



# Step change in cellulosic ethanol – the future is moving closer

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World Biofuels Market, Brussels

Session 4B – Cellulosic Ethanol & Biobutanol  
Session



## Bioinnovation – Making more with less

Novozymes is a bioinnovation company. We use biotechnology to improve the use of resources in more than 40 industries around the world.

Novozymes offers the leading technology platform for bioethanol production.

Novozymes is about making more with less. Within biofuel our enzyme technology helps unlock the fuel potential of biomass.



# Rethinking fuel

- Leading enzyme provider for starch based ethanol enzymes in all regions where we operate
- Over 150 scientists dedicated to the development of biofuel solutions
- Broad insight into cellulosic ethanol work –we are working on various feedstocks and technologies
- 271 patents granted and 188 patent families submitted for biofuels to date - and growing
- Participating in three DOE cellulosic ethanol development contracts totaling over \$25 million in project investments

The only enzyme provider to commit to providing commercially viable cellulosic enzymes by 2010

# The path Novozymes is taking to lead the industry to commercial viability and beyond

2006-2007

**Celluclast®  
Novozym® 188**

2008

**Experimental  
Cellulase  
blends**

**2009**

**2010**

**2010  
Promise  
Delivered**

2011+

**New products**

# The Cellic product family is enabling market leaders to make cellulosic ethanol a reality

Introducing  
Novozymes'  
Cellic product family

- ❖ Cellic CTec
- ❖ Cellic HTec

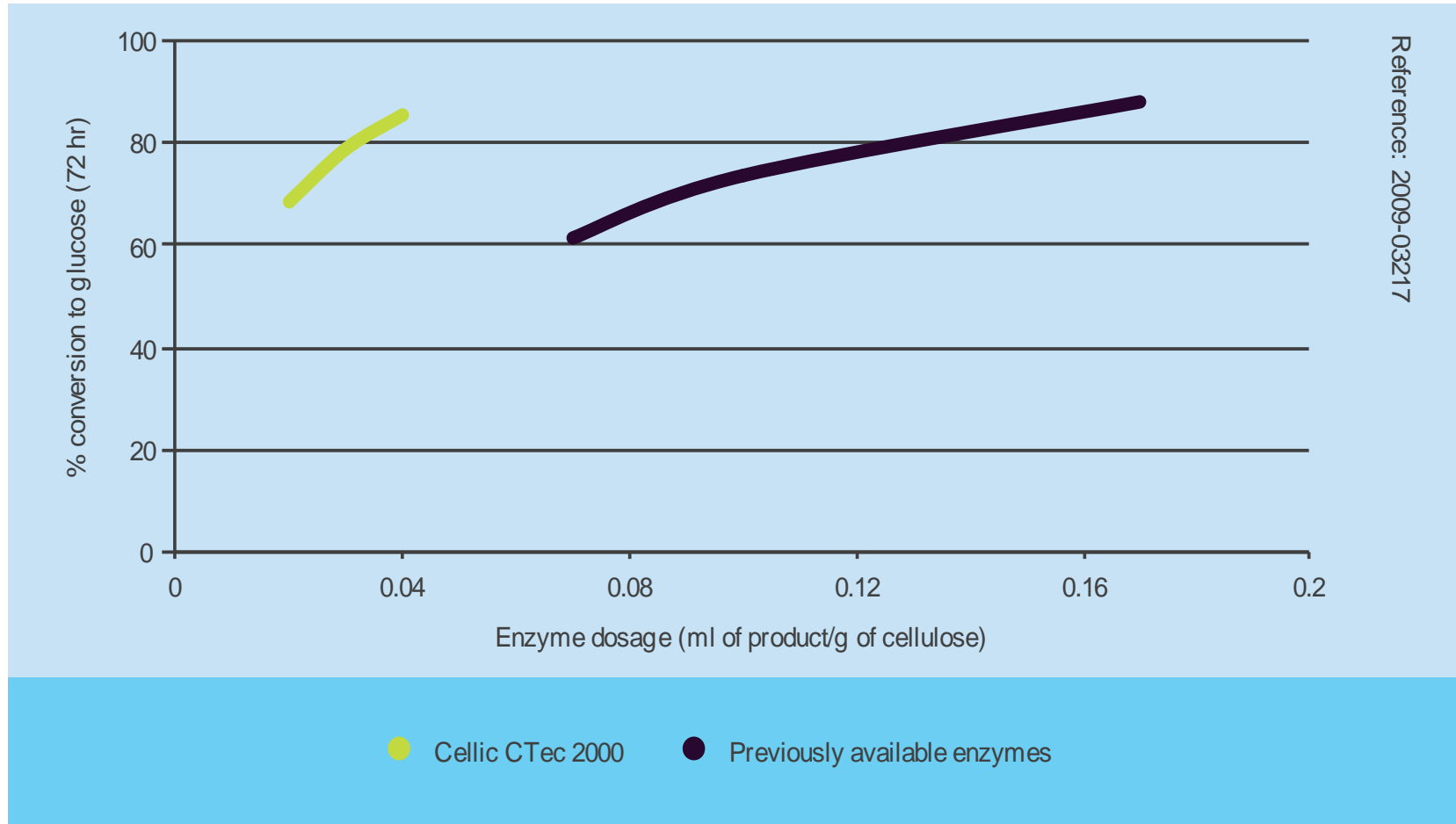
Best cost/performance ratio  
seen so far

Wide versatility – proven on  
different feedstocks and  
processes

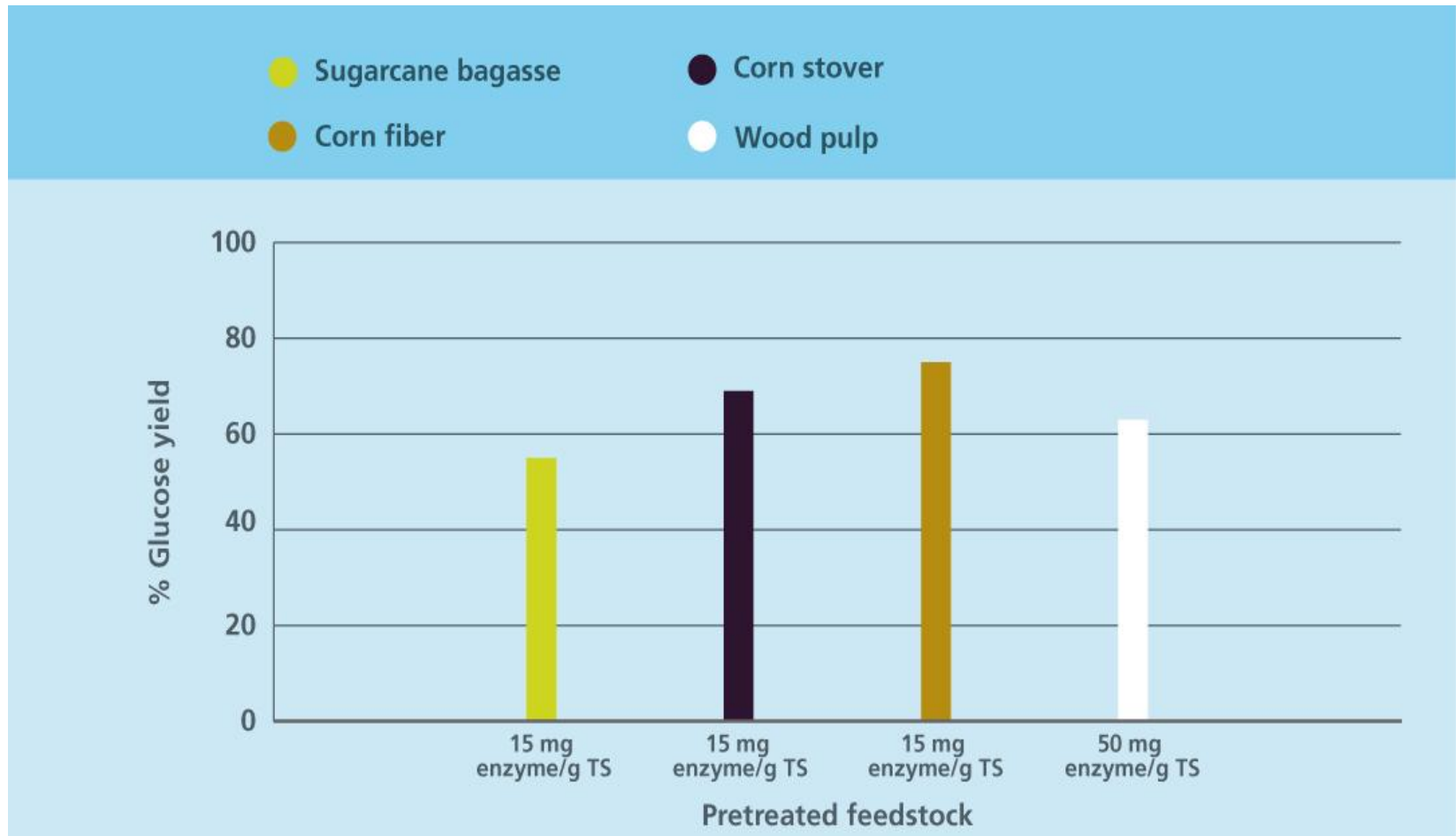
Stable and highly  
concentrated formulations

# We have taken a big step forward

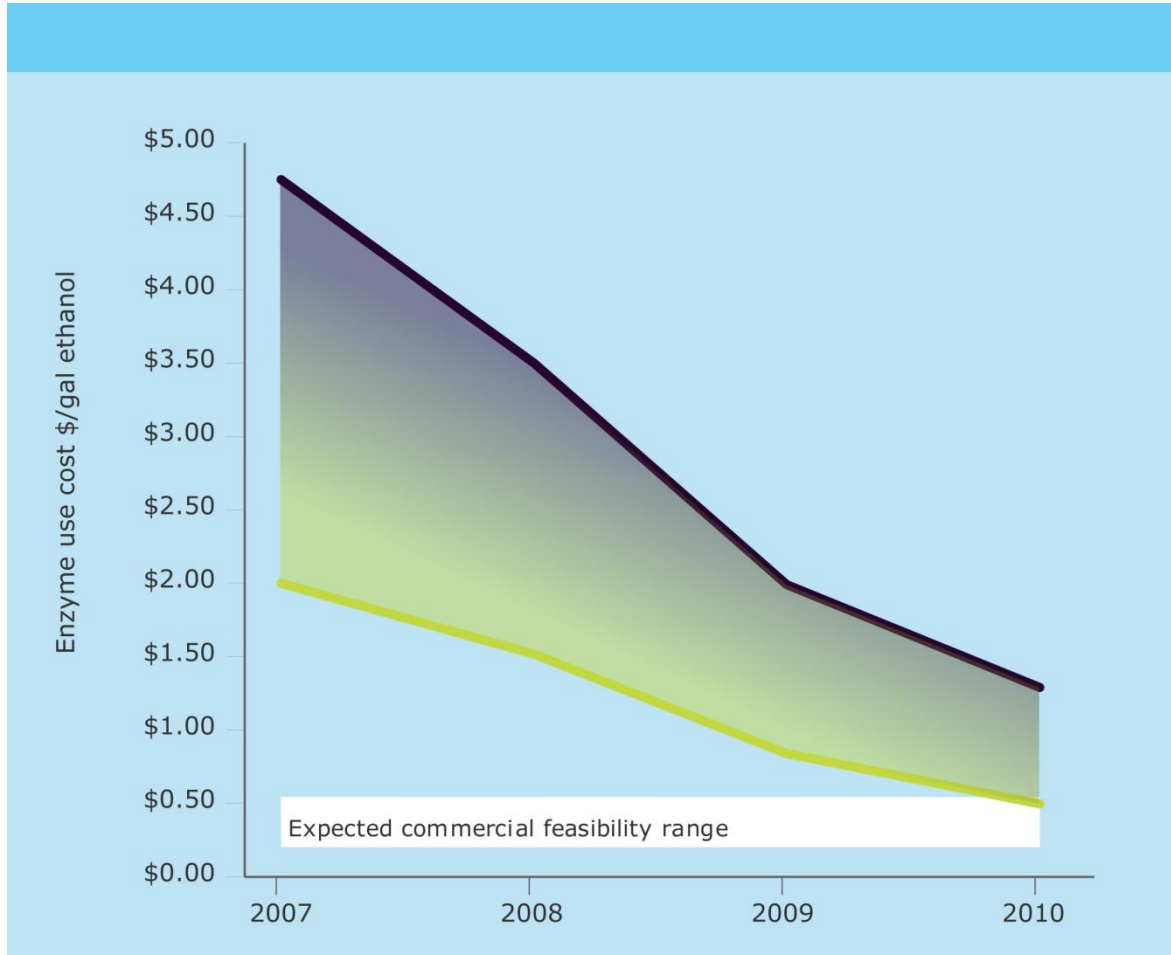
- Best cost/performance ratio in the industry today



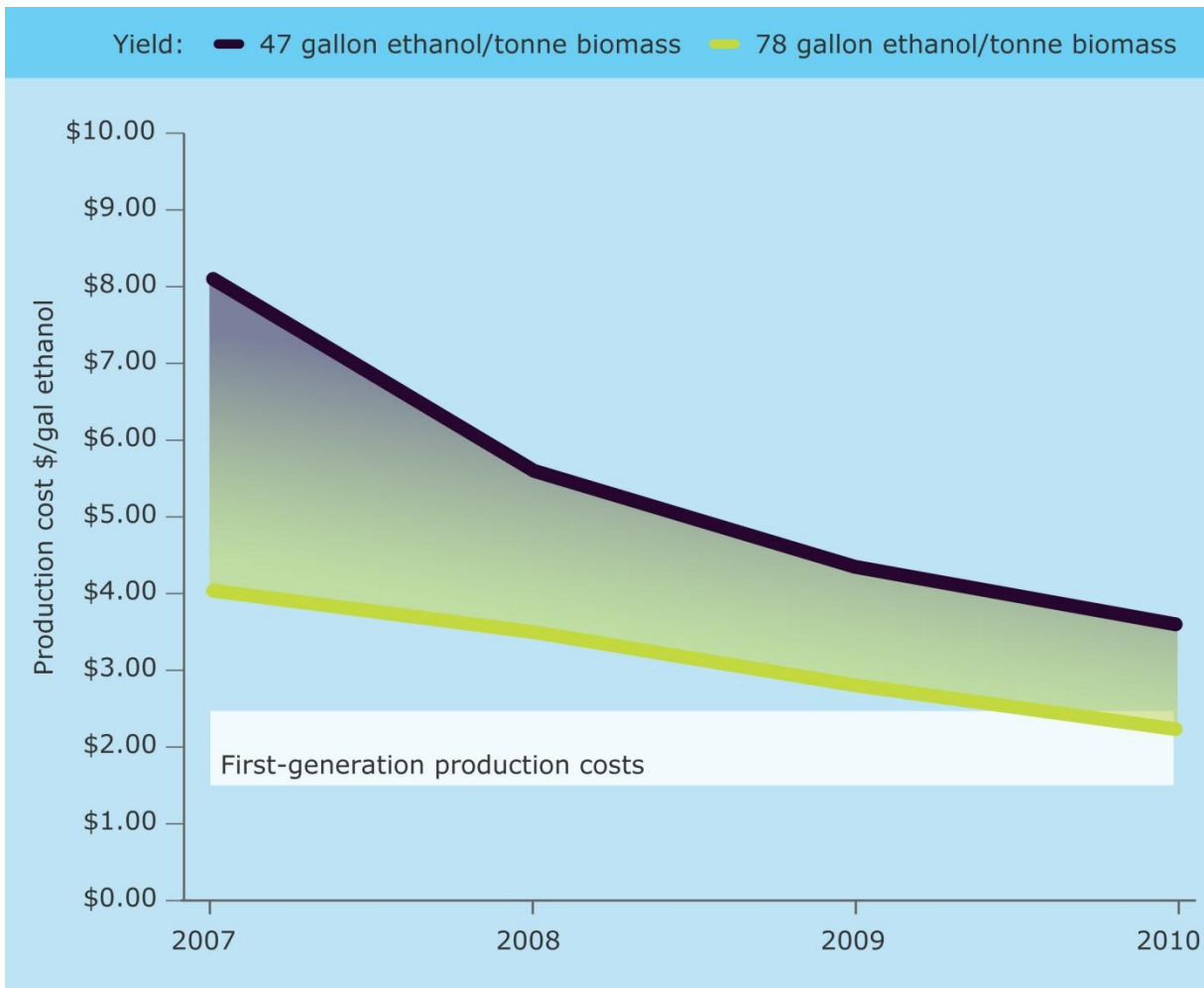
# Performance proven on many feedstock types



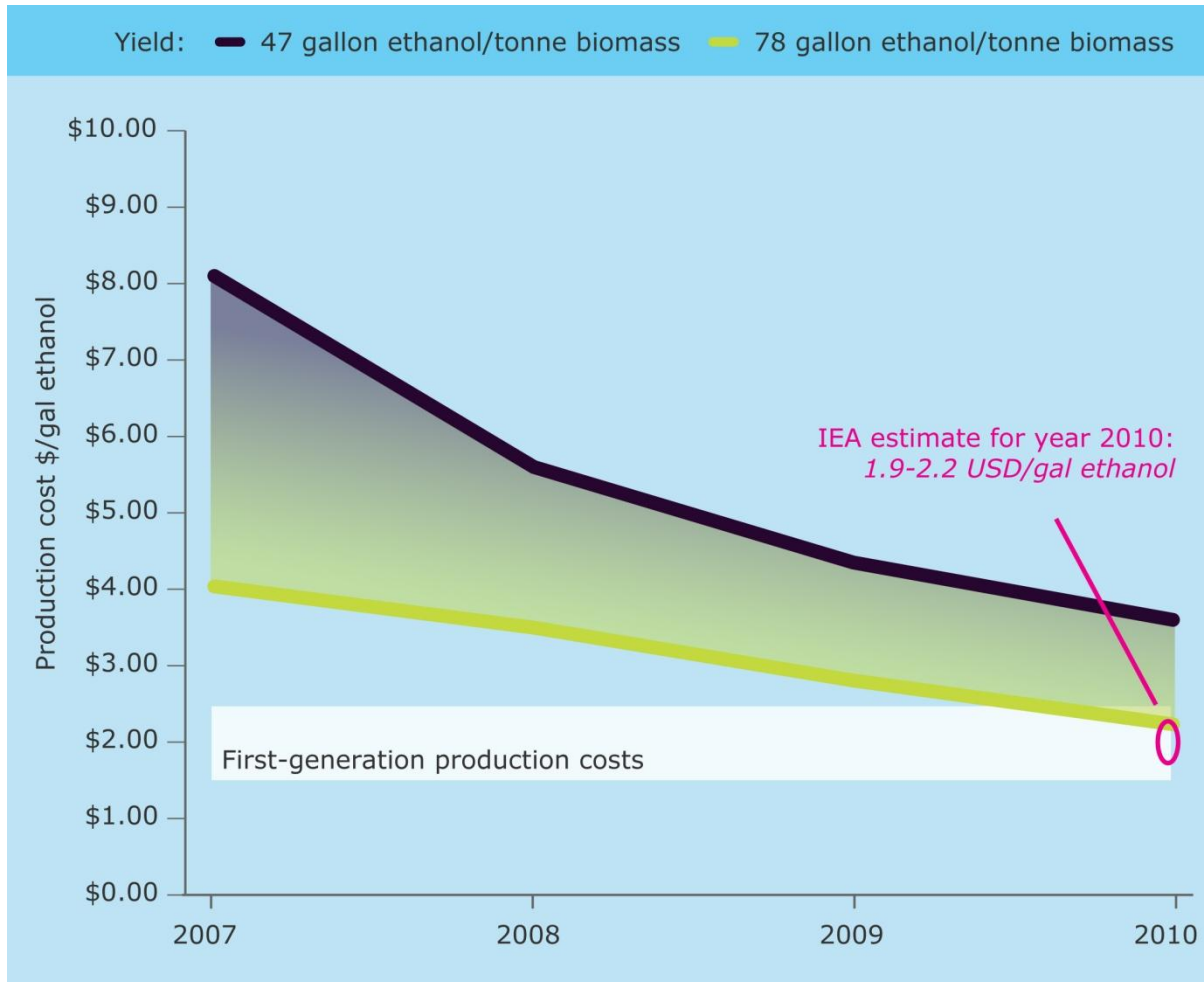
# Enzyme costs are declining rapidly



# Helping drive cellulosic ethanol to cost competitiveness



# Helping drive cellulosic ethanol to cost competitiveness



# Moving beyond NREL in 2010

Parameter	Current assumption	Commercial
Feedstock	Corn stover	Various
Feedstock price	USD 50/ton	USD 0 – 100+ /ton
Pretreatment	Dilute acid	Various
Yield Gal/dry MT	47/78	Range+ inflation
Total project investments USD/(gal/year)	9.5/5.5	
IRR/payback time	10%/20 years	X/X



# Novozymes is leading the way... ... to a promising biomass future



- Enzyme costs are becoming a smaller percentage of the total process costs for cellulosic ethanol
- Novozymes Cellic product family is a key step in our path to delivering our 2010 promise for commercially viable enzymes
- Through partnerships we will advance enzyme and process technology to enable commercial viability of cellulosic ethanol

Join the dialog...

[www.bioenergy.novozymes.com](http://www.bioenergy.novozymes.com)

Thank you