

Green Chemical/ Ammonia Demonstration Project



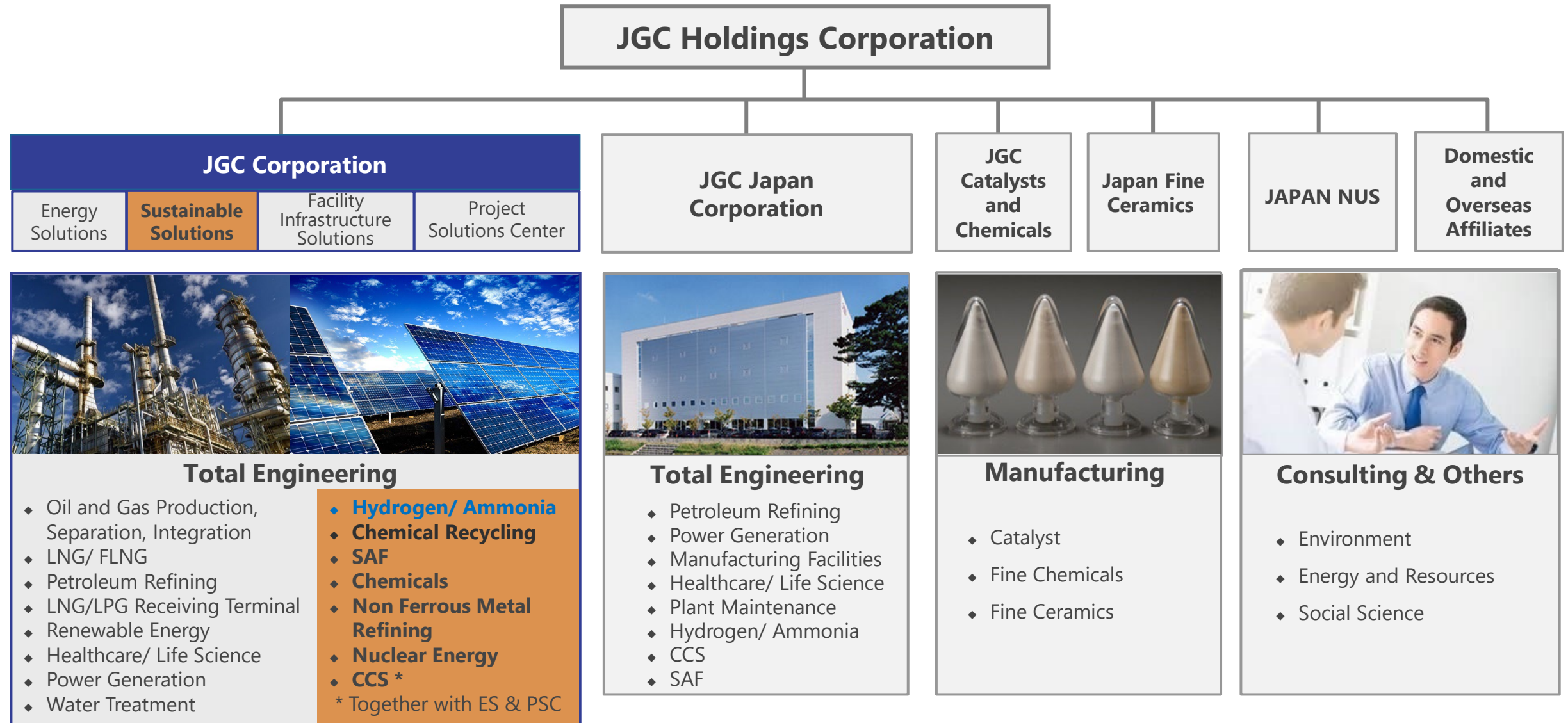
Enhancing **planetary health**

16 November 2022

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JGC Group Structure



JGC's Activities for Green Ammonia <Power to Chemical Demonstration>

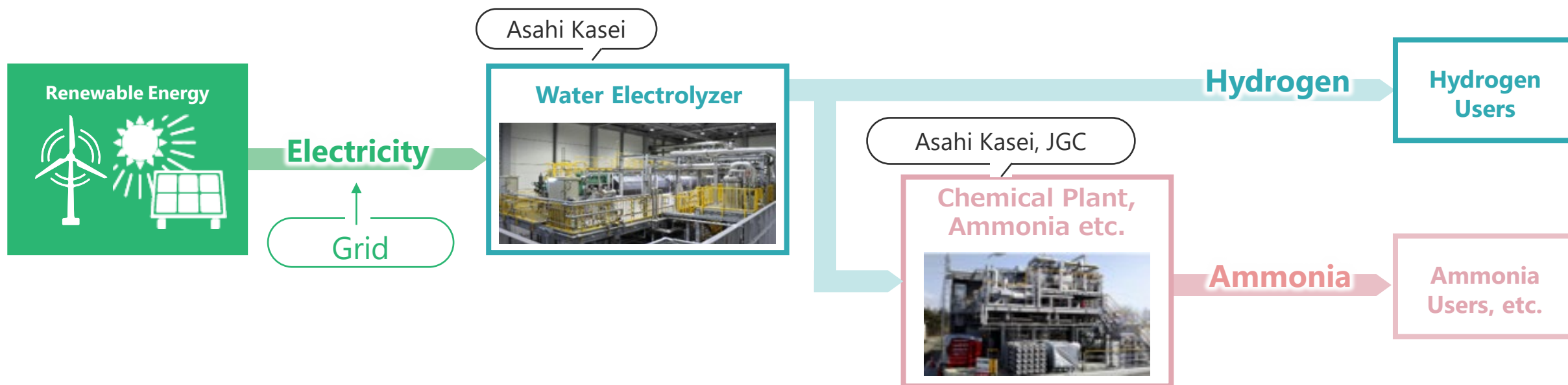
Outline



AsahiKASEI



- JGC and Asahi Kasei have been selected and started “**Large-scale Alkaline Water Electrolysis System Development and Green Chemical Plant Demonstration**” under “Green Innovation Fund” by NEDO *
- Semi-commercial scale (Phase 1) and Commercial scale (Phase 2) for 10 years till FY 2030



* NEDO (New Energy and Industrial Technology Development Organization) , <https://www.jgc.com/jp/news/assets/pdf/20210826j.pdf>

JGC's Activities for Green Ammonia <Integrated Control System>

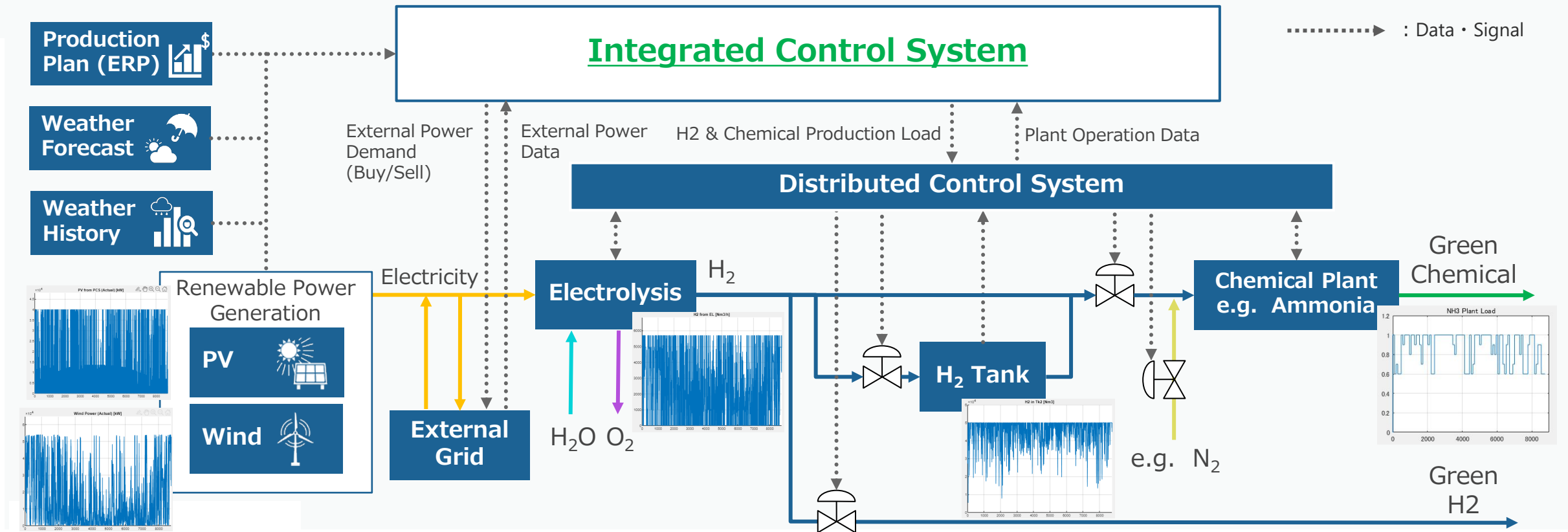


AsahiKASEI



Outline

In Green Chemical Process, such as Ammonia, fed with Hydrogen derived from **Fluctuating Renewable Energy**, "**Integrated Control System**" which manages hydrogen supply and realize **chemical plant's optimum operation with minimum downtime** will be developed and demonstrated.



JGC's Activities for Green Ammonia <Automated Operation>



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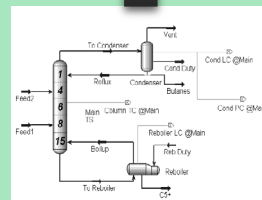


Outline

Automated Start-up and Shutdown Operation for Green Ammonia Plant will be developed and demonstrated based on JGC experiences in Power Plant and LNG Facilities, which will contribute **reducing Human Resources** for plant operations and **Time for start-up and shutdown** to increase benefit for customers. The key technology for success is “Plant Digital (Process) Twin” using Dynamic Simulation model.



DCS Emulator



Dynamic Simulation



Digital (Process) Twin

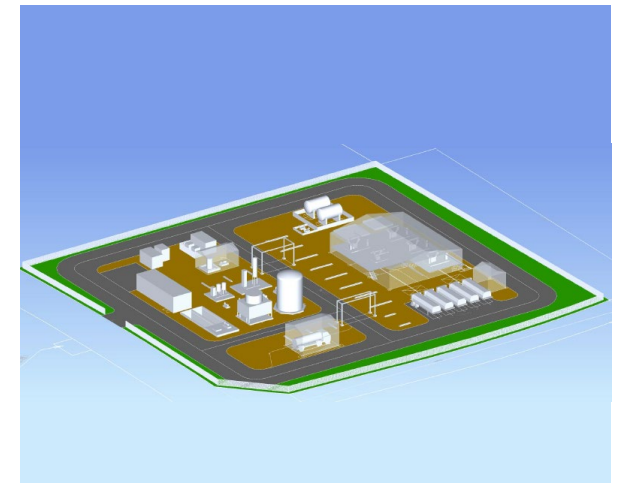
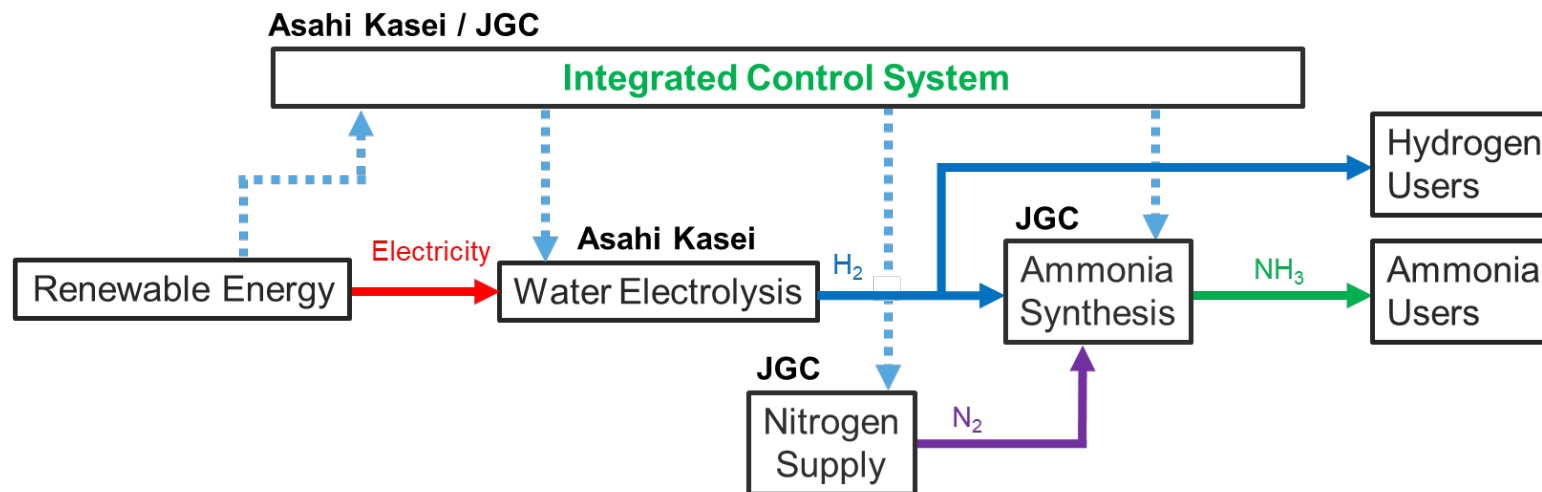
Semi-commercial scale (2024~ Demonstration operation ; Phase1)

- Establish connection between Asahi Kasei's Water electrolysis (**10MW**) in FH2R * with JGC's Ammonia synthesis facilities (**4TPD**), and implement jointly developed “**Integrated Control System**”
- Utilize produced ammonia as De-NOx agent in thermal power plant, or material for chemical or fertilizer production plant, and study local supply chain.
- Current Status and Milestone :
 - FEED** for Green Ammonia Plant has been completed By JGC & JGC Japan, with KBR Ammonia Synthesis Process
 - Start EPC*** within Fiscal Y.2022
 - Start Demonstration Operation within Fiscal Y. 2024 until Fiscal Y. 2026

* Fukushima Hydrogen Energy Research Field

** FEED : Front End Engineering Design

*** EPC : Engineering, Procurement, and Construction



Sample of 3D Image of Ammonia Plant

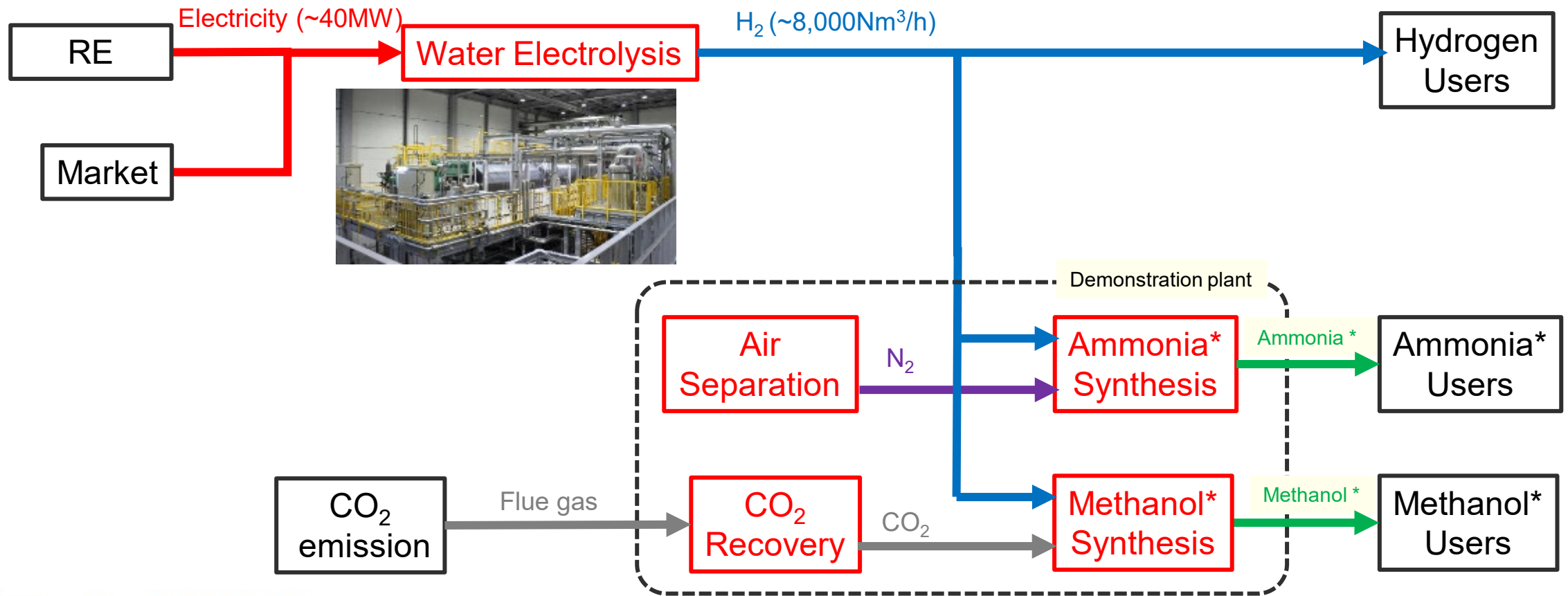


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Commercial Scale (2027~Demonstration operation ; Phase 2)

- Installation of **Large-scale Alkaline Water Electrolysis System (40MW)** with Basic Chemical Synthesis Facility
- Hydrogen production by renewable energy and electric power market, Basic Chemical Synthesis, such as **Ammonia and/or Methanol**, Demonstration operation as Decarbonized plant



* Products for the Demonstration plant is not determined yet.

JGC&TOYO; Ammonia Alliance Japan

JGC and TOYO entered Business Alliance for Fuel Ammonia Project



Strengths

- Extensive experience in **large scale projects** and **modular construction**
- More than **20,000 projects** in over 80 countries

Strengths

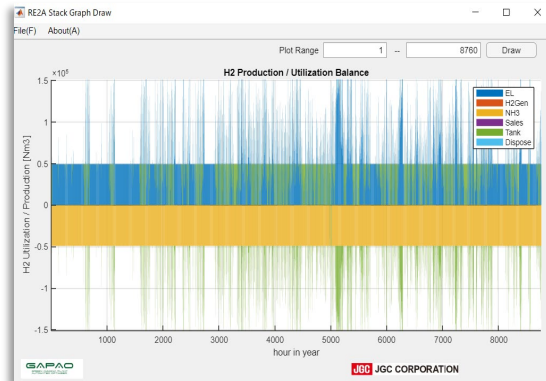
- Extensive experience with **KBR licensed ammonia** plant
- More than **80 Ammonia projects**

JGC&TOYO Ammonia Alliance Japan can

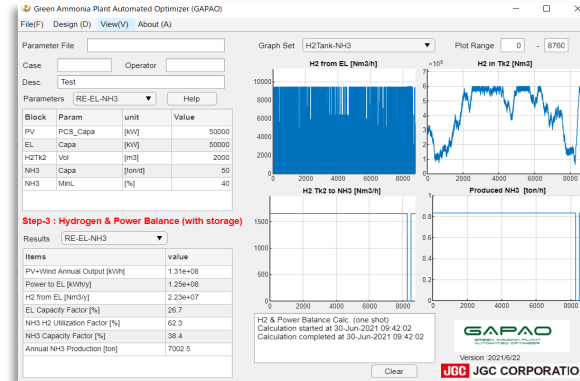
- provide **one stop high value solution** from planning phase to EPC in a timely manner with **KBR licensed ammonia process**
- offer **the competitive proposal** based on the extensive experience of both parties

Simulation Tool for Green Ammonia Plant Optimization based on Fluctuating Renewable Energy Input, by Balancing H₂ and Energy, and Consideration of Dynamic Features

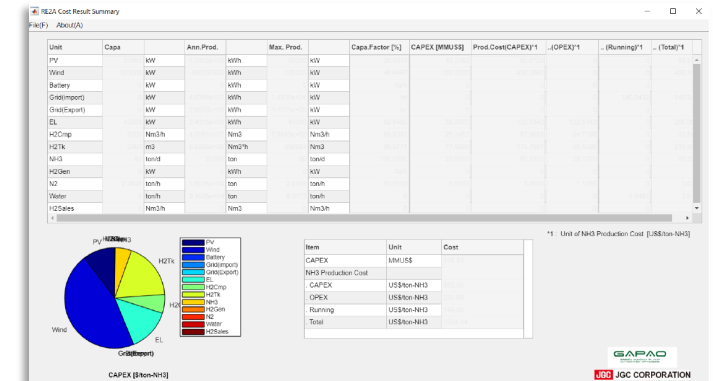
◆ Output Image



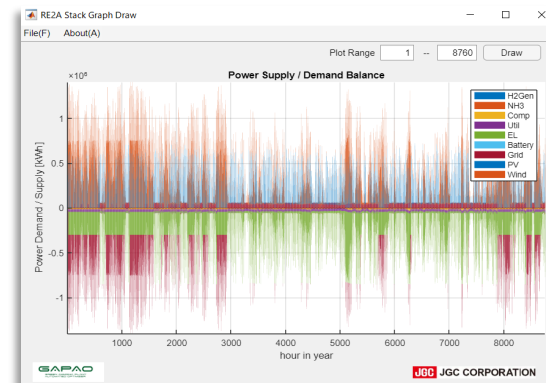
Hydrogen balance



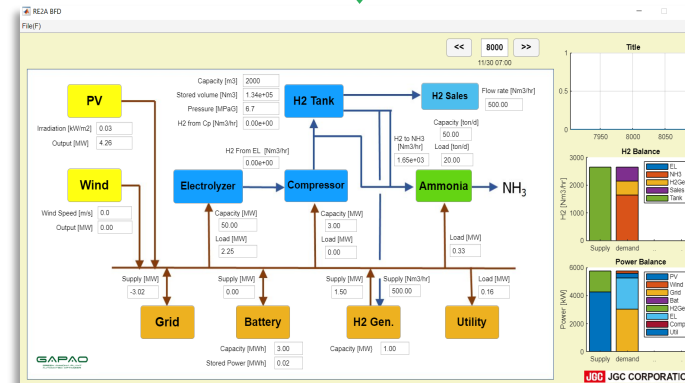
Main GUI



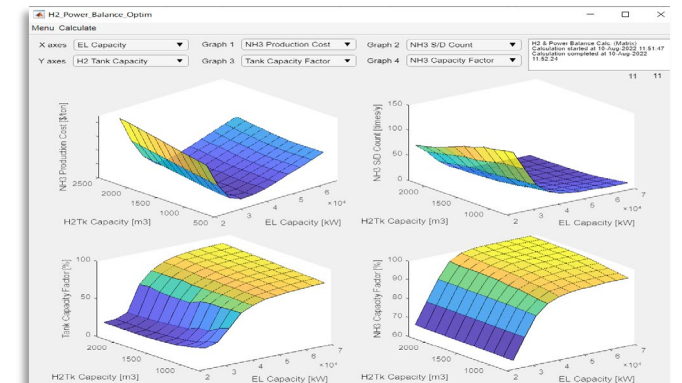
Levelized cost and breakdown



Power balance



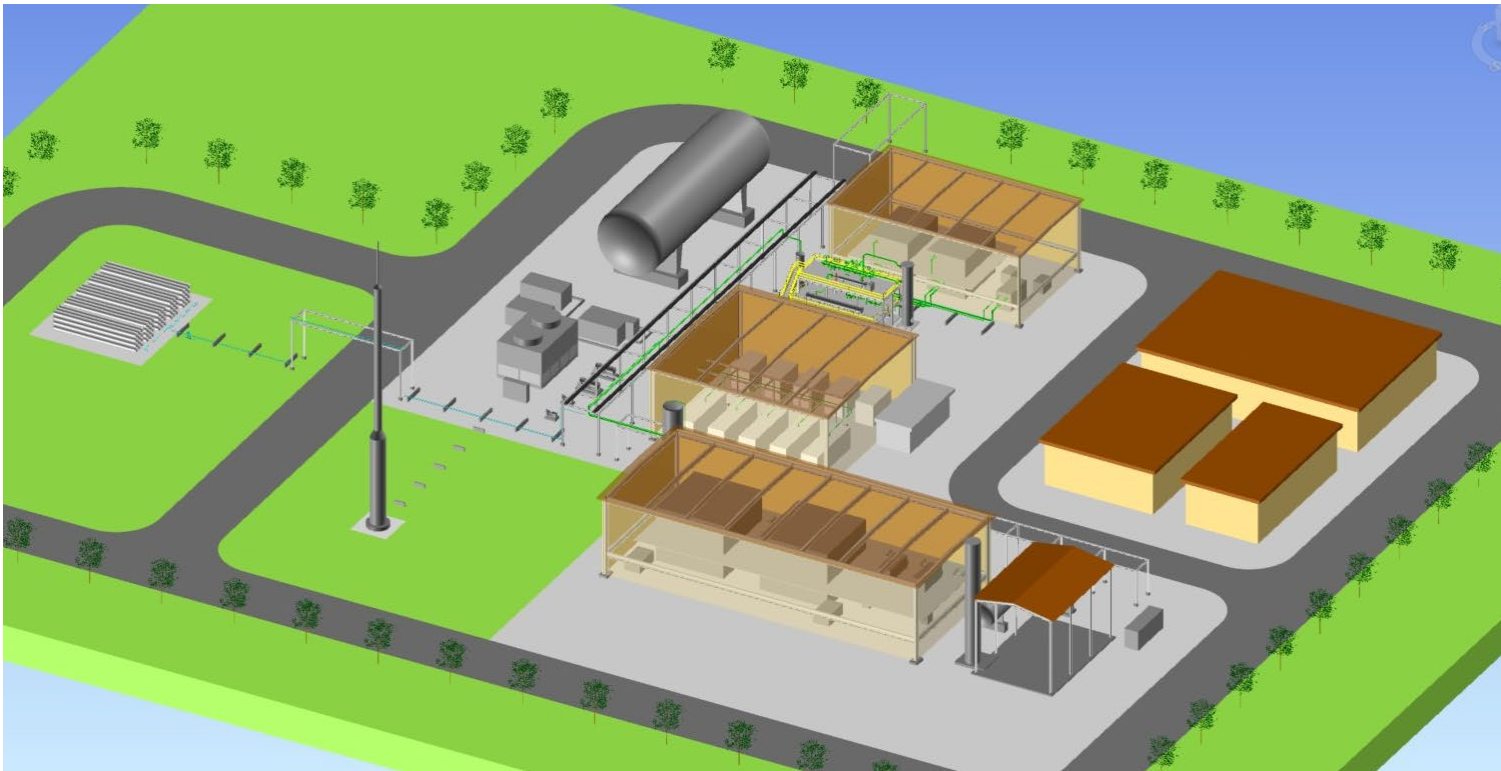
Block flow diagram and material balance



3D graphs visualizing optimum design point

Outline

- ✓ Design standardization and packaging for cost competitiveness and early delivery.
- ✓ Construction cost saving by skid / modular design concept.



Sample of 3D Image of mid-scale Green Ammonia Plant



THANK YOU VERY MUCH

**WE LOOK FORWARD TO BEING INVOLVED
IN YOUR CLEAN H₂ & AMMONIA/CHEMICAL PROJECTS,
AS ENGINEERING AND/OR INVESTMENT PARTNER**

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