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Case Study: Demonstrating the Benefits of Distributed Green Ammonia in Boone, Iowa

Distributed green ammonia (DGA) offers compelling economic, environmental, and supply chain resilience benefits for rural agricultural regions, including the Midwest. These regions depend on ammonia imports and face challenges due to price volatility and high transportation costs. The Upper Midwest largely imports ammonia from the Gulf Coast region using a complex transportation network that includes pipelines, rail, barges, and trucks.

An innovative demonstration project in Boone, Iowa, demonstrates the benefits of the farmer-cooperative ownership model for DGA projects and how renewable energy can be integrated with ammonia production. This project is a partnership between Landus, an agricultural co-operative, and TalusAg, an agricultural subsidiary of Talus Renewables, an international company specializing in providing low-cost, carbon-free fertilizers through a distributed network of on-site ammonia systems.

Key takeaways

- The project is strategically positioned in the Upper Midwest, a region with both widespread renewable energy resources and established infrastructure for ammonia fertilizers.
- The ammonia project represents a pioneering effort in DGA production, combining modular design with distributed deployment to meet the environmental and economic needs of farmers.
- The region is conducive to DGA production due to agricultural demand, high transportation costs due to importing fertilizer from the Gulf Coast, and access to affordable, renewable electricity.
- A cooperative ownership model can help mitigate financial risks by distributing costs among multiple stakeholders while ensuring a reliable and affordable green ammonia supply.

This case study adapts and republishes information provided originally in a report, Distributed Green Ammonia: Demonstrating Modular Systems for Sustainable Agriculture, which was prepared for the Hydrogen Economy Collaborative (HEC), a project of GPI, by GPI's Dreek Morgan, Val Stori, Gabrielle Olson, and Emmy Curtis.

Project highlights

- The project spans 75,000 square feet and is situated on a 35.8-acre site adjacent to an existing 33-acre Landus grain facility.[1]
- Landus facilities have had ammonia storage tanks on site for several years, making additional, local ammonia production easier from a permitting perspective.
- The facility utilizes a 1.4 MW electrolyzer and the TalusOne modular ammonia production system developed by TalusAg.
- The project uses a 1 MW on-site solar array
- It produces up to one ton of ammonia per day.[2]

Project partnership and the role of farmer cooperatives

The partnership between Talus Renewables and Landus launched the first DGA system in North America, which uses renewable energy from on-site solar and purchased off-site renewable energy production to locally produce anhydrous ammonia for regional agricultural use.

Landus is an agricultural cooperative headquartered in Des Moines, Iowa, with several regional facilities and service locations throughout Iowa and Minnesota. The cooperative operates across 34 states and 16 countries.[3] Farmer cooperatives (co-ops) are important early-technology partners for scaling DGA. Co-ops can pool resources to invest in shared ammonia production infrastructure, enabling farmers to benefit from economies of scale collectively.

TalusAg is an agricultural technology subsidiary of Talus Renewables, specializing in providing low-cost, carbon-free nitrogen fertilizers through a distributed network of on-site ammonia systems.[4] TalusAg partners with agricultural cooperatives to deploy its modular ammonia production systems. TalusAg currently offers two modular models:

- The TalusOne, which is capable of producing 1 to 2 tons of ammonia per day[5]
- The TalusTen, which is capable of producing up to 20 tons per day[6]

[1] Landus Cooperative, “Rural Matters: Grand Opening of Boone Fertilizer Facility,” Landus Cooperative, June 17, 2024, https://www.landus.ag/posts/rural-matters-grand-opening-of-boone-fertilizer-facility.

[2] “Landus Green Ammonia Plant,” Ideal Energy, accessed April 18, 2025, https://ideal.energy/landus-plant.

[3] “Landus Cooperative,” Landus Cooperative, accessed April 4, 2025, https://www.landus.org.

[4] TalusAg, “Farm Management Solutions,” accessed April 5, 2025, https://www.talusag.com/for-farms.

[5] Talus Renewables, “Talus Renewables Announces $22 Million Raised in Series A Financing,” *PR Newswire,* November 2, 2023, news provided by Talus Renewables, https://www.prnewswire.com/news-releases/talus-renewables-announces-22-million-raised-in-series-a-financing-301974223.html.

[6] Talus Renewables, “Talus Renewables Announces $22 Million Raised in Series A Financing.”

The Talus Renewables-Landus partnership is effective because it combines private investment with cooperative-driven implementation:

- TalusAg provides the funding and renewable energy expertise to deploy a modular ammonia facility.
- Landus leverages its member network, its strong balance sheet, and long-term investment capacity to ensure adoption and alignment with farmer needs. This cooperation strengthens supply chain stability, supports local economic development, and directly benefits the cooperative's farmer-members.
- Other farmer cooperatives with similar capacities are well-positioned to replicate this model, harnessing DGA to advance environmental and economic sustainability and resilience in their communities.[7]

Project demonstrates benefits of distributed green ammonia

While cost of the ammonia fertilizer is an essential measure of success, DGA projects, like the Boone plant, have several additional benefits, particularly to the local and regional electric grid for the benefit of local ratepayers. These benefits emphasize the advantages of DGA projects, stretching from providing value to the local community to relieving local electricity grid congestion:

- **Providing value to the local community.** The local community demonstrated strong customer demand for Talus' green ammonia through letters of intent for 12- to 15-year take-or-pay agreements.[8]
- **Enhancing system reliability and stability.** The Boone system offers fully interruptible electric operational flexibility, enabling control over system load to manage demand peaks and maintain stability in the local electric grid. With load factors ranging from 40 percent to 95 percent, the Boone system provides substantial operational flexibility, enabling adjustments on a monthly, daily, or even hourly basis.[9] The project already optimizes its power consumption by operating the electrolyzer intermittently, capitalizing on key periods of low demand between grain-drying demand spikes.[10]
- **Alleviating local electricity grid congestion.** The TalusTen system can rapidly reduce its load from 11.5 MW to 500 kW in less than ten minutes,[11] enabling demand response during peak events and optimizing economic incentives. Through an intelligent metering system, the electrolyzer adjusts its production based on real-time data that tracks solar production, total facility/farm usage, and electrolyzer consumption.[12]

[7] Tristan Peitz (TalusAg), video call with author, May 7, 2025.
[8] Tristan Peitz (TalusAg), email to author, May 7, 2025.
[9] Tristan Peitz (TalusAg), email to author, May 7, 2025.
[10] "Landus Green Ammonia Plant," Ideal Energy.
[11] Tristan Peitz (TalusAg), email to author, May 7, 2025.
[12] "Landus Green Ammonia Plant," Ideal Energy.

- **Facilitating renewable integration into the electric grid.** Renewable resources, such as wind and solar, produce power when the renewable resource is available. When the grid is congested, wind and solar generation can be curtailed. The Boone system's operational control has the capability to allow Talus to utilize curtailed renewable resources, which optimizes cost and the renewable resource.
- **Lowering electricity costs for other local rate payers.** The Boone system reduces overall electricity costs for local ratepayers by cutting net grid demand through on-site solar, operating the electrolyzer as a flexible load that avoids peak demand (and peak demand charges), and by storing excess renewable electricity as ammonia, which avoids having to purchase high-priced energy at other times.

Strategic fit: Ideal markets for distributed green ammonia

The Boone DGA project was developed in a high-demand agricultural zone with a dense concentration of corn and soybean farms, which account for over 75 percent of the total land area in Boone County.[13] In comparison, corn and soybean farms represent only 6.35 percent of the total land area in the US.[14] The significant local demand for ammonia fertilizers adds value to the DGA resource, avoiding the need for new transportation or shipping infrastructure.

Affordable renewable electricity is a key driver for the DGA market, as it enables carbon-neutral production at a low price. The Boone plant was built in an area with significant renewable energy resources that already serve the grid with economically competitive electric energy production. In 2024, Boone County generated over 1.3 million megawatt-hours of renewable energy while consuming only 460,000 megawatt-hours. As a result, the energy consumed by residents of Boone County produces zero CO_2 emissions per person annually.[15]

To further enhance sustainability, the TalusAg-Landus system uses a 1 megawatt on-site solar array that is integrated with the local utility.[16] The on-site solar array is registered with CleanCounts—North America's largest clean energy registry—and generates renewable energy credits (RECs). These RECs, in combination with RECs from the regional grid, are retired to provide the auditable proof of matching renewable energy use with ammonia production.[17]

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[13] USDA, National Agricultural Statistics Service, *County Profile: Boone County, Iowa* (2017 Census of Agriculture) (USDA-NASS, 2019), https://www.nass.usda.gov/Publications/AgCensus/2017/Online_Resources/County_Profiles/Iowa/cp19015.pdf.

[14] USDA, National Agricultural Statistics Service, *2022 Census of Agriculture – Full Report, Volume 1, Chapter 1: United States,* Table 35 (USDA-NASS, 2024), https://www.nass.usda.gov/Publications/AgCensus/2022/Full_Report/Volume_1%2C_Chapter_1_US/st99_1_035_035.pdf.

[15] "Boone County, Iowa Electricity Rates & Statistics," FindEnergy accessed September 23rd, 2025, https://findenergy.com/ia/boone-county-electricity/.

[16] "Landus Green Ammonia Plant," Ideal Energy.

[17] Rob Davis, CleanCounts, email to author, January 11, 2026.

Public policy and industry alignment

Federal incentives and grants were vital to make local production viable in the initial phases of the Boone green ammonia project. For example, the US Department of Agriculture Fertilizer Production Expansion Program grant, valued at approximately $4.9 million, played a critical role in supporting the construction of the Boone plant.[18]

Simultaneously, the 45V Clean Hydrogen Production Tax Credit, set to expire in December 2027 for new projects, plays a crucial role in reducing ammonia costs by lowering the cost of hydrogen, a primary input and cost driver. The tax credit offers an incentive of up to $3 per kilogram of clean hydrogen produced, helping DGA to remain cost-competitive with conventional ammonia. By leveraging the 45V tax credit, the Boone plant cut ammonia costs by more than half.[19]

The 30 percent investment tax credit (ITC) for clean energy investments, including electrolyzers and solar projects, helped further lower costs for the Boone DGA project.[20] The ITC enhanced the project's financial reliability, reducing the risk for investors and helping secure additional project financing in the form of RECs for future projects.[21]

Additionally, the Iowa Economic Development Authority and the US Department of Energy funded an analysis titled *Renewable Hydrogen in Iowa*, developed by Ideal Energy, a solar energy company based in Fairfield, Iowa. The report assesses the potential of Iowa's hydrogen economy and the impact of hydrogen on employment and the national hydrogen market.[22] It also builds on the broader decarbonization goals outlined in the Iowa Energy Plan, prioritizing the transition to low-carbon technologies in the energy and agricultural sectors.

Looking ahead

DGA is a key building block for the future of low-carbon agriculture. It can position the Upper Midwest to stabilize nitrogen fertilizer supply and costs by producing fertilizer close to demand. By replacing a portion of imported fertilizer with locally produced ammonia, DGA is keeping more dollars in rural communities while strengthening co-ops and local electric utilities.

Moreover, low-carbon crops are attractive to food companies seeking to lower their Scope 3 emissions (indirect greenhouse gas emissions from a company's value chain) and/or meet European disclosure and procurement specs. Food and beverage companies, as well as biofuel producers, often offer premiums or longer-term contracts for low-emissions agricultural products like corn and soy.[23]

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[18] Landus Cooperative, "Rural Matters: Grand opening of Boone Fertilizer Facility."
[19] "Talus Local Ammonia," TalusAg, accessed, May 1, 2025, https://www.talusag.com/#section_about.
[20] Tristan Peitz (TalusAg), email to author, May 7, 2025.
[21] Tristan Peitz (TalusAg), email to author, May 7, 2025.
[22] Eric Johnson and Greg Wilson, *Renewable hydrogen in Iowa* (Ideal Energy, LLC, August 24, 2022), https://ideal.energy/white-papers.
[23] NuWay-K&H Cooperative, "The Benefits of Lower Carbon Intensity (CI) Corn Farming," NuWay-K&H Cooperative, April 15, 2024, https://nuway-kandh.com/the-benefits-of-lower-carbon-intensity-ci-corn-farming/.

Together, premium pricing for low-carbon crops, shorter supply chains, and transparent, predictable pricing make DGA an integral component of a resilient, sustainable, and economically valuable Midwest agricultural system.

Opportunities for future DGA projects are abundant in the Midwest. For example, TalusAg continues to explore the Midwest for DGA-primed markets where fertilizer is valued and profitable, and where agricultural cooperatives have a robust presence, including other counties in Iowa and the broader Corn Belt.[24] The Minnesota Made Ammonia Coalition recently announced a deal to begin manufacturing DGA in Blue Earth, Minnesota, eventually producing over 14,000 tons annually, equivalent to 5 percent of Minnesota farmers' needs.[25]

Agricultural cooperatives with healthy balance sheets, proven safety records, and the necessary fertilizer infrastructure are well-positioned to develop DGA systems. In fact, TalusAg is currently deploying to Eagle Grove, Iowa, the first TalusTen system capable of producing 20 metric tons of green ammonia per day. This system will begin operating under a ten-year fixed-price offtake contract and is anticipated to be commissioned by the end of 2026. Later this year, a second TalusTen system is planned to begin construction in Manning, Iowa.[26]

Research background: *The information in this case study was gathered by GPI authors of the distributed green ammonia report through a combination of primary and secondary research, including a literature review of policy documents and market analyses. Insights were gleaned from attending the Green Ammonia Summit hosted by the Minnesota Farmers Union in December 2024, where stakeholders convened to discuss the challenges and opportunities surrounding DGA implementation. At the summit, additional insights were gained through direct engagement with DGA developers and first movers such as FuelPositive and Landus. In addition, the authors directly engaged with TalusAg staff.*

[24] Tristan Peitz (TalusAg), email to author, April 10, 2025.
[25] Kristoffer Tigue, "Minnesota's aspirations for a 'green ammonia' industry could soon pay off for farmers," *Minnesota Star Tribune,* March 6, 2026, https://www.startribune.com/minnesotas-aspirations-for-a-green-ammonia-industry-could-soon-pay-off/601591441.
[26] Schmuecker Renewable Energy System, *Iowa Farm Bureau: Green Ammonia Plant Opens in Boone,"* May 20, 2025, https://solarhydrogensystem.com/2025/05/20/iowa-farm-bureau-green-ammonia-plant-opens-in-boone/.