

Stock exchange announcement

14 April 2005

Novozymes and NREL achieve 30-fold reduction in enzyme cost and conclude biomass-to-ethanol project

The project goal has been achieved: the cost of enzymes for biomass-based fuel ethanol production has been reduced to USD 0.10-0.18 per gallon in laboratory trials, a 30-fold reduction since 2001. Enzymes are no longer the main economic barrier to the commercialisation of biomass technology.

In January 2001, supported by funds from the U.S. Department of Energy (DOE), Novozymes and the National Renewable Energy Laboratory (NREL) entered into a collaborative research subcontract totalling USD 14.8 million over three years, with a one-year extension worth USD 2.3 million granted in April 2004. The project sought to dramatically cut the cost of converting cellulose biomass from corn stover into sugars for the production of fuel ethanol and other valuable products. Once commercially viable, a process of this type could help reduce dependency on non-renewable and petroleum-based energy and raw material sources.

By using its comprehensive range of proprietary biotech tools to identify new enzymes, engineer and boost catalytic activity, and increase production yield, Novozymes has successfully reduced the overall enzyme cost for the process of converting corn stover to ethanol to USD 0.10-0.18 per gallon in laboratory trials. This 30-fold reduction from the starting point of more than USD 5 dollars per gallon in 2001 is due to a combination of pre-treatment technology developed by NREL and novel enzyme solutions from Novozymes.

Per Falholt, executive vice president for Research & Development and chief science officer at Novozymes, said, "Needless to say, we're delighted with this achievement because it clearly demonstrates Novozymes' ability to solve real-world problems through the application of advanced biotech processes. Although these results are still only on laboratory scale, and probably require a modified business model for enzyme production, this is a major step forward in commercialising production of fuel ethanol from renewable biomass, and validates yet again the value and promise of industrial biotechnology."

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Novozymes A/S
Investor Relations
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Krogshøjvej 36
2880 Bagsvaerd
Denmark

Telephone:
+45 8824 9999
Telefax:
+45 4442 1002

E-mail:
info@novozymes.com
Internet:
www.novozymes.com

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“Novozymes has made great progress in reducing the cost of enzymes for the utilisation of cellulosic biomass, effectively eliminating a major technical barrier to commercialisation. By combining NREL improvements to the pre-treatment of corn stover with new enzymes developed by Novozymes, the cost reduction achieved provides an excellent example of the synergy that can be harvested through well-placed government-sponsored research partnerships. While much work remains to translate this success to the commercial marketplace, Novozymes should be applauded for their fine efforts in this collaboration,” said Douglas E. Kaempf, Biomass Program Manager at the U.S. Department of Energy.

Based on its four years of focussed research in this area, Novozymes has developed unique expertise in the conversion of corn stover and other biomass feedstocks, expertise that will encourage broader industrial applications beyond fuel ethanol. For example, Novozymes’ work may make possible the use of corn stover as an alternative feedstock for products currently derived from petrochemicals.

However, successful commercialisation of the biomass-based process for production of fuel ethanol and other useful products is still dependent on further refinements of the enzyme technology, establishment of a formal collection system for biomass, further progress in overcoming the technical barriers in biomass pre-treatment, optimisation of current yeast organisms, as well as financial incentives for industry to invest in facilities utilising biomass instead of corn starch as feedstock.

Gerson Santos, R&D Director at Abengoa Bioenergy, said, “These new enzyme systems are the key to the future growth and geographical expansion of the fuel ethanol industry into areas where cereals are not readily available. In 2006, we expect to initiate testing of Novozymes’ enzymes solutions at our biomass fractionation process development pilot plant in York, Nebraska, USA to validate the technology’s performance. As one of the biggest ethanol producers in Europe and the USA, Abengoa Bioenergy is committed to the development and commercialisation of biomass-based fuel ethanol production technology for a more sustainable transportation sector.”

The world’s leading enzyme company, Novozymes is currently supplying a range of enzymes for corn-based fuel ethanol production, mainly in the USA. US fuel ethanol production has grown rapidly over the past few years and totalled 3.5 billion gallons in 2004, up more than 20%, benefiting from environmental legislation and a political drive towards more sustainable fuel sources.

Contacts persons

Press and media:

Kenneth Aukdal

Tel. (direct): +45 4442 6615

Investor Relations

In Denmark:

Lene Aaboe

Tel. (direct): +45 4446 0082

Niels Eldrup Meidahl

Tel. (direct): +45 4443 3304

In USA:

Thomas Kudsk Larsen

Tel. (direct): +1 919 494 3279

Novozymes is the biotech-based world leader in enzymes and microorganisms. Using nature's own technologies, we continuously expand the frontiers of biological solutions to improve industrial performance everywhere. Headquartered in Denmark, Novozymes employs more than 3,900 people in 30 countries. Novozymes produces and sells more than 600 products in 130 countries. Novozymes A/S' B shares are listed on the Copenhagen Stock Exchange. For further company information, visit Novozymes on the Internet at www.novozymes.com

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