

[EXCERPT FROM]

**ACTIVATED CARBON PLANT / HEAT PLANT INTEGRATION: VCSU & UND
Pro Forma**

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ACTIVATED CARBON PLANT / HEAT PLANT INTEGRATION: VCSU & UND PRO FORMA SUMMARY

Introduction

Valley City State University and the University of North Dakota (VCSU/UND) intend to partner with a private sector business to produce and sell Activated Carbon (AC). VCSU will manufacture AC at lower costs than traditional methods by leveraging their approved new steam heating system to offset necessary capex required for manufacturing AC. Distribution and sales will be conducted by the private sector partner. The efficiencies provide a significant source of revenue (*annual cash flow of \$2.5 million in years 1 – 10, \$4.3 million after initial debt retired*) which can fully liquidate the capital procurement debt within a few years, after which revenues will build reserves for other needs. The model can be replicated at other NDUS campuses.

AC Market Values

- Current market value of \$2400 per ton to end user with future projections of \$4000/ton.
- VCSU plans to sell at \$1400 per ton F.O.B under contract to private sector distribution.
- \$1000 per ton mark-up covers transportation and marketing costs for re-seller. VCSU profit of \$325/ton.

AC Market Demand

- VCSU production planned at 6,000 tons per year. We are exploring partnerships with Midwest Energy Emissions Corporation (ME2C) and Calgon Corporation.
- ND market alone exceeds 100,000 tons per year, with a global market projected to grow to more than 2 million tons by 2022.
- VCSU production 0.25% of current demand - will have no identifiable impact on market demand.

Self-liquidating Capital Construction Debt

- Total capital investment of \$22.5M including working capital during construction.
- Gross revenue from annual production of 6,000 tons @ \$1400 per ton = \$9.4M.
- Annual cash flow of \$2.5 million in years 1 – 10, \$4.3 million after initial debt retired.
- Debt liquidation in 3.5 years.
- Model remains viable at \$1000 per ton, with debt liquidation in 10 years or less.

Market Risks

- China may flood market with AC
 - Unlikely, but North Dakota – Regional market will have some insulation based on local demand and shipping costs to this area.
- Technology will displace AC usage
 - Currently not on the horizon, with debt liquidation occurring well before any anticipated reduction in demand.
- Other Market Variables
 - Increase in transportation costs would have minimal impact.
 - Feed stock (lignite) costs increases would have a minimal impact.
 - EPA regulations promulgated in next ten years may reduce overall functional life of plant, but impact on debt liquidation unlikely.

Primary benefit: New sources of revenue promote self-sufficiency in higher education.

ACTIVATED CARBON PLANT / HEAT PLANT INTEGRATION: VCSU & UND PRIMER

Key Point – What is activated carbon?

- Activated carbon is produced from carbon-containing natural resources such as biomass and coal using well developed technology.
- Activated carbon is valuable as it absorbs contaminants from air, water, and other media.
- Activated carbon is mainly used for gas cleanup in coal fired power plants and water purification in municipal water treatment plants. It has many other uses as well.

Key Point – Activated carbon markets:

- Activated carbon sale is a growth market. Marketing surveys from eight different sources estimate a CAGR ranging from 11 to 13%.
- Activated carbon sale is a stable market, with no practical substitute on the horizon.
- Activated carbon is valuable, and typically sells from \$1500 to \$3,000 per ton.
- High purity specialty carbons (a potential future market) can sell for \$15,000 per ton.

Key Point – Activated carbon manufacturing:

- Activated carbon is a straight-forward manufacturing process using proven methods.
- Current US production levels are approximately 435 tons annually from seven major producers.
- Activated carbon manufacturing requires steam to “activate” the carbon.
- Standard activated carbon manufacturing wastes significant amounts of volatile gasses which are released from coal feed stocks.

Key Point – Why lignite coal?

- Lignite is mined locally, and produces the best activated carbon as it is already a porous feed stock.
- Costs for shipping lignite for local production of activated carbon is low.
- Costs for shipping lignite-sourced activated carbon to regional users is low.

Key Point – Why combine steam plants with activated carbon plants?

- Activated carbon plants release fuel during production and require steam for activation.
- Steam plants produce steam and can use the fuel.
- Together, the two plants become much more efficient than if standing alone.

Key Point – How do the financials play out?

- Manufacturing efficiencies by combining the plant result in increased profits.
- Profits are sufficient to repay the capital investment in the carbon plant within 5 years.
- New boilers and/or steam plants can be installed and payed for in an additional 5 years.

Key Point – Win-Win

- Activated carbon is a stable market with sales generating revenue to meet the deferred maintenance needs.
- This is a model for campus self-sufficiency that reduces the need for appropriations.
- Institutions can use this model for research and education to strengthen their mission.
- This model can be replicated at other sites across North Dakota.

Activated Carbon Project Advisory Team

- Steve Benson, Associate VP for Research, Energy and Environmental Research Center, UND
- Nick Hacker, State Board of Higher Education
- Lonnie Laffen, CEO, JLG Architects
- Michael Mann, Executive Director, Institute for Energy Studies, UND
- Tisa Mason, President, VCSU
- Larry Robinson, Executive Director, VCSU Foundation
- Ed Schafer, 30th Governor of North Dakota
- Mike Seifert, CEO, Aurora Borealis Dakota
- Delton Steele, Regional President, U.S. Bank
- Greg Stemen, State Board of Higher Education
- Rick Tonder, Facility Planning Director, NDUS
- Wesley Wintch, VP for Business Affairs, VCSU