by nuclear reactors.

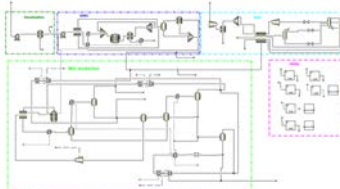
Materials And Methods

Platform Design

No.	Process	Option 1	Option 2	Option 3	Option 4
1. Architecture					
1.1	Location	Near shore	Onshore	Offshore	
1.2	Facility type	Integrated	Separate		
2. Nuclear Power Plant					
2.1	Nuclear Reactor	MSR	LWR		
2.2	Thermal Storage	Nitrate salt	CRUSH	Synthetic oil	
3. Chemical Plant					
3.1	Desalination	RO			
3.2	Air Separation	Cryogenic	PSA		
3.3	Electrolysis	SOEC	PEM	Alkaline	
3.4	Ammonia Synthesis	Haber-Bosch			

Key elements of the platform design are selected to examine different electrolyzers, nuclear reactors, and storage options.

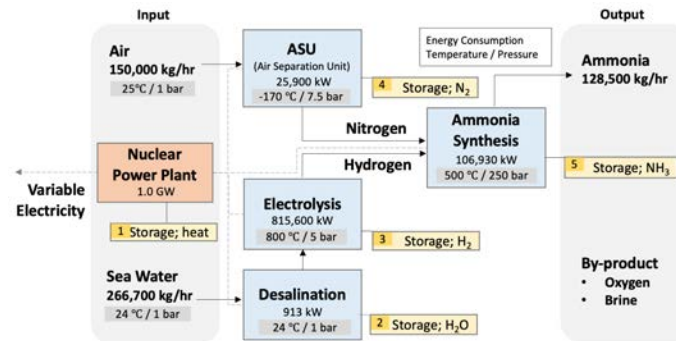
Process Modeling



Aspen Plus is used to design and optimize the chemical process. Different operating modes are examined while ensuring the constant ammonia production rate.

Research Highlights

- First-of-its-kind Floating Production Storage & Offloading (FPSO) to produce ammonia with nuclear power

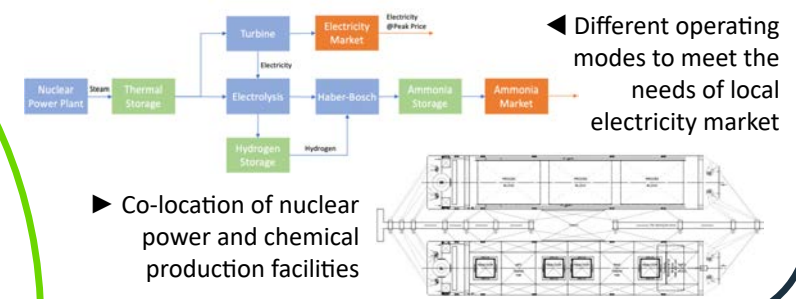


- The flexible operation and storage of chemical products to meet the peak electricity demand

- Maximized system efficiency by utilizing thermal energy from the ammonia synthesis unit

Operating Parameter

- Location: US Gulf Coast
- Power Source: Nuclear reactor (Molten salt reactor or Pressurized water reactor) capable of generating approx. 1.2GW electricity
- Production Capacity: 1 MMTPA liquid ammonia



Diagrams

◀ Different operating modes to meet the needs of local electricity market

▶ Co-location of nuclear power and chemical production facilities

Discussion

- The floating facilities ensure economic feasibility while complying with the safety requirement of operating nuclear power plants with chemical processes.
- The heat from the ammonia synthesis unit increases the efficiency of the high operating temperature of electrolysis.

Future Work

- Different nuclear reactors and electrolysis types will be investigated to determine the preferred combination.
- The techno-economic analysis of the flexible operation will be conducted to determine the optimal hydrogen storage capacity.