

CARBON CREDITS AND THE VOLUNTARY MARKET

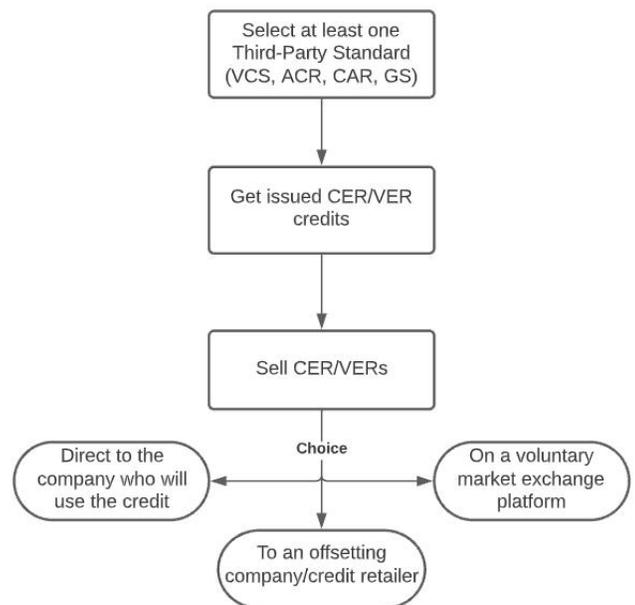
Background

The voluntary carbon marketplace allows companies and individuals to offset unavoidable carbon emissions by purchasing carbon credits. Each credit corresponds to the removal or reduction of one metric ton (MT, tonne) of carbon dioxide gas (CO₂), and when a credit is used by an entity to compensate for the emission of one tonne of CO₂, it becomes an offset. Credits that have been verified by a third-party company are often more desirable to the end-buyer.

Many of these third-parties are non-governmental organizations (NGOs) and can issue certified carbon credits for a project, as long as it meets their set of standards. These Certified or Verified Emission Reduction credits are usually referred to as CER or VER credits.

The flowchart to the right shows the general process for going through the voluntary carbon market to receive and sell carbon offsets.

There are two avenues for which CER/VER credits can be issued for the Independent Ammonia Making Machine™ (IAMM™), as there are two processes involved that avoid carbon emissions. First credits can be earned for using renewable energy to power the IAMM™ units instead of using fossil fuels for electricity. Second, credits can be earned by using “green” hydrogen to produce ammonia. “Green” hydrogen is produced from water (H₂O), whereas a “gray” process produces hydrogen from fossil fuels, particularly natural gas. By avoiding the use of fossil fuels for producing the required electric power and avoidance of the use of natural gas for producing the hydrogen, the IAMM™ synthesis process can be completely carbon-free.



Verification Process & Various Standards

Of all the national and international third-party verification bodies, four of the largest and most established are listed below.

- Verified Carbon Standard (VCS)
- American Carbon Registry (ACR)
- Climate Action Reserve (CAR)
- Gold Standard (GS)

Each verification body has established methodologies for issuing emissions reduction credits for renewable energy, whereas it is unknown if agricultural-based green ammonia credits have been issued before, and thus there is no established process for verifying these credits, nor is there market data on the price range of these credits. AmmPower is actively investigating this area to determine accurate values on the price for green ammonia credits. However, the method used to verify and issue credits across all third-party verification bodies and for all project sectors is generally the same and is listed below.

1. Submit project application for your IAMM™
2. Monitoring and data collection
3. Project certification and commercialization

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Selling Credits & The Number of Credits Available

Emissions reduction credits can either be sold directly to a company to meet their emission reduction obligations, or they can be sold to a trading retailer that facilitates the transaction between the seller and the end user of the credits. Although there are a few global voluntary carbon credit exchange platforms, they are less established and the pricing can be volatile.

As shown with the following formula, the more carbon dioxide that is prevented from entering the atmosphere, the more money that can be earned through selling carbon offsets. With IAMM™ the number of carbon credits earnable are given with the process provided in Table 1.



Table 1. Calculation breakdown for total carbon dioxide prevented/total carbon credits available with IAMM™

	Value	Metric Units	Value	English Units
CO₂ Prevention by Process				
<i>Ammonia Synthesis</i>	2	MT CO ₂ /MT NH ₃	2.2	ton CO ₂ /MT NH ₃
<i>Renewable Energy</i>	180.5	MT CO ₂ /GWh	199.0	ton CO ₂ /GWh
IAMM™ Production				
<i>Output</i>	4	MT NH ₃ /day	4.4	ton NH ₃ /day
<i>Input</i>	10	MWh/MT NH ₃	9.1	MWh/ton NH ₃
Total CO₂ prevented/Total number of credits earned each year with IAMM™ for 365 days of production				
<i>Ammonia Synthesis</i>	2920.0	MT CO ₂ = No. Credits	3218.7	ton CO ₂
<i>Renewable Energy</i>	2636.0	MT CO ₂ = No. Credits	2905.6	ton CO ₂

Typically, the cost per carbon credit is priced differently depending on the sector, technology, and market demand. For example, credits for the renewable energy sector ranged between 1.0 – 2.2 USD/credit over the last three years, whereas credits for the reforestation sector were worth up to \$9.7 in the same time frame.

The Potential Cost of Green Ammonia Credits

As previously mentioned, it's unknown if agricultural-based green ammonia credits have been issued before, and thus there is no market data on the price range of these credits. To understand the potential cost, it must be noted that government tax incentives are also possible in the near future, and through federal issued tax credits, one could avoid the voluntary carbon offsetting market altogether.

Through the voluntary market system, industrial and agricultural-based carbon credits typically range between 1-25 USD. However, a production tax credit (PTC) for the creation of “green” hydrogen was passed through the House under the “Build Back Better” bill and is still under review by the U.S. Congress for legislative approval, as of November 2021. The proposed credit would give \$3 per kg of hydrogen “during the 10-year period beginning on the date such [green hydrogen] facility was originally placed in service” [7]. From the ammonia-making perspective, \$3 per kg of hydrogen is equal to \$532.68 per metric ton of ammonia.

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Assuming 1.5 USD/credit can be earned for the renewable energy used to power one IAMM™ unit for 365 days of production, and the credit price for ammonia synthesis is varied between 1-25 USD/credit, Figure 1 shows the potential annual income for owning an IAMM™ unit utilizing CER credits today or PTCs in the future.

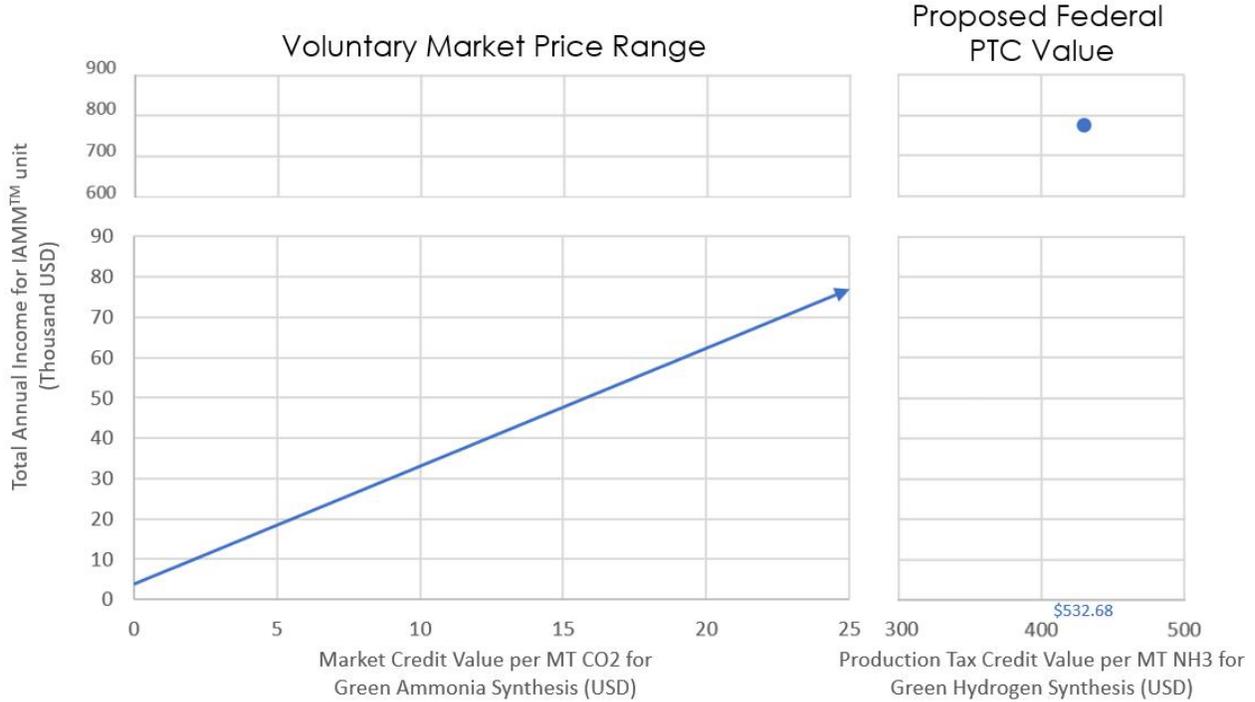


Figure 1. Total income potential from selling carbon offsets or earning carbon tax credits for varying price of credits for ammonia synthesis with the IAMM™ unit, including credits earned for using renewable energy at 1.5 USD/credit.

AmmPower Support

As can be seen from the graph above, federal tax credits will provide a much greater return on the investment for an IAMM™ unit than selling carbon offsets on the voluntary market. Therefore, AmmPower is closely watching the movement of this bill and will report updates on the progress as they are released.

In the meantime, AmmPower will continue to research the voluntary credit market and support the process for verifying and obtaining emissions reduction credits for your IAMM™ unit to help offset operating expenditures.

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