

Financial Feasibility of On-farm Production of Green Ammonia

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1. Introduction

- Net-zero carbon emissions targets may transform regional energy production, yet energy imports will remain significant in meeting local energy needs (Schmidt et al., 2019).
- Green ammonia, produced from renewable energy sources, is a sustainable alternative to traditional production with minimal or no carbon emissions.

Direct CO_{2e} Emissions to Produce One Tonne of Ammonia

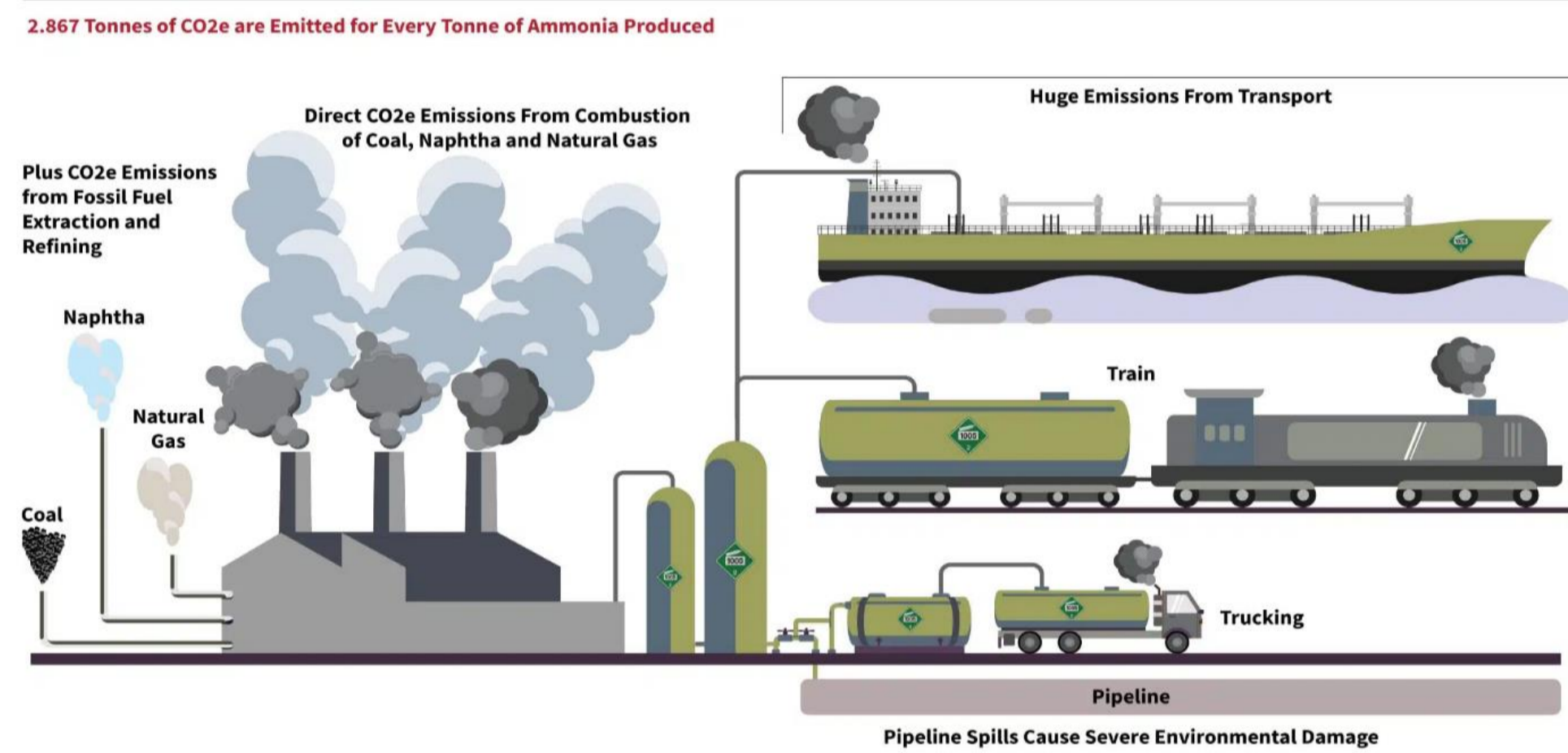


Figure 1: Direct CO₂ Emissions in Traditional Ammonia Production and Distribution (FuelPositive Corporation, 2024).

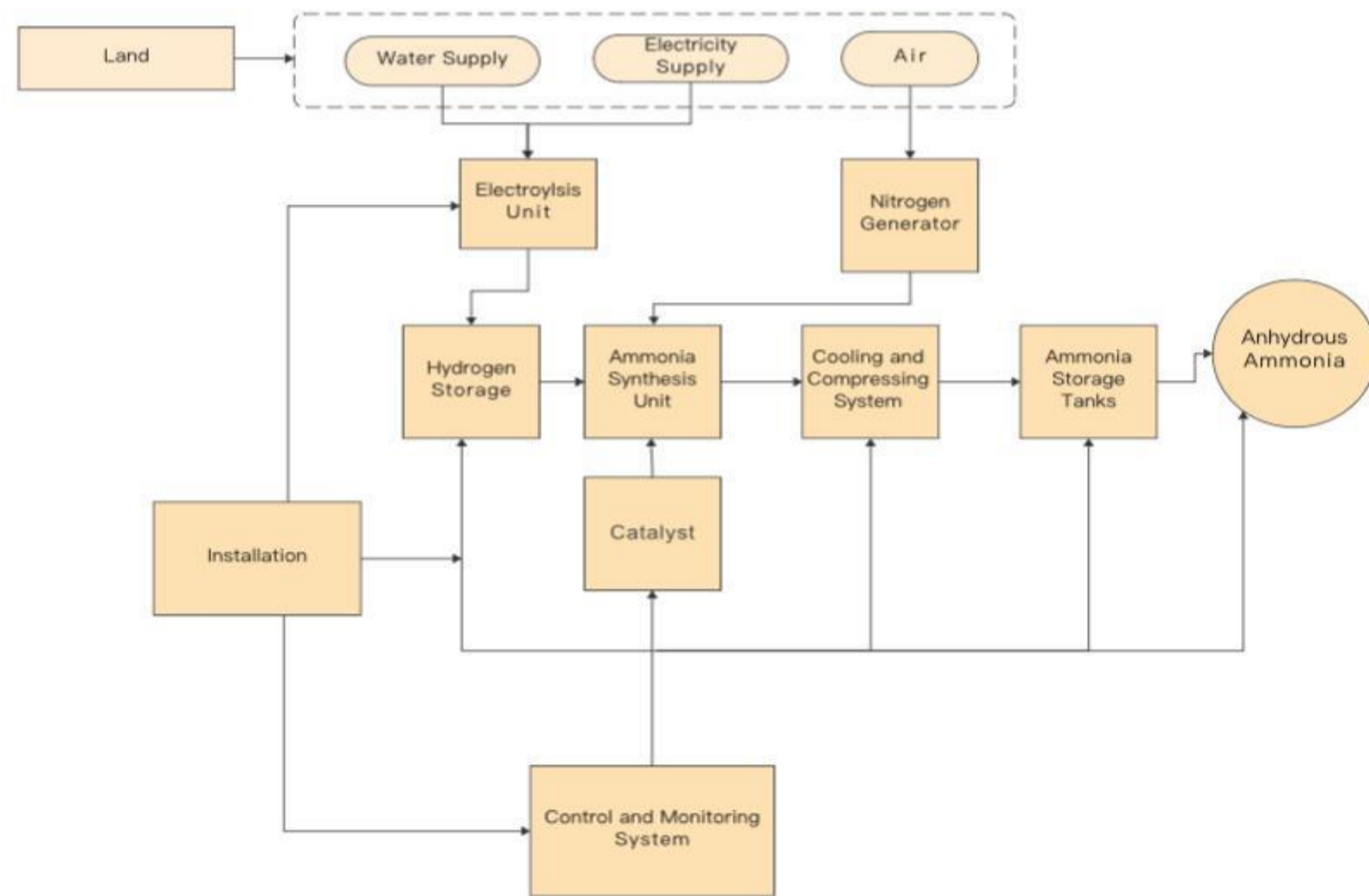


Figure 2: A schematic flowchart of the on-farm green ammonia production process.

2. Research Objectives

- Develop a Capital Budgeting Model that accounts for capital costs, major operating costs (such as electricity, and storage), and the level of ammonia generated.
- Evaluate the financial feasibility of on-site ammonia production compared to the purchase cost of off-site ammonia.
- Identify factors influencing the Net Present Value (NPV).
- Create a model adaptable to various farm conditions.

3. Case Study Results - Manitoba

- The study used base data including its technology, production costs, and ammonia output levels.

Table 1: Cost Summary of Technologies, Ammonia Production, and NPV Results

Input/ Assumptions	Amount
Initial Costs	
Initial Investment	-5,000,000
Land Cost	-6,400
Installation Cost	-20,000
Operating Parameters	
Capacity Factor (Days)	330
Water Usage	
Operating Costs (Cost of Water)	298
Electricity Usage	
Operating Costs (Cost of electricity)	380,160
Other Costs	
Storage Costs	900
Maintenance Costs	25,000
Production & Revenue	
Price of Ammonia (per tonne)	1,300
Ammonia Produced (tonne/year)	561
Revenue from Ammonia (\$)	729,300
Environmental Credits	
Green Incentive	44,800
Financial Parameters	
Discount Rate	9%
Project Lifespan (Years)	20
Net Present Value (NPV)	-\$1,175,782.73

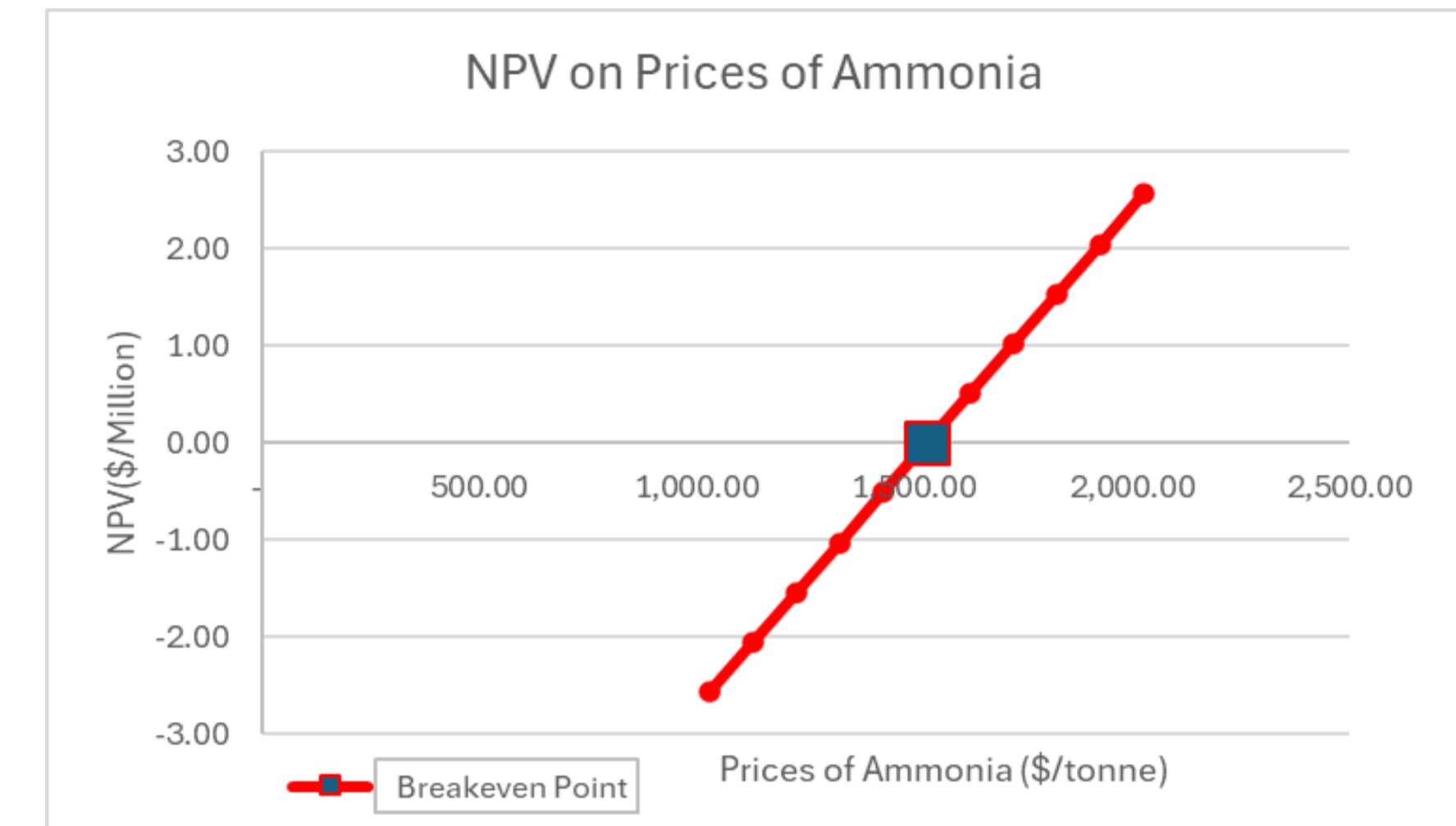


Figure 3: Graphical analysis of the impact of ammonia prices on NPV.

4. Conclusion

- Farmers can utilize this capital budgeting model to assess the costs and advantages of technology before making a purchase decision.
- Adopting green ammonia technology contributes to significant environmental benefits by reducing carbon emissions.
- Electricity costs and ammonia prices are the most crucial factors influencing the financial feasibility of this technology.

5. References

- Schmidt, J., Gruber, K., Klingler, M., Klöckl, C., Camargo, L. R., Regner, P., ... & Wetterlund, E. (2019). A new perspective on global renewable energy systems: why trade in energy carriers matters. *Energy & Environmental Science*, 12(7), 2022-2029.
- FuelPositive Corporation. (2024). Green ammonia system. <https://fuelpositive.com/green-ammonia-system>