
novozymes
Rethink Tomorrow
Towards a
bio-based economy
Adam Monroe
President, Novozymes North America


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Rethink Tomorrow
Novozymes vision
”We imagine a future where our biological solutions create the necessary balance between better business, cleaner environment and better lives”.

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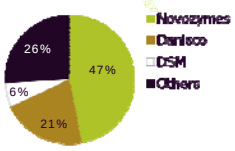
Novozymes in brief

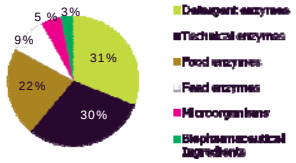
- World leader in industrial enzymes & microorganisms and market leader in all main industries (enzymes account for > 90% of sales)
- Sales USD ~ 1.5bn (FY2008)
- More than 700 products used in 130 countries in > 30 different industries
- R&D activities in 5 different countries . ~ 14% of sales invested in R&D.
- New product sales around 25% of total sales in 2007

- Biotech sector leader in Dow Jones Sustainability Group Index for 7 consecutive years
- Recognized as a top 20 company in SustainableBusiness.com list of sustainable business stocks
- Ranked #8 (Pharmaceuticals & Biotechnology) in Carbon Disclosure Project, Nordic Report 2007

Enzymes for industrial use
Market size USD ~2.9 billion



Distribution of Novozymes' business revenue 2008 USD ~1.5 billion



Source: Novozymes' 2008 estimates

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WWF: Biotechnology key driver of low-carbon economy

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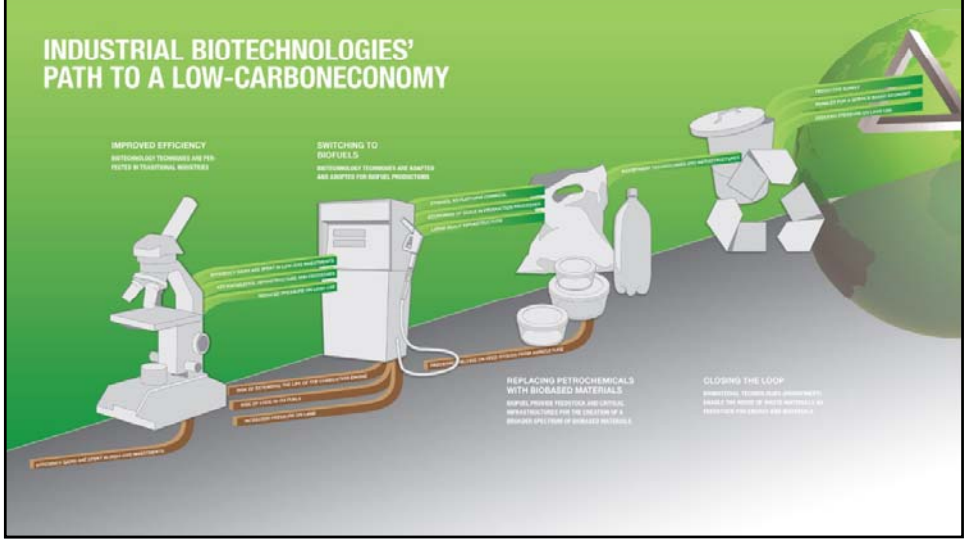
Conclusion: Four industrial biotech cornerstones provide up to **2.5 billion tons of CO_2 reductions**



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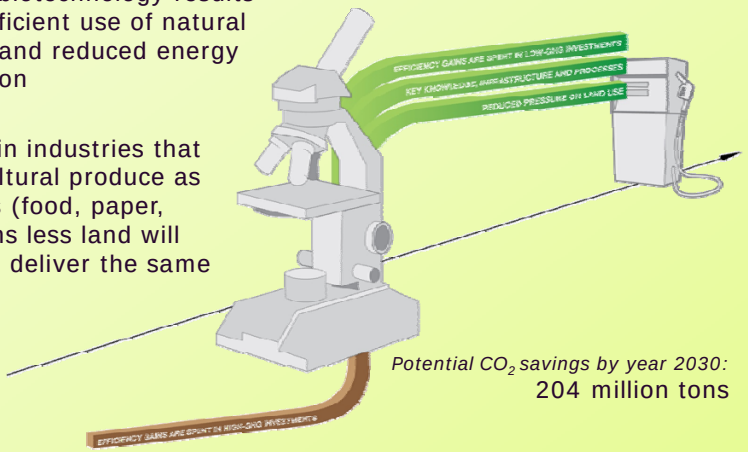
Cornerstone 1: Improved efficiency

- Industrial biotechnology results in more efficient use of natural resources and reduced energy consumption
- Efficiency in industries that use agricultural produce as feedstocks (food, paper, etc.) means less land will be used to deliver the same benefits



Potential CO_2 savings by year 2030:
204 million tons

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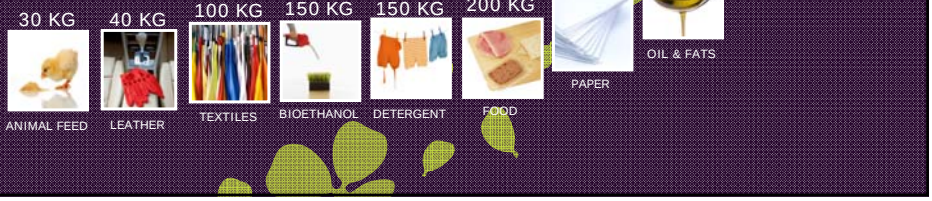
How we help forward-thinking companies…

- Environmental impact comparisons

CO_2 COSTS PRODUCING 1KG ENZYME: 1-10 KG

CO_2 REDUCTION USING 1 KG ENZYME IN DIFFERENT INDUSTRIES :



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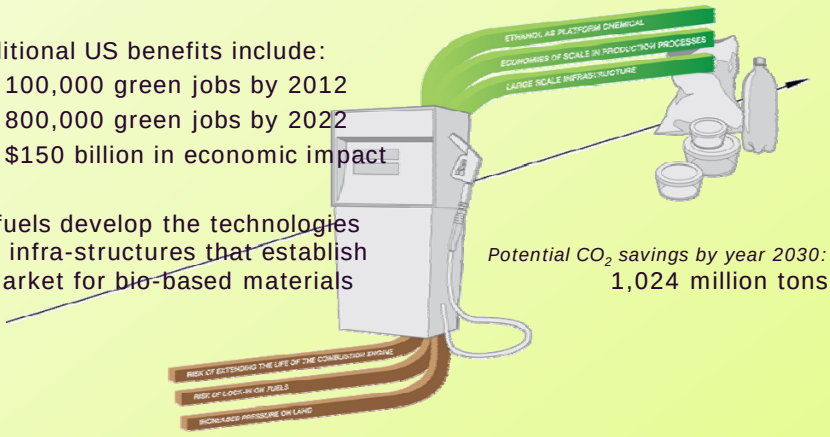
Cornerstone 2: Switching to biofuels

- Second- generation biofuels have the potential to deliver ~1 billion tons of emission reductions by 2030
- Additional US benefits include:
  - 100,000 green jobs by 2012
  - 800,000 green jobs by 2022
  - $150 billion in economic impact
- Biofuels develop the technologies and infra-structures that establish a market for bio-based materials



Potential CO_2 savings by year 2030:
1,024 million tons

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Need for biofuels is a critical part of the equation

- Transportation will emit 8 billion tons CO_2 in 2030.
- Only 50% of the CO_2 reductions needed in the transport sector can be obtained by efficiencies. The rest must come from new technologies
- McKinsey: Bioethanol is the most cost-efficient CO_2 abatement in the transport sector
- Second-generation biofuel technology will be ready in 2010
  - 2009 - **Danish** based Inbicon opened the world's first demonstration facility that converts wheat straw to advanced biofuel.
  - Abengoa - Demonstration Facility opening 2010 in **Spain**
  - Petrobras – Demonstration Facility late 2010 in **Brazil**
  - **China:** Novozymes, COFCO & Sinopec establishing advanced biofuel demonstration facility
  - POET – Opening Project Liberty in **USA** in 2011

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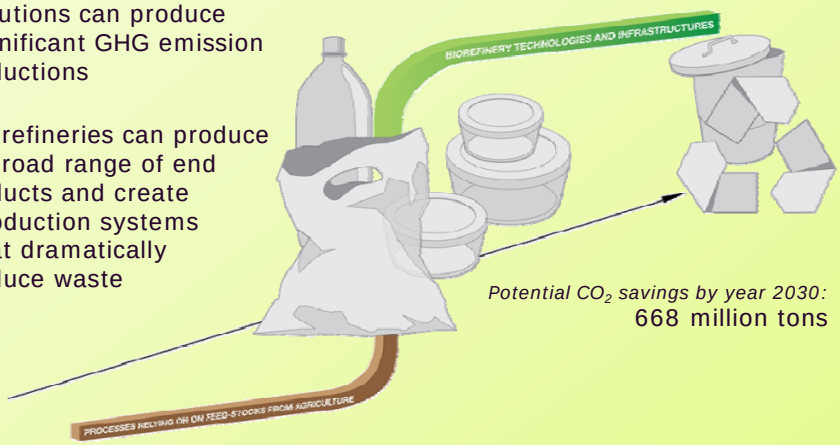
Cornerstones 3 &4: Replacing petrochemicals with bio-based materials

- The substitution of petrochemical processes and ingredients with bio-based solutions can produce significant GHG emission reductions
- Biorefineries can produce a broad range of end roducts and create production systems that dramatically reduce waste



Potential CO_2 savings by year 2030:
668 million tons

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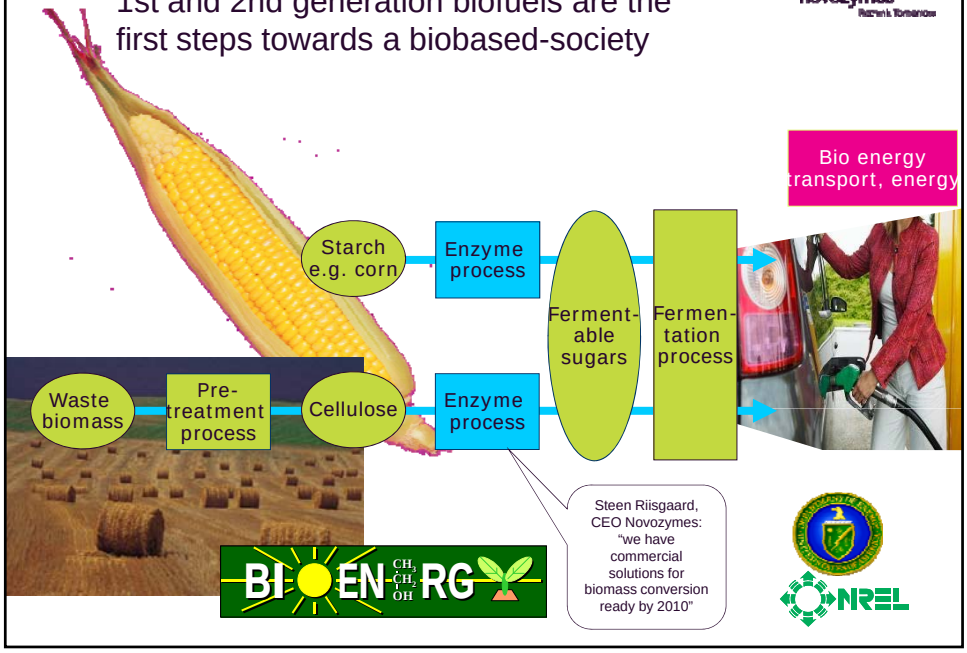
1st and 2nd generation biofuels are the first steps towards a biobased-society



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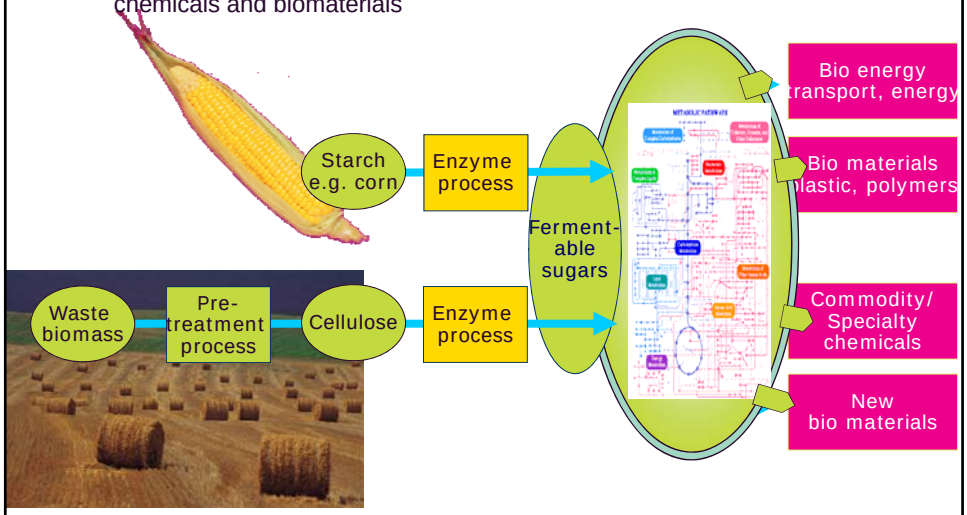
The technology goes far beyond biofuels

sugars can be utilized used for cost-competive production of chemicals and biomaterials



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U.S. Policy is key to achieving global solutions

- The Renewable Fuels Standard must be supported as a basis for next generation discoveries
  - Create a market to support RFS production via increase to E15 and commitment to accelerated FFV introductions
  - Fuel all existing federal 120,000 FFVs with highest available blends of advanced biofuels.
  - Fast deployment of the USD 480 million recovery funds targeted for biorefineries
- Recognition and support of bio-based alternatives in Federal legislation and procurement
  - Consistent biomass definition in legislative language
  - Bio-based purchasing directives
  - Credits and incentives for sustainable biomaterials research, production and commercialization

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Future perspectives and implementation – The way forward will be in phases

Biorefineries based on starch input, specific feedstocks => specific products

USING EXISTING TECHNOLOGIES

1st Generation Biofuels

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DEPLOYING NEW TECHNOLOGY

Gradual replacement of existing materials with biomaterials

Advanced Biofuels

Biorefineries based on cellulosic input, multiple feedstocks => multiple products

NEW BIOMATERIALS

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...and *potential* advantages are many

- Independence of volatility of crude oil and its derivatives
- Cost competitiveness
- Improved carbon footprints through reduced GHG emissions and recycling potentials
- Utilization of renewable biomass
- Novel molecules unattainable from petrochemical sources

- 2.5 billion tons of CO_2 reductions
- Creation of 800,000+ green jobs by 2022

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