

# Research Highlights Report

## BILLION-DOLLAR BUSINESS OPPORTUNITY IN ETHANOL WASTE

New studies document the untapped value of ethanol byproducts for agricultural states.

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Reports available at: [www.TrestleEnergy.com/economic-analysis](http://www.TrestleEnergy.com/economic-analysis)

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New economic reports show that producing biomass fuel pellets from crop residues like corn stalks can provide a billion-dollar development opportunity for agricultural states.

Iowa-based Regional Strategic, Ltd. examined the economic impact of collecting, processing, and delivering corn stover byproducts of ethanol – the stalks, stems, and leaves of corn plants – to use for generating electricity. The stover is compressed into biomass pellets that can be burned like coal in existing power plants, reducing CO<sub>2</sub> emissions and increasing renewable energy supplies.

The study results reveal that with modest infrastructure investments, building even a single pellet facility can deliver large quantifiable economic benefits across the farm economy, and developing a broader industry around corn stover pellets represents billion-dollar scale opportunity.

The studies focus on Nebraska and Iowa, two leaders in U.S. ethanol production, with an eye toward how building out a new bioenergy industry would impact the economies in these states.

Growing corn for ethanol produces roughly 8.3 million tons of harvestable corn stover each year in Nebraska, while Iowa's ethanol industry produces around 16 million tons per year. Using

this stover to reduce carbon emissions elsewhere in the economy reduces the overall carbon footprint of ethanol – making the ethanol more valuable in jurisdictions with Low Carbon Fuel Standards or Clean Fuel Standards (“LCFS/CFS”). This additional value can help farmers earn extra profits by collecting their stover and can fuel a new economic engine for agricultural states.

The impacts show that building a corn stover industry to complement ethanol production in Iowa could generate over \$1 billion in additional labor income and contribute \$2 billion to the Iowa's GDP by 2030. In neighboring Nebraska, the analysis shows the potential to generate \$840 million in labor income and contribute \$1.5 billion to the state GDP over the same period.

### Overview of the Opportunity

#### *What is the opportunity?*

- Build a corn stalk pellet industry to increase the value of ethanol

#### *What's in it for farm communities?*

- New products & revenue
- Higher value for existing products
- Economic development
  - *New investment opportunities*
  - *More labor income*
  - *Additional GDP growth*

#### *What does it take to build it?*

- Fuel existing coal plants with corn stalk pellets



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## Background

Biomass pellets made from corn stover byproducts of ethanol – the stalks, stems, and leaves of corn plants – can be burned with coal, or “cofired”, in existing power plants to reduce CO<sub>2</sub> emissions and increase renewable energy supplies.



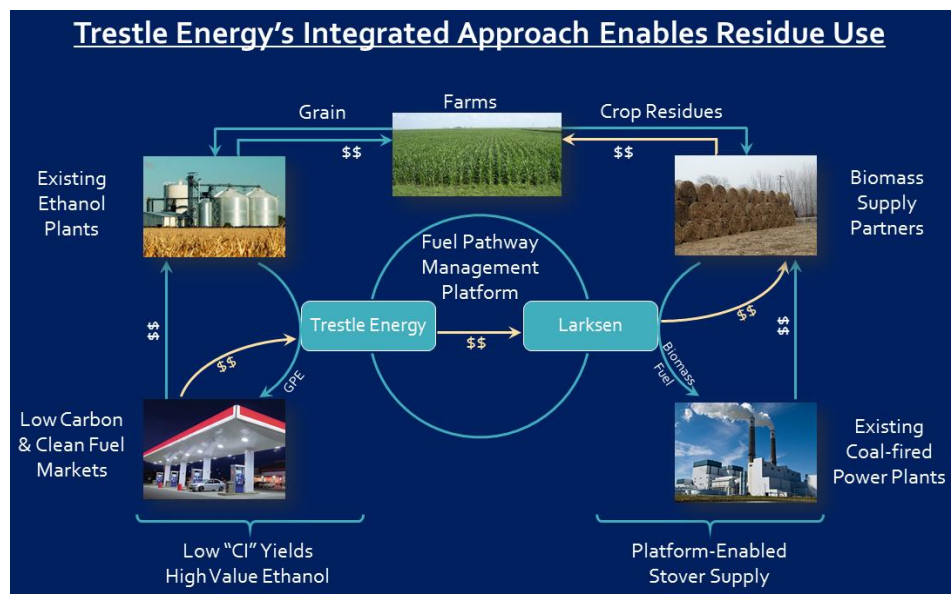
This is similar to the way wood pellets are burned in many European power plants. However, if the pellets are produced from the discarded parts of corn plants that are grown for ethanol, then the pellets can also reduce the carbon footprint or Carbon Intensity (“CI”) value of ethanol. Ethanol produced with a low CI value can command a significant premium in markets with LCFS/CFS programs and can generate premium value “advanced biofuel” renewable identification numbers under the federal Renewable Fuel Standard program

(“RFS”). The premium value created under these programs creates a new opportunity to develop a pellet industry that complements existing ethanol production and delivers significant, measureable economic benefits across agricultural states.

Although corn is widely grown throughout the United States, only the stover that is produced from corn used for ethanol can get credit under LCFS/CFS programs and the RFS. In order to be economically viable, corn and ethanol production must be concentrated near coal-burning facilities that can blend the pellets into their fuel mix. There are currently six states in the U.S. that produce over a billion gallons of ethanol per year: Iowa; Nebraska; Illinois; Minnesota; Indiana; and South Dakota. Together, these states produce nearly 11 billion gallons of ethanol per year.

[Trestle Energy](#) has established new fuel pathways under LCFS programs in California and British Columbia that enable existing ethanol plants to produce very low carbon fuels and command a significant financial premium in the market. These pathways integrate coproduction of fuel ethanol and biomass pellets for use in existing coal-fired boilers.

Trestle Energy’s affiliate for biomass supply, [Larksen LLC](#), demonstrated the technical and economic performance of crop residue fuel pellets during the 2012 corn marketing year. This demonstration provided the basis for both Trestle Energy’s fuel pathways, which received final approval in California in 2016, and for the new



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series of economic impact analyses developed by [Regional Strategic LTD](#), an independent analysis consultancy specializing in economic development across agricultural communities.

Over the past several years, Larksen LLC has validated the technology and then process feasibility in the field. Larksen estimates that corn grown for ethanol in the six states noted above could yield roughly 44 million tons of harvestable corn stover per year. It is conceivable that this stover could replace around 37 million tons of coal used for electricity generation. This is equivalent to roughly 5% of the 738 million tons of coal burned by U.S. power plants in 2015 [[EIA 2017](#)].

### **Study findings**

The independent studies, commissioned by Larksen LLC, quantify the economic impacts of building a pellet industry to complement ethanol production. The reports focus on economic impacts for Iowa and Nebraska, two leading states in ethanol production. They show that building even a single pellet facility can deliver large economic benefits and that broader industrial development represents a multi-billion dollar opportunity for agricultural states.

#### *State-level total economic impacts through 2030.*

	Iowa		Nebraska	
	Labor Income	State GDP	Labor Income	State GDP
Single Facility Started in 2018 <sup>a</sup>	\$43 Million	\$78 Million	\$44 Million	\$80 Million
10% Cofire Industry Beginning in 2020 <sup>b</sup>	\$1.1 Billion	\$2.0 Billion	\$840 Million	\$1.5 Billion

<sup>a</sup> Source: Tables 7 and 9 of the original reports. <sup>b</sup> Source: Scenario 3 in Tables 11 and 13 of the original reports.

For each state, researchers evaluated five scenarios, reflecting the fact that this industry is not yet “on the ground.” The scenarios explored range from a single pellet plant, characterized as a building block for the industry, to multiple stepping-stone perspectives on potential industry growth over time. The industry-wide scenarios consider biomass cofire rates of 10% and 40%, where biomass pellets replace 10% and 40% of the coal burned, respectively. Research by the U.S. Department of Energy and commercial experience in Europe indicate that 10% biomass cofire rates can generally be achieved with modest investments, while cofiring at 40% biomass can require more significant plant modifications.

Taking Iowa as an example, the new studies indicate that creating just a single pellet mill can deliver strong economic benefits in the state between now and 2030:

- \$43 Million in new labor income;
- \$78 Million value added contribution to Iowa’s GDP; and
- \$159 Million increase in Iowa’s economic output.

And when you broaden the scope to consider the industry potential over ten years, the analysis clearly shows that cofiring stover pellets – even at just 10% – represents a billion-dollar opportunity for Iowa:

- \$1.1 Billion in new labor income;
- \$2.0 Billion value added contribution to Iowa’s GDP;
- \$4.1 Billion increase in Iowa’s economic output.

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The results are similarly dramatic for Nebraska, where processing enough corn stover to replace 40% of coal used in the state's power plants would add \$490 million to the state's GDP, and increase labor income in the state by \$255 million per year. This would require harvesting stover from only about 16% of the state's corn acreage or 71% of the state's acreage used for ethanol.

Processing stover available on all of the corn acreage used to supply Nebraska's ethanol industry would increase the state's GDP by \$687 million and deliver an additional \$357 million in annual labor income.

### **Conclusions**

The studies developed by Regional Strategic LTD have put a clear value on the discarded byproducts of ethanol production: This is a multi-billion-dollar opportunity, ready to be reaped in America's ethanol producing states. The technologies to do this exist today. What's needed are modest infrastructure investments for existing coal plants to expand their fuel mix and burn corn stalk pellets. The benefits – worth billions of dollars for agricultural states – can be realized within a definably short time period and will accrue across the farm economy, from farm workers to individual enterprises and all the way up to the state. In order to reap these benefits farm states can take action to enable the modest infrastructure investments required.