Testimony of

Kurtis Miller, President

Cargill Industrial Specialties
Cargill, Incorporated
9320 Excelsior Boulevard
Hopkins, MN 55343

"Grow it Here, Make it Here: Creating Jobs through Bio-Based Manufacturing"

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Chairwoman Stabenow, Ranking Member Cochran, and distinguished members of the Senate Committee on Agriculture, Nutrition and Forestry, thank you for the opportunity to testify before you today. I hope my statement will provide insight into the current state of our bio-industrial sector and highlight the economic and job creation opportunities associated with investment in these promising technologies.

My name is Kurtis Miller, President of Cargill Industrial Specialties, a business of Cargill, Inc. Cargill provides food, agriculture, financial and industrial products and services to the world. Together with farmers, customers, governments and communities, we help people thrive by applying our insights and nearly 150 years of experience. We have 142,000 employees in 67 countries who are committed to feeding the world in a responsible way, reducing environmental impact and improving the communities where we live and work.

The Cargill Industrial Specialties Business Unit seeks growth in renewable agriculture-based products by delivering customer solutions through a focused market and customer segmented

approach. Our focused innovations solve specific problems for our customers whether based on performance, cost or process. We leverage our expertise in bio-based chemistries to deliver the right solution for their particular need. Today, I am here to discuss our successes and struggles; what we have learned and what we hope to see in the future.

I am encouraged by the Chairwoman's commitment to promoting bio-based production through her "Grow it Here, Make it Here" initiative and by holding hearings like this one. I urge the Committee to continue, and to strengthen, its support for bio-based manufacturing. The focus on sustainability has progressed from an emerging trend to a consumer expectation as population continues to grow and oil prices continue to rise over the long run. As consumers demand more environmentally friendly products, bio-based materials are gaining in popularity for application in food and beverage packaging, plastics, lubricants, surfactants, and pharmaceuticals. Bio-based materials can help reduce dependence on foreign oil, limit pollution, mitigate climate change and reduce exposure to toxic chemicals. Bringing to market new bio-based materials with wholly new properties and performance can also fuel originally unforeseen innovation and opportunity. And of course, bio-based manufacturing also has the potential to create new high-paying "green" jobs.

At Cargill, we consider ourselves to be innovators in the bio-industrial space. We have developed and brought to market a number of bio-industrial chemistries, compounds and products, with quite a few more promising technologies in the pipeline. We invest in, and work very closely with, other pre-commercial bio-products companies such as Montana's Rivertop Renewables and Wisconsin's Virent, Inc., a partnership we share with fellow witness Coca-Cola. Three of our top-performing products have been honored as winners of the prestigious Presidential Green Chemistry Award.

Polylactide Bio-polymer (PLA)

In 1989, we began a research project looking for innovative uses of carbohydrates from plants as feedstock for more sustainable plastics. This was the start of NatureWorks LLC, now a 50-50 joint venture with Thailand's PTT Global Chemical. NatureWorks was the first company to

commercialize a broad family of low-carbon-footprint polymers derived from 100-percent renewable resources, which compete with oil-based plastics and fibers. NatureWorks engineered and built the first ever large scale bio-polymer plant, with the required economies of scale to compete head-to-head with traditional oil-based polymers. NatureWorks LLC produces the PLA bio-polymer on a Cargill site in Blair, Nebraska, which is then marketed globally under the Ingeo brand.

Fueling a healthy export market, and now used in countries around the globe, Ingeo is used in a variety of applications including rigid and flexible disposable packaging (packaging for meat, deli, fresh fruit and vegetables sold in retail grocery stores), compostable food service items, oil field services, non-wovens (baby wipes, diapers), 3D printing filament and in an ever increasing range of durable products (gift cards, mobile phones, computer and copier housings). Thanks to using renewable feedstocks, Ingeo materially lowers the carbon footprint of its targeted applications while requiring less energy for its production. The production of these materials typically uses 50 percent less fossil fuel and emits 60 percent fewer greenhouse gases in manufacture than conventional plastics.

NatureWorks is a typical representative of the broader bio-polymer and green chemical industry, and was proud to be a 2002 Presidential Green Chemistry Challenge Award recipient (as Cargill Dow LLC) in recognition of Ingeo providing a number of benefits, including its low carbon footprint, renewable composition and for being compostable and recyclable.

Vegetable Oil Polyols

One of the two chemical building blocks used to make polyurethane is a "polyol." Polyols are key ingredients in flexible polyurethane foams, which are used in furniture and bedding. Historically, polyurethane has been made from petrochemical polyols. The idea of replacing these polyols with bio-based polyols is not new, but the poor performance, color, quality, consistency, and odor of previous bio-based polyols restricted them to limited markets. Previous bio-based polyols also suffer from poor chemical reactivity, resulting in foam with inferior properties.

Cargill has successfully developed bio-based polyols for several polyurethane applications, including flexible foams, which are the most technically challenging. BiOH polyols provide excellent reactivity and high levels of incorporation. These foams set a new standard for consistent quality with low odor and color. Foams containing BiOH polyols retain their white color longer without ultraviolet stabilizers. They also are superior to foams containing only petroleum-based polyols in standard tests. In large slabstock foams, such as those used in furniture and bedding, BiOH 5000 polyol provides a wide processing window, improved comfort factor, and reduced variations in density and load-bearing capacity. In molded foams such as automotive seating and headrests, BiOH 2100 polyol can enhance load-bearing or hardness properties relative to conventional polyols.

Use of BiOH polyols reduces the environmental footprint relative to today's conventional polyols for polyurethane production. Each million pounds of BiOH polyols saves nearly 700,000 pounds of crude oil. In addition, Cargill's process reduces total energy use by 23 percent and carbon dioxide emissions by 36 percent.

BiOH polyols diversify the industry's supply options and help mitigate the effects of uncertainty and volatility of petroleum supply and pricing. Cargill is the first company to commercialize bio-based polyols on a large scale in the flexible foam market. Formulators can now use bio-based polyols in flexible foam without compromising product performance. Cargill was proud to be a 2007 Presidential Green Chemistry Challenge Award recipient in recognition of this accomplishment.

Vegetable Oil Transformer Fluid (FR3)

Let me now talk for a moment about transformer fluid from vegetable oil. High-voltage electric transformers must be filled with an insulating fluid that absorbs heat and prevents short-circuiting. For many years, most transformers were filled with polychlorinated biphenyls (PCBs) or, especially after PCBs were banned, petroleum-based mineral oil. While mineral oil is significantly less hazardous than PCBs, it is quite flammable and may be toxic to aquatic species.

Furthermore, mineral oil is very hydrophobic. At normal operating temperatures within a transformer, water is generated. In mineral-oil filled transformers, the ability for mineral oil to absorb the extra water generated is limited causing the overall insulation system (usually wood, paper or cardboard) to degrade faster. The service interval for transformers is largely dependent on the operational life of the solid cellulose insulators, so preventing the degradation of those insulators can significantly extend the service life of the transformer.

Cargill has developed Envirotemp FR3 natural ester dielectric fluid based on vegetable oil instead of petroleum. These bio-based oils can be used in replacement of mineral oil for retrofilling transformers. If used in newly designed transformers, the transformers can be made smaller owing to better thermal performance of Cargill's oils. The FR3 fluid is significantly less flammable than mineral oil, greatly reducing the risk of fire or explosion. Cargill's oils also increase the service life of the cellulose insulation by 5-8 times longer than mineral oil thus extending the insulation life as well as the transformer life.

A transformer using FR3 fluid has a lower carbon footprint across the entire life-cycle of a transformer, with the largest reductions occurring in the raw materials, manufacturing, and transportation phases. The total carbon foot print of an electric transformer is about 55-times lower when using FR3 fluid compared to mineral oil. This is all in addition to the low toxicity in soil and water, high biodegradability, and the fact that FR3 fluids are based on a renewable resource.

Furthermore, transformers filled with FR3 fluid offer improved fire safety for the community. There have been no known explosions or fires in the hundreds of thousands of transformers filled with FR3 fluid since the product launched.

FR3 fluid has achieved numerous industry validations including EPA's Environmental Technology Verification, the lowest environmental impact performance score in a BEES 4.0 lifecycle assessment, USDA Bio-based Product certification, and certification as a less flammable fluid by both Underwriters Laboratory (UL) and Factory Mutual Research

Corporation. We are currently working with EPA to finalize our DfE certification for FR3 fluid. Cargill was proud to add the 2013 Presidential Green Chemistry Challenge Award to this list of honors.

Lessons Learned

What we have learned over two decades of participation in the bio-industrial space is that this is hard stuff. Bio-manufacturing is a difficult and risky business with many moving parts. Due to their initial relatively smaller scale, chemicals from biomass are often more expensive at the start than petrochemicals except in periods of unpredictable price spikes. This leaves a very small window for growth for most technology-driven green initiatives to achieve competitive economies of scale and fulfill their promise as engines of economic development and job creation.

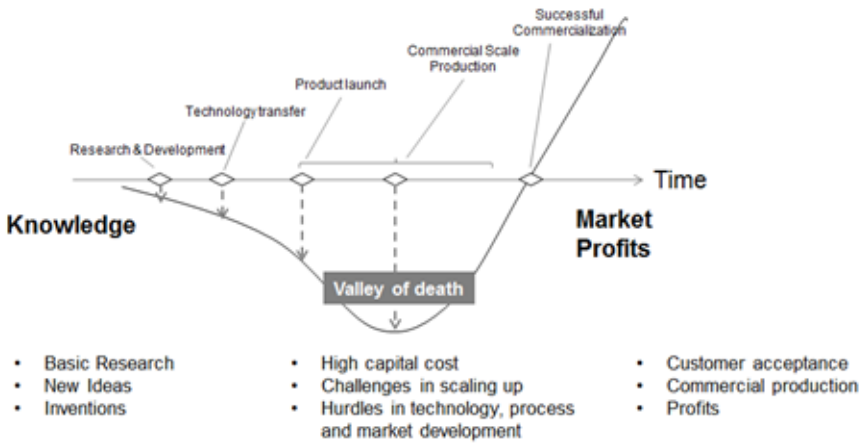
The most important lesson from our experience in NatureWorks, bio-based polyols, FR3 fluid and other industrial products is the need for a well-balanced approach to the commercialization process. Technology alone is not enough to succeed. Success in commercializing technology requires several other considerations including a competitive manufacturing/supply chain, distribution, sales and marketing personnel with customer knowledge, supply and demand understanding of raw materials and the end product.

Manufacturers must develop a solid understanding of their raw material and manufacturing supply chains. Fluctuations in the agriculture and petrochemical markets can make or break a company. Over the years, we have seen quite a few renewable fuel companies go under, or acquired by traditional refiners, because of a lack of understanding about their raw materials and what causes prices to rise and fall.

Large-scale commercialization of bio-based products is limited by constraints on physical assets, or access to capital for costly construction of demonstration-scale facilities. As referred to by the Chairwoman as the "valley of death," the inability to access capital and conversion capacity often prevents promising technologies from advancing to commercial scale production. As a

result, many bio-based companies are not able to surpass the early stages of development. Venture capital is rarely committed to large investments without full-scale proving trials.

Another problem currently facing the new product development field is providing customers with representative samples for testing and evaluation. Market development, and therefore justification for a full-scale installation, is hindered by the ongoing challenge of gauging customer interest. Semi-works facilities are needed that can supply sizable commercial quantities for testing and development at customer facilities. Given that bio-based products are often replacements for existing products, companies need this capability to validate the products performance and assess the need for larger quantities of the product.



Manufacturers must also have a clear value proposition that delivers distinctive value to the consumer. Emphasizing "greenness" alone is unlikely to be successful without a strong functional and/or price advantage. Companies must understand the industry they are attempting to provide bio-based alternatives for and their potential customers business model and priorities. They must define how the new technology can enhance current or future application opportunities and deliver true value. Our products must perform as well as, if not better than, existing alternatives.

The fixing of the value proposition itself requires not only a detailed understanding of customer needs but also of their "ecosystem," or the other players in their value chain and the environment

in which they operate, whether political, financial or legal. An understanding of the customers' ecosystem will allow a manufacturer to calibrate value from crop to packaging and even further. Industry must avoid the "build it and they will buy it" mentality.

Moving Forward

If the United States seeks to be the world leader in developing and promoting the emerging bio-economy, we must increase our investment in research and testing facilities that will position us globally as an innovative nation where companies will want to locate, create jobs, and be a part of the growth potential in biosciences and advanced bio-manufacturing.

The U.S. government can support innovation through competitively awarded research funds to reduce the cost of often expensive, time-consuming, R&D.

Federal agencies can revise regulations to differentiate between traditional industrial products and bio-based products with governmentally recognized environmental attributes such as low toxicity in soil and water, and high biodegradability. We believe this would further encourage, and enable faster adoption of, these commercially-viable, bio-based solutions.

In addition, the industry needs near-term manufacturing-scale support similar to that provided to other industries in their early stages such as those to petrochemical companies and other renewable technologies. Because this is risky business, with commercialization hurdles and staunch competition from petroleum-derived processes that have been established for decades, we need front-end encouragement to reduce the risk of failure, embolden companies to accept the challenge and develop a high-performing, green product that can survive in the marketplace. Otherwise, we are likely to continue to see companies exploring options in other geographies with more attractive government support and feedstock options.

Government can also reward consumer, as well as corporate, adoption of these products by creating, and educating these potential customers about, incentives that help them reduce the

physical and financial burden of conversion from traditional products, including tax credits and regulatory relief for adopting renewable, less toxic and energy efficient technologies.

In summary, I would like to thank this Committee for its commitment to bio-based manufacturing and urge you to continue investing in this promising technology. I thank the Committee for its leadership in creating and maintaining BioPreferred, which has sent a strong message to the marketplace, and urge continued support and strengthening of the program going forward.

In the end, only the marketplace will decide which innovations succeed. We are a strong believer that, with the right near-term support, bio-based manufacturing will provide commercial products that out-perform their existing alternatives. In addition, these "green" technologies will reduce dependence on foreign oil, limit pollution, mitigate climate change and reduce exposure to toxic chemicals. Success for the bio-industrial sector will result in an influx of high-paying jobs, opportunities for rural development and prosperity for our domestic agricultural industry and manufacturing base.

Thank you again for the opportunity to share Cargill's views with you today. I am willing to answer questions and respond to specific inquiries going forward.