# Montana State Legislature

**Exhibit Number:** 4

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# Brelsford Engineering, Inc. (BEI)

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SENATE HIGHWAYS
EXHIBIT NO. 4
DATE 2/1/05
BILL NO. SB293

**Welcome**

**Cellulose for Bio-Ethanol**

**Comparison of Cellulose Hydrolysis**

**Technical & Economic Eval**

**BEI Pilot Plant**

**Commercial Validation Demo**

**DACH Patented Process**

**Contact BEI**

***At this time BEI is offering professional chemical process engineering services, technical reports, preliminary process engineering designs, economical feasibility analyses and related industrial consulting engineering services.***

***Contact:***

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*Currently available for purchase:*

*"Relative Comparison of Dilute Acid Cellulose Hydrolysis Process"*
*BEI Technical Report #401 – $25.00*

*This report includes technical descriptions of BEI chemical kinetic calculations and resulting graphic diagrams of dilute acid hydrolysis results in the BEI two-stage hydrolysis process.*

*Subsequent delivery to you of this purchased report will be by e-mail attachment.*

PayPal CLICK HERE TO BUY

**Last updated on Monday, December 06, 2004 10:58:30 AM**

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# A DISCUSSION OF
# THE BEI HYDROLYSIS PROCESS AND REACTOR SYSTEM

## Initiation

The initial BEI Process Development and Demonstration Project included Brelsford Engineering, Inc. (BEI) testing and evaluating four ligno-cellulosic biomass (LCBM) renewable energy resource materials, by chemical engineering bench and pilot-plant processing was funded by the Montana Renewable Energy Program (as Project MT-DNRC-ARE-466-811). The BEI Final Report was titled: "Development of Cellulose Conversion - The BEI Hydrolysis Process". It was used, by Donald L. Brelsford, P.E., BEI President and Inventor, as a supplement in an unsolicited proposal BEI submitted to the National Institute of Science and Technology's Office of Energy Related Inventions (USDOC/NIST/OERI).

## Economics

Subsequently, a directly-related USDOC/NIST/OERI recommendation was sent to the USDOE/C&RE's Inventions and Innovations Program. USDOC/NIST/OERI recommendation was then used, in October 1989, by BEI in an unsolicited proposal to USDOE/C&RE/I&IP for the BEI Improved Hydrolysis Process Refined Engineering Proto-type Demonstration Project.

USDOC-NIST-OERI Recommendation Report No. 457 suggests that USDOE seriously consider support for the demonstration of The BEI Hydrolysis Process, at pilot-plant scale, for the moderate temperature, moderate-density, dilute-acid hydrolysis of soft-wood sawdust to yield a single solution product of pentose and hexose sugars, at substantially reduced energy, chemical and process costs.

It further indicated that current costs of agricultural & logging residues are about $45 per dry ton. By using conventional two-stage dilute-acid hydrolysis processing the production cost of fuel grade ethanol could be about $1.17 per gal. Dr. Ulbrecht also indicated, that through the use of the BEI Hydrolysis Process, its acid and energy cost savings would result in the

reduction of fuel ethanol production cost from about $0.91/gal - sugar basis to $0.81/gal with the BEl Process energy saving advantages. Pacific NW softwood lumber mill wood-wastes are readily available @ $25/BDT or less. By use of this low-cost raw material, the resulting comparative cost of fuel ethanol production, by full-use of the BEI Hydrolysis Process, would be about $0.65 per gallon; which is 45% less than $1.17 per gallon @ $45 per bone dry ton feedstock and by conventional two-stage hydrolysis processing.

## Clean, Renewable Energy

Energy efficiency and clean, renewable energy will mean a stronger economy, a cleaner environment, and greater energy independence for America. By investing in technology breakthroughs today, our nation can look forward to a more resilient economy and secure future.

Highway vehicles in the United States account for consumption of approximately 10 million barrels of oil per day. Without significant changes, that figure is projected to reach 15 million by the year 2020. The total U.S. domestic oil production capacity currently stands at 7.75 million barrels per day; which peaked about 1975.

Ethanol lessens our dependence on foreign oil. Used as an additive to make gasoline burn cleaner, this renewable fuel now displace 128,000 barrels of imported oil and other petroleum products every single day. The equation is simple. The more renewable fuels we use, the less oil we have to import.

The U.S. ethanol industry is the fastest growing energy industry in the world. Ethanol is now blended in 30% of the nation's gasoline. When the 14 new ethanol plants now under construction go on stream, annual capacity will expand toabout3.6 billion gallons. Locally owned ethanol plants account for 40% of total industry capacity

With crude oil prices setting new records, it seems in everyone's best interest to support a domestic product; especially one made from crops you can plant anew every year. To insure a brighter energy future, all Montana vehicle owners may soon go to gas stations and demand ethanol.

Let us make Montana the next state to guarantee that every gallon of gasoline has added to it a clean burning, agriculturally produced product called ethanol.

## 2005 AD Perspectives

Currently, 81 ethanol plants nationwide have the capacity to produce 3.64 billion gallons annually. There are 16 ethanol plants and 2 major expansions under construction with a combined annual capacity of more than 750 million gallons.

The 150,000 Americans whose employment is tied to the U.S. fuel ethanol industry support Govern Mike Johanns' nomination to be Secretary of Agriculture.

## New Study Highlights Economic Impact of Ethanol Industry in Iowa

Iowa's 15 existing ethanol plants and nine plants under development will contribute a total of $3.9 billion to the state's economy once all plants are in production, according to the 2004 ethanol economic impact study.

A key factor benefiting local economies is the fact that almost all of the State's ethanol industry's corn and labor, plus 44% of its other inputs, are purchased within Iowa. In addition to $910 million in corn purchases, the industry spends $82.4 million on wages, $161.6 million for ingredients, and $203.7 million for energy each year.

## 2004 AD Perspectives

The U.S. ethanol industry set a monthly production record for October 2004 of 226,000 barrels per day (b/d), according to data released by the U.S. Energy Information Administration (EIA). Production was up 20 percent compared to October 2003, when 188,00 b/d of ethanol were produced.

The ethanol industry is expected to produce 3.4 billion gallons in 2004, up from 2.81 billion gallons in 2003.

The U.S. uses 20 million barrels of crude oil a day, 60% of which is imported. Present ethanol production at approximately 200,000 barrels a day, all of which reduces imports by the equivalent of 1.7% already. Alternative fuels currently account for 2.1% of total energy use in automotive transportation. Total energy needs in transportation are projected to rise 54% between now and 2025.

"Renewable fuels, such as ethanol and biodiesel, plan an important role in a comprehensive energy plan that promotes conservation and reduces dependence on foreign sources of energy. Ethanol and biodiesel are also an important part of our rural economy and a great example of the success of value-added agriculture." (Pres. G. Bush)

A review of actual wholesale figures shows that replacing MTBE with ethanol in RFG reduced prices by 8 cents per gallon in California in 2003. Further, replacing MTBE with in ethanol in New York has reduced average RFG prices 3.8% since October 2003. Finally, the traditional price spread between RFG and conventional fuels has disappeared.

Current ethanol prices rose sharply since July 2004 the start of the month as high demand and rising gasoline prices supported the market. Spot fuel ethanol prices were about $1.65 a gallon as a national average, up from $1.55 two weeks ago, $1.41 a month ago and$1.40 a year ago. The record in this segment of the market was set in December 2003 at over $1.72 a gallon. Prices in all areas are expected to remain strong in view of price trends in the gasoline market.

**MARKETBOX - March 2004**

| Product Prices | Latest | Month Ago | Year Ago |
|---|---|---|---|
| Ethanol jobber price national average $/gallon | 1.6526 | 1.3946 | 1.4572 |
| Ethanol jobber price, Upper Midwest average, $/gallon | 1.5865 | 1.3388 | 1.3989 |
| Dried distillers grains, national average, $/ton | 1.3429 | 135.71 | 116.00 |
| Unleaded gasoline, retail, national average, $/gallon | 1.724 | 1.650 | 1.708 |
| On-road diesel fuel, retail, national average | 1.694 | 1.635 | 1.825 |
| **Ethanol Production** (To December 2003) | | | |
| Monthly average, barrels per day | 207,000 | 194,000 | 176,000 |
| Year-to-date average, barrels per day | 183,000 | 181,200 | 139,000 |
| Monthly production, million gallons | 269.5 | 244.5 | 227.9 |
| Cumulative production, year to date, million gallons | 2,815.0 | 2,545.5 | 2,138.0 |

Tennessee lawmakers are considering several measures to encourage the production of ethanol in the state. One would mandate at least 5% ethanol in all gasoline sold in Tennessee by July 1, 2005. Two bills to encourage using corn and other agricultural products for energy include the Tennessee Agriculture Ethanol Production Act of 2004, which would offer incentives of up to $6 million to producers of ethanol and biodiesel.

A study released last month by the Energy Information Administration strongly suggests that the 5-billion-gallon renewable energy standard envisaged in the energy bill is too low. The analysis predicts that ethanol will displace less than 1% of U.S. oil imports by 2010 and just 1.2% by 2025.

The domestic ethanol industry set an annual production record of 2.81 billion gallons in 2003, an increase of more than over 32 percent from 2.13 billion gallons in 2002 and 91 percent from 1.47 billion gallons in 1999.

"The record production in 2003 highlights that ethanol is a reliable and highly valued gasoline component from coast to coast," said Renewable Fuels Association President Bob Dinneen. "The new markets in California, New York and Connecticut added last year helped boost demand, but won't be fully felt until this year. Clearly, 2004 will be even bigger for ethanol than 2003."

According to data from the Energy Information Administration (EIA), a new all-time monthly production record was set in December of 2003. Over 207,000 barrels per day (b/d) of ethanol were produced exceeding the previous monthly record of 194,000 b/d set in November.

Among the accomplishments of the ethanol industry in 2003:

- Annual record of 2.81 billion gallons produced;
- Monthly record of 207,000 barrels per day produced in December;
- Currently, 72 ethanol plants can produce 3.1 billion gallons annually.
- With 15 plants under construction, annual production capacity will soon expand to over 3.6 billion gallons;
- Farmer-owned ethanol plants account for 40% of total industry capacity;
- Ethanol use consumed more than 1 billion bushels of corn;
- Ethanol use reduced nearly 3 million tons of carbon monoxide, 300,000 tons of ozone equivalent VOCs, and 5.7 million tons of $CO_2$- equivalent greenhouse gas emissions.

Ethanol cost-effectively replaced MTBE in California and New York in 2003. Ethanol replaced MTBE, which was banned by both states due to water quality concerns, to meet the Clean Air Act's reformulated gasoline (RFG) oxygenate standard.

With crude oil prices rising, natural gas supplies falling, U.S. energy imports at their highest level in history and the reliability of the nation's electricity grid in question, the nation needs an energy policy that reinvests in domestic sources -- now.

Source: U.S. Energy Information Administration,
www.cia.doe.gov/oil_gas/petroleum/data_publications/wrg/mogas_history.html