POTEN & PARTNERS

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GLOBAL ENERGY EXPERTISE FOR A SUSTAINABLE FUTURE
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# Update on Korean Clean Ammonia Market

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PREPARED FOR

**AMMONIA ENERGY ASSOCIATION 2025 APAC CONFERENCE, PERTH**

# Brief overview of Poten's support in Korea

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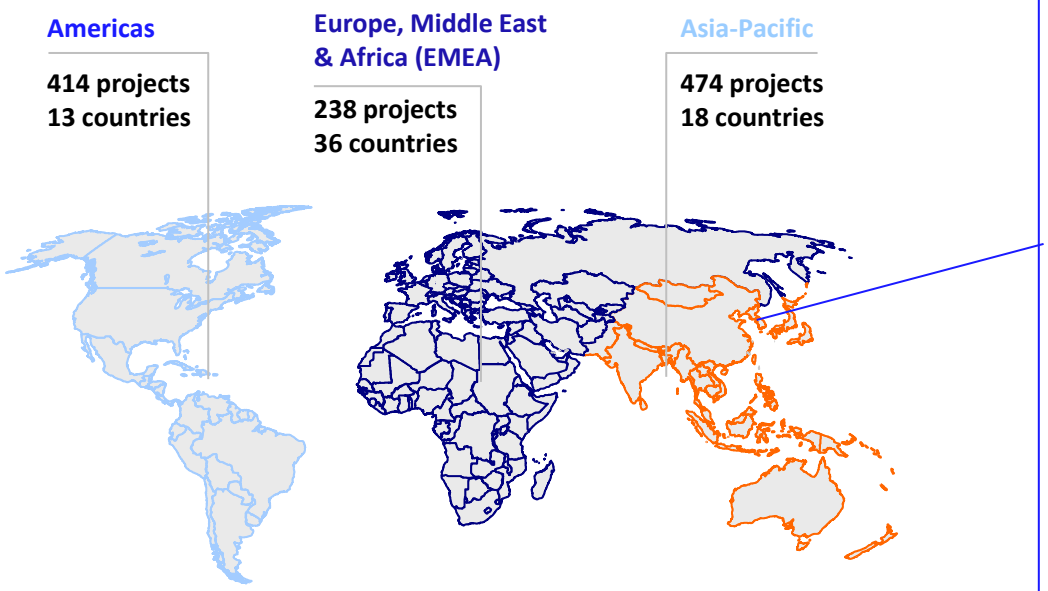


### 2019-2024 Advisory in APAC, including Korea

- LNG procurement – 20 projects
  - Tender process
  - HOA/SPA negotiation, SPA and TUA alignment
  - SPA term quantifying for negotiation
- Market/Price study – 15 projects
- Others – 6 projects
  - Commercial structure of LNG receiving terminals
  - Shipping strategy, etc.
- Ammonia/Hydrogen – 4 projects

**Full value chain support**

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**Market**

# Poten is best positioned to understand Korean buyers and their hydrogen / ammonia procurement strategies

- Poten holds a unique position as the leading commercial advisor for LNG procurement in the Korean market
  - Poten has provided commercial advisory services to nearly all the power companies in Korea that import LNG. In fact, we are not aware of any power utility that has not received Poten's support.
  - As a result, many of the LNG tender processes currently adopted by Korean power companies were initially developed by Poten. Poten has also supported most of the industrial companies in Korea that import LNG.
- We have provided the following services for importing LNG to power plant and/or industrial companies over the past 10 years:
  - Market and price overview services; LNG procurement strategies; Draft ITBs for procuring LNG; Clarification sessions with LNG suppliers; Drafting of key term sheets for HOAs; and Supporting negotiation with suppliers for HOA/SPAs.
- Korea's clean hydrogen/ammonia buyers have used LNG industry concepts as a benchmark for their contracting activities and are typically the same companies who we have advised for LNG procurement
- With Poten being well-connected in the Korean market and having been very deeply involved in procuring LNG for power plant companies, we are best positioned to understand Korean buyers and their hydrogen/ammonia procurement strategies.

# Clean Hydrogen Portfolio Standard (CHPS) 2025

# What is Korea's CHPS?

- CHPS is an abbreviation of the Clean Hydrogen Portfolio Standard
- CHPS is a tender for subsidizing clean hydrogen held by the Korea Power Exchange (KPX)
  - There were specific tenders issued by entities for clean hydrogen in Japan and Singapore, but the CHPS is the largest tender in Asia to this point in time.
- The first tender process took about 6 months in 2024 – the 2024 CHPS
  - The scheme was finalized and announced by the Korean government in late May 2024.
  - Many power plant companies in Korea ran their own tender process to select suppliers in August/September. Most of the companies selected their suppliers in early November and submitted their own application to CHPS in early November.
  - The result of CHPS tender came out November 22, 2024.
- The second tender process was announced May 2025 – the 2025 CHPS.

# CHPS aims to promote clean hydrogen power generation

- Under the CHPS, the Korean Government purchases a certain amount of electricity generated by clean hydrogen/ammonia (a co-firing ratio of at least 20%, measured in GHV)
- Under CHPS system, the government subsidizes the difference between the contract price and the System Marginal Price (SMP) – or the wholesale electricity price – on the Korea Power Exchange (KPX)
  - The Bid Price will be the total Levelized Cost of Electricity (LCOE) - Fixed cost and Fuel cost.
- Volatility from Inflation and Shipping cost fluctuations are not considered
  - Fuel cost should be Fixed Price for Green hydrogen/ammonia and HH-linked price with Fixed Price for Blue hydrogen/Ammonia.
- Contract Term: 15 years
  - COD to be 3 years after signing CHPS contract with a one-year grace period.
- Contract Quantity for CHPS 2025 is planned at 3,000 GWh
- Contract Quantity for subsidizing through CHPS 2024 was planned to be 6,500 GWh
  - Around 1.2% of total power demand in Korea
  - However, only 750 GWh was awarded in 2024 to KOSPO for co-firing with coal at its Samcheok Green Power Unit 1 in Gangwon Province in the NE of the country.

# Key updates to the CHPS for 2025 and tender schedule

- Reduction in opening quantity from 6,500 GWh in 2024 to 3,000 GWh in 2025
  - Competition will intensify, and bidders with only the most competitive terms will be awarded.
- Exchange rate adjustments allowed in the 2025 CHPS
  - The most difficult condition for suppliers in the 2024 CHPS was that the bid price was required to be in KRW, without scope for future exchange rate adjustments. Accordingly, clean ammonia supply bidders had to submit their supply cost in KRW.
  - In CHPS 2025, the rules have been altered to allow bidders to submit their clean ammonia price in USD.
- Additional volume flexibility
  - Quantity carryover / borrowing mechanism is introduced.
  - Power plant companies may carryover or borrow up to 10% of the annual contract quantity within a contract year.
- The CHPS bid schedule is very tight

| 9th May | | 15th ~ 26th Sep. | | 29th Sep. ~ 10th Oct. | | 31st Oct. | | ~ mid-Dec. |
|---|---|---|---|---|---|---|---|---|
| **CHPS Bid Issued** | → | Bidder Registration | → | Proposal Submission | → | Shortlist | → | Contract Award |

  - Power plant companies must issue an invitation to bid to suppliers regarding clean ammonia supply after the CHPS bid announcement (May) and select one of them to negotiate an SPA by the end of 2025.

# Clean Hydrogen suppliers must obtain a Clean Hydrogen Certificate (CHC) issued by KEEI to participate in the CHPS

- Clean Hydrogen Certificate is a certification system implemented by the Korean government to assess the cleanness of Hydrogen and provide incentives accordingly
  - It measures Well-to-Gate Greenhouse Gas emissions per 1kg of Hydrogen produced
  - Emissions from shipping temporarily excluded considering technical development of clean shipping vessels.
- Korea Energy Economics Institute (KEEI) is the designated certification operation institution and is providing preliminary consultation to determine estimated CHC grade
- Typically, Green Hydrogen falls within Grade 1 & 2 and Blue Hydrogen falls within Grade 3 & 4, with green hydrogen evaluated much higher than blue hydrogen in the CHPS

| Grade | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| GHG emissions ($KgCO^{2e}/KgH^{2}$) | 0~0.1 | 0.1~1 | 1~2 | 2~4 |
| CHPS Evaluation | 35 | 32 | 8 | 1 |

- Other major requirements for participating the CHPS tender are:
  - Facilities to have obtained or to be acquired for power generation business license
  - Clean hydrogen (CHC holding or to be obtained)
  - 20% or more co-firing rate
  - Carbon emissions before co-firing > Carbon emissions after co-firing.

# Price is critical in the CHPS tender process

- Price is weighted at 60% in the evaluation process. There is a price ceiling in the CHPS tender which is not officially released. When participants are submitting their price bid to the CHPS, the supply cost of clean ammonia should be reflected as:
  - Green ammonia: fixed price
  - Blue ammonia: HH-linked price or fixed price
  - Inflation rate and shipping cost assumptions should be fixed for the entire contract period – a condition that suppliers find challenging as they cannot pass through unforeseen volatility
  - Also, due to the price ceiling, it may be difficult for green ammonia to be selected
    - Cleaner ammonia is evaluated higher on non-pricing factors. However, it may be challenging for Green ammonia to succeed in the CHPS tender as it is typically more expensive than to Blue ammonia.
- Non-price factors have a 40% weighting, and the evaluation of non-price factors is as follows:.
  - Power generation emission factor (10)
  - Clean hydrogen grade (35)
  - Industrial contribution (15)
  - Credit rating (2)
  - Stability of fuel procurement (20),
  - Resident acceptance and project progress (13)
  - System acceptability (5)

# What to prepare for 2025 CHPS

- As discussed, on May 2025, the CHPS 2025 scheme was released. It is generally similar to the 2024 CHPS, but differs in two ways:
  - CHPS 2025 eased exchange rate conditions. It did not insist on KRW only.
  - Regarding volume flexibility, only carry forward was possible in CHPS 2024. But CHPS 2025 also makes it possible to borrow volume from the following year.
- Factors to be considered by sellers:
  - Whether to supply directly or through a partner who shares the risk
  - What shipping options to choose and how to reflect this in the contract price
  - How to respond when a buyer makes excessive demands regarding ToP
  - How to deal with Conditions Precedent(s) stipulated by the Buyer and Seller
  - The tender process is very short; how can it be successfully navigated?
  - How to negotiate binding nature of the bid or HOA.

# With experience in the 2024 CHPS, Poten is well positioned to offer support to clean hydrogen suppliers for the 2025 CHPS

- Price was the most important factor driving the results of the 2024 CHPS, and this is expected to be the case in 2025 as well. Poten can provide advise on the pricing strategy that best balances competitiveness with risk management

- With experience advising buyers in the 2024 CHPS, Poten clearly understands both buyer rationale behind key requirements and the CHPS requirements, providing optimized negotiation strategy to suppliers
  - The schedule for 2025 CHPS is one month tighter then 2024 CHPS, with power plant companies submitting bids for the CHPS in early October. Given these tight timelines, well-prepared negotiations are essential, requiring clear understanding of CHPS requirements.

- Due to uncertainties around the clean hydrogen market and CHPS, buyers will seek to transfer risks to suppliers
  - Poten can support suppliers on distinguishing which risks are manageable and designing risk mitigation strategies.
  - As for risks that are difficult to accept, Poten can assist negotiation with buyer to share risk between parties to achieve a win-win situation.

# CHPS 2024 recap

# The 2024 Clean Hydrogen Portfolio Standard (CHPS) in Korea was the first large tender for subsidizing clean hydrogen in the Asian region

- Asian energy consumers in Japan and Singapore have issued outline clean hydrogen/ammonia tenders in the past, but these tenders were generally not for large or commercially firm volumes.
- CHPS 2024 was the first large scale commercial tender for clean ammonia as a bulk fuel
- The result for 2024 CHPS were released on November 22nd, 2024
  - The discussion around CHPS started several years ago, but the scheme was finalized and announced by the Korean government in late May 2024.
  - The power plant companies in Korea ran their own tender process to select suppliers in August/September. companies selected their suppliers in early November and submitted their own application for CHPS in early November 2024.

# Price was the most important factor in the 2024 CHPS, with only 11.5% of opened quantity met due to upper price limit

| Power Plant Company | Power plant | Clean fuel type | Capacity | Bid quantity* | Bid price per KWh (KRW) | Result |
|---|---|---|---|---|---|---|
| KOSPO | Samcheok Green Power #1 | Ammonia | 1,022 MW | 750 GWh | 400-500 | Awarded |
| KOEN | Incheon Yeongheung #5 | Ammonia | 870 MW | 1,105 GWh | 500-600 | Disqualified |
| EWP | Dangjin #10 | Ammonia | 1,020 MW | 1,295 GWh | 500-600 | Disqualified |
| KOMIPO | Shin-Boryeong #1 | Ammonia | 1,019 MW | 1,295 GWh | 500-600 | Disqualified |
| SK Innovation E&S | Boryeong Power plant | Hydrogen | 1,050 MW | 1,335 GWh | Mid 600 | Disqualified |
| **Total** | | | **4,981 MW** | **5,782 GWh** | | |

**Bid quantity of disqualified bidders are assumed based on capacity*

- For the opening of 6,500 GWh generation capacity, five Power Plant Companies submitted applications totaling nearly 5,800 GWh of total capacity.
  - Among the five participants, only one was private company (SK Innovation E&S). Others such as Hanwha Impact or Dusan Fuel Cell decided not participate, mainly due to the high price of clean hydrogen. In 2025, more private companies are expected to actively participate.
- KOSPO was the sole bidder awarded in 2024, being the only participant to submit a bid price below the upper limit reported to be around 500 KRW/KWh
  - KOSPO's winning bid quantity of 750 GWh equates to around 0.4 MMt of Ammonia or just above 1,000 tonnes of Ammonia per day; assuming around 1 TWh of electricity requires 0.5 MMt of Ammonia.

# Bidders struggled to meet the challenging requirements, and the tight schedule set out by the government in the 2024 CHPS

- Requirements from the 2024 CHPS were transferred to the tenderers for each power plant
  - Terms were excessively buyer sided, and many suppliers chose not to participate in the tender process as they were not be able accept the risks associated with the process. Major challenges were:
    - Price should be in KRW (This requirement is lifted for 2025 CHPS)
    - Fixed Price for 15 years

      *(*The price of Blue hydrogen/ammonia can be "HH-linked + Fixed", but the ratio for HH-linked portion was capped, the cap is not known)*
    - Take-or-Pay (ToP) was not guaranteed or required excessive ACQ reduction rights
    - Conditions Precedents.

- The overall schedule in 2024 was too short and suppliers were unable to sufficiently prepare or respond to this
  - CHPS 2024 Scheme announced: May 2024
  - Submission of CHPS application: Nov 2024
  - Signing of CHPS contract: Dec 2024.

- There was a price cap which was not released. In reality, the price of green hydrogen/ammonia cannot have been lower than the cap price in 2024
  - Our understanding is that the fuel cost should be around or below USD700/ton.
  - A challenge was that the CHPS was launched because of the environment, but because the focus is primarily on economics, there was some confusion about the purpose of the system and how to achieve its goals.

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