

## COST PROJECTIONS FOR GRAY & GREEN AMMONIA

### Background

Historically, ammonia prices have closely followed the price of natural gas, the feedstock used to produce the hydrogen necessary for the ammonia synthesis process. Based on this fact, the value of this “gray” ammonia will increase in the future as the cost of natural gas is projected to increase.

In order to produce “green” ammonia, “green” hydrogen must be used. For the hydrogen to be green, it must be made without liberating carbon containing greenhouse gasses. Green hydrogen is created by the process of electrolyzing water using electricity from renewable energy (RE) sources.



The cost of renewable energy is projected to decrease in the future as technology improves, so the cost to make green ammonia will decrease over time. For this study, AmmPower considered three RE Mix cases:

- A. 50% Solar PV, 50% Wind
- B. 75% Solar PV, 25% Wind
- C. 25% Solar PV, 75% Wind

### Projections

Figure 1 compares the projected market price of gray and green ammonia considering all three aforementioned RE Mix cases, assuming green ammonia is sold for the same price as gray ammonia in February 2022 (1500 \$/US ton) and the margin earned from selling ammonia at today’s market price is held constant in the future.

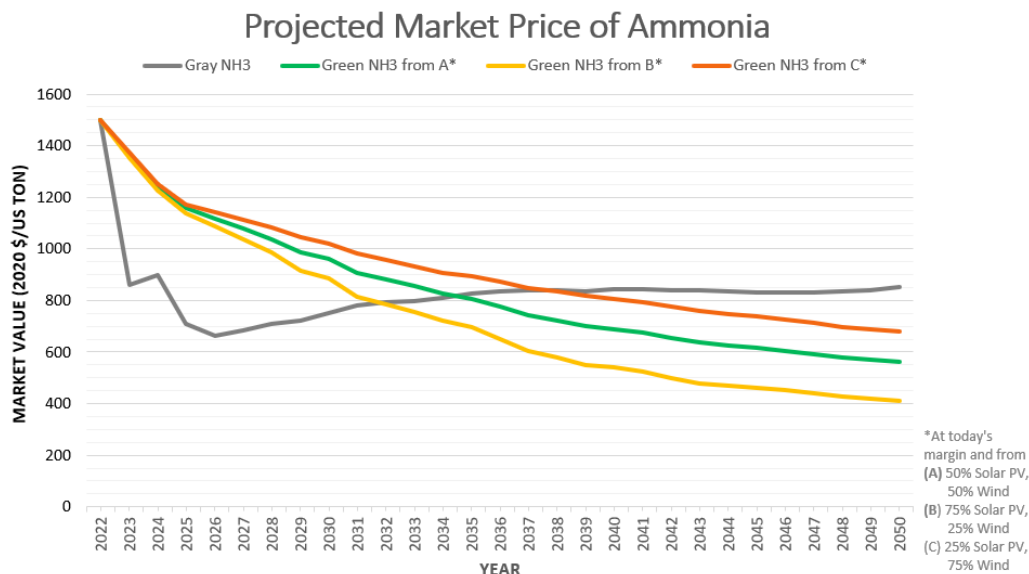


Figure 1. Projected market value of gray and green ammonia from present day to the year 2050 including three RE scenarios.

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Figure 2 gives the estimated cost and market pricing projections for producing and selling green ammonia, using RE Mix A (50% solar, 50% wind), compared to the present prices of anhydrous ammonia. These projections closely follow the levelized cost of electricity (LCOE) for renewable energy, shown in blue.

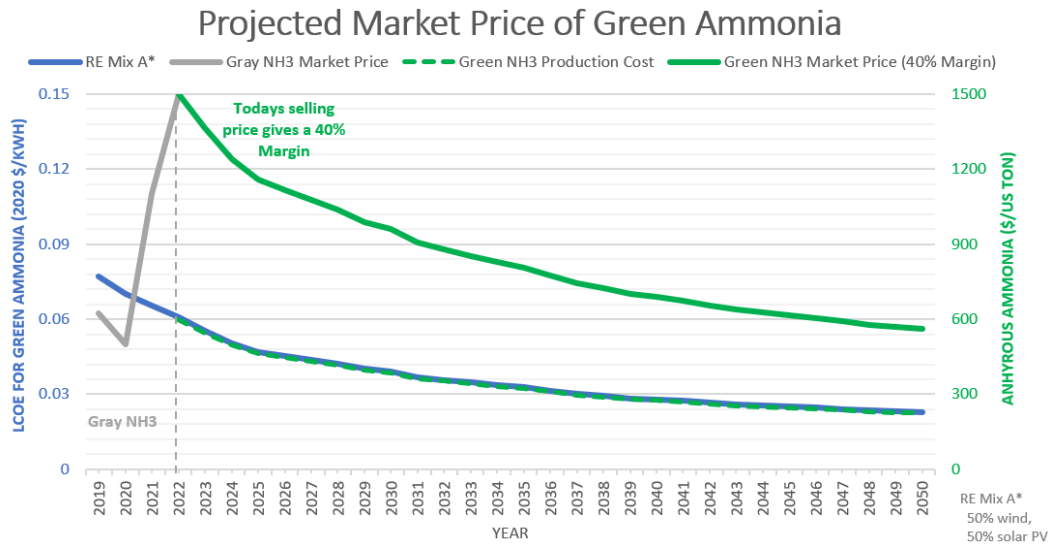


Figure 2. Projected cost and price of green ammonia prices powered by a hybrid mix of renewable energies with at today's margin (43.7%), the required cost to produce green ammonia, and the present gray ammonia prices for comparison

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### References

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- [3] Naam, Ramez. “Solar's Future Is Insanely Cheap (2020).” *Ramez Naam*, 14 May 2022AD, <https://rameznaam.com/2020/05/14/solars-future-is-insanely-cheap-2020/>.
- [4] U.S. Energy Information Administration (EIA), Short-Term Energy Outlook, October 2020 and EIA, AEO2021 National Energy Modeling System run ref2021.d113020a. EIA, AEO2021 National Energy Modeling System run ref2021.d113020a.
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Note: The AmmPower America LLC cost model was also utilized to calculate projections according to the data sourced above<sup>1</sup>.

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<sup>1</sup> This study uses 2020 dollars and has not made corrections for anticipated monetary inflation, as the referenced data does the same.