

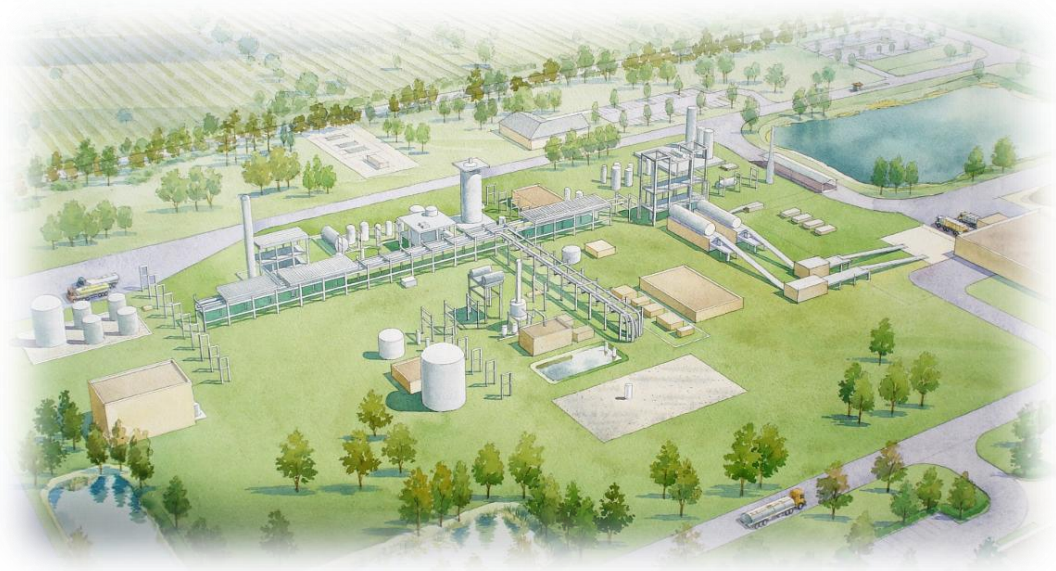
INEOS Bio

Advanced bioethanol production from ligno-cellulose, residues and waste materials

Energy Institute

London

18th April 2011

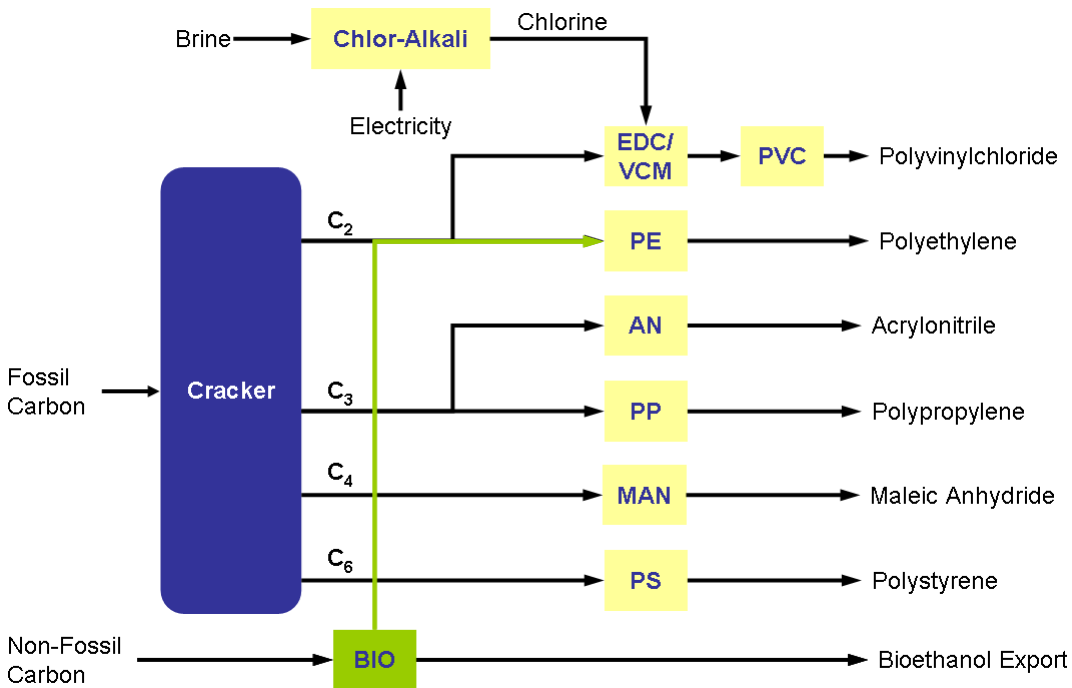




- A leading global chemical company
 - Privately owned
 - Vertically integrated
 - Worldwide asset base
- Refineries in France and UK
 - 400,000 bbls/day
- Uniquely positioned to deliver technology
 - Leading licensor of chemical process technology
 - Expertise in technology scale-up and commercialization
 - INEOS sites available for licensees
 - Transport fuels & biofuels expertise

Technology portfolio

Solutions for Cracker Projects



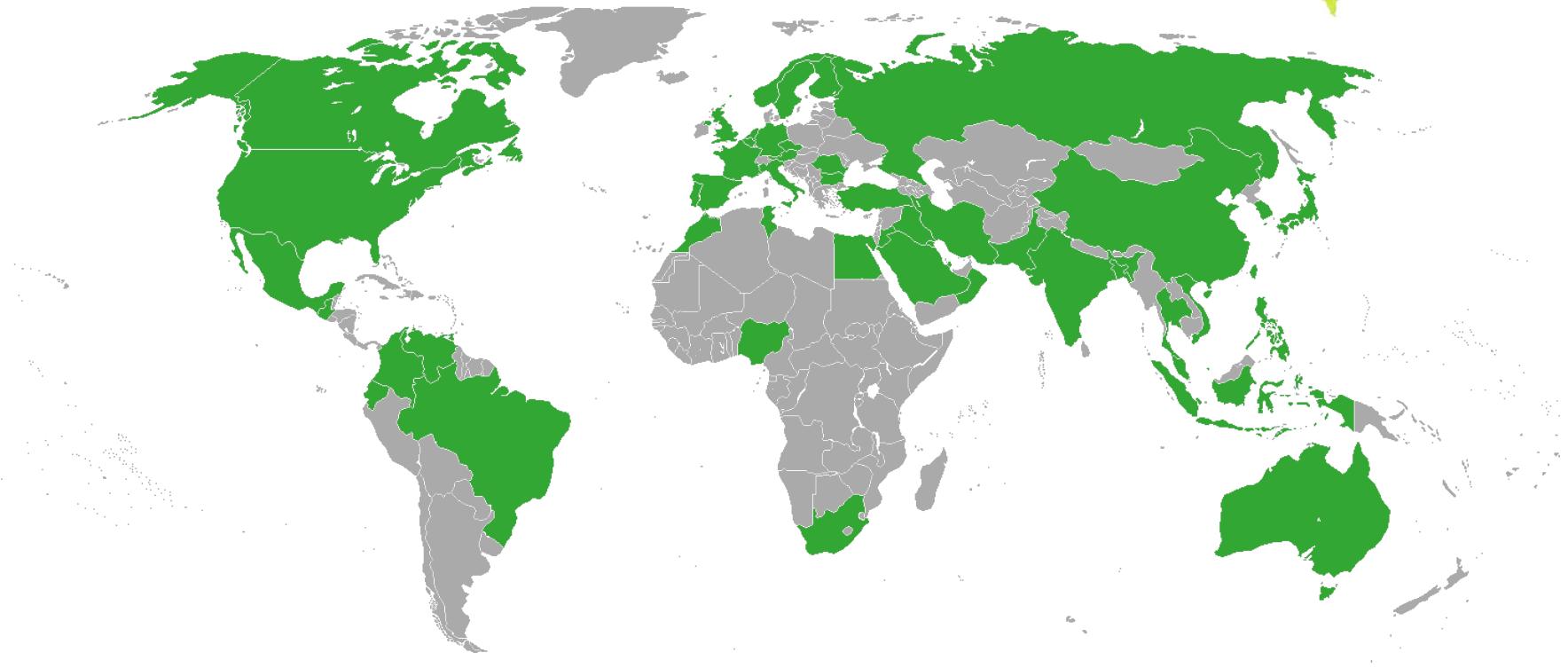
Snapshot Licence Customer Base



INEOS is a world wide leading technology provider

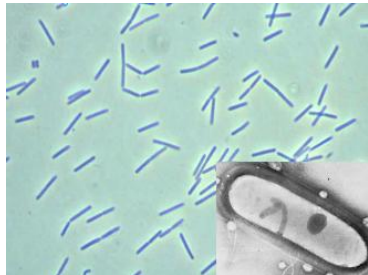
INEOS Technologies worldwide

270 licenses in 51 countries



History of INEOS Bio

- Bioengineering Resources Inc. founded in 1984 in Fayetteville, AR, USA
- Ethanol project begun in 1991
 - Ethanol pilot plant began operation in 2000 using trailer gas
 - Gasifier pilot plant began operation in 2003
 - Fully integrated gasification - fermentation - distillation
- INEOS Bio created in 2008
 - Front End Engineering Design with global contractor KBR 2009
 - US EPC contract awarded to AMEC in December 2010
- Ground breaking on first industrial scale plant in February 2011



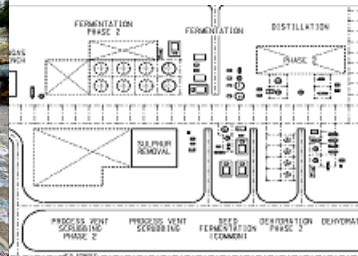
1989 – Discovery C. Ljungdahlii
300,000+ hours in the lab



2003 – Demonstration Unit
40,000+ hours operation



2008 – INEOS Bio created



2009 – Front End Engineering



2011 – Construction of first plant begins

Meeting Societal Challenges and Market Needs

World-scale biorefineries

Utilize INEOS BioEnergy Technology

- Low cost, carbon neutral advanced biofuel for use in today's cars
- Local waste to fuel & power for local use
- Robust, reliable & safe
- Market ready

Meet Society's Emerging Challenges

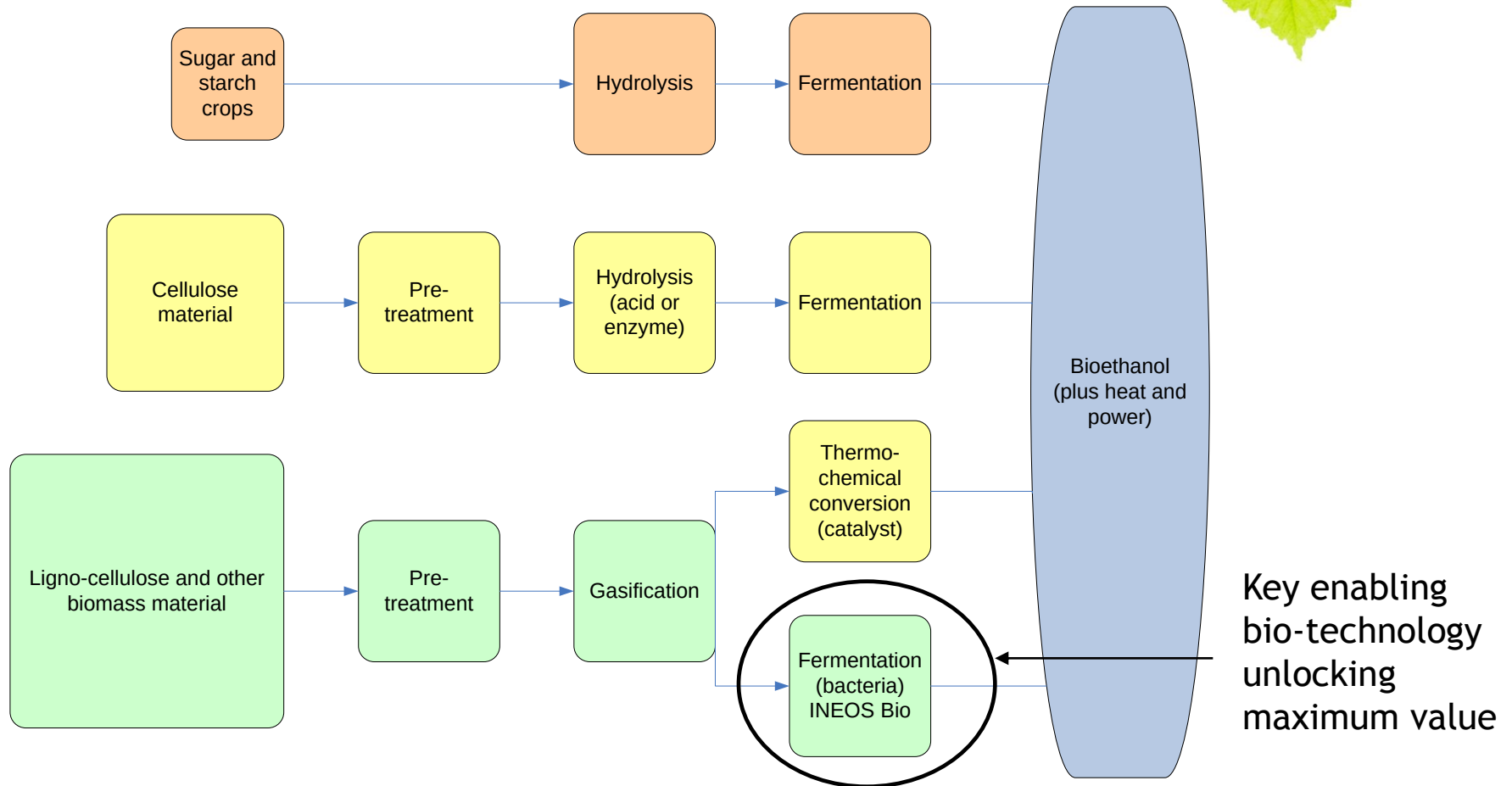
- Climate change
- Efficient use of waste
- Energy independence
- Energy diversity
- Job creation
- Wealth creation

Respond to Market Drivers

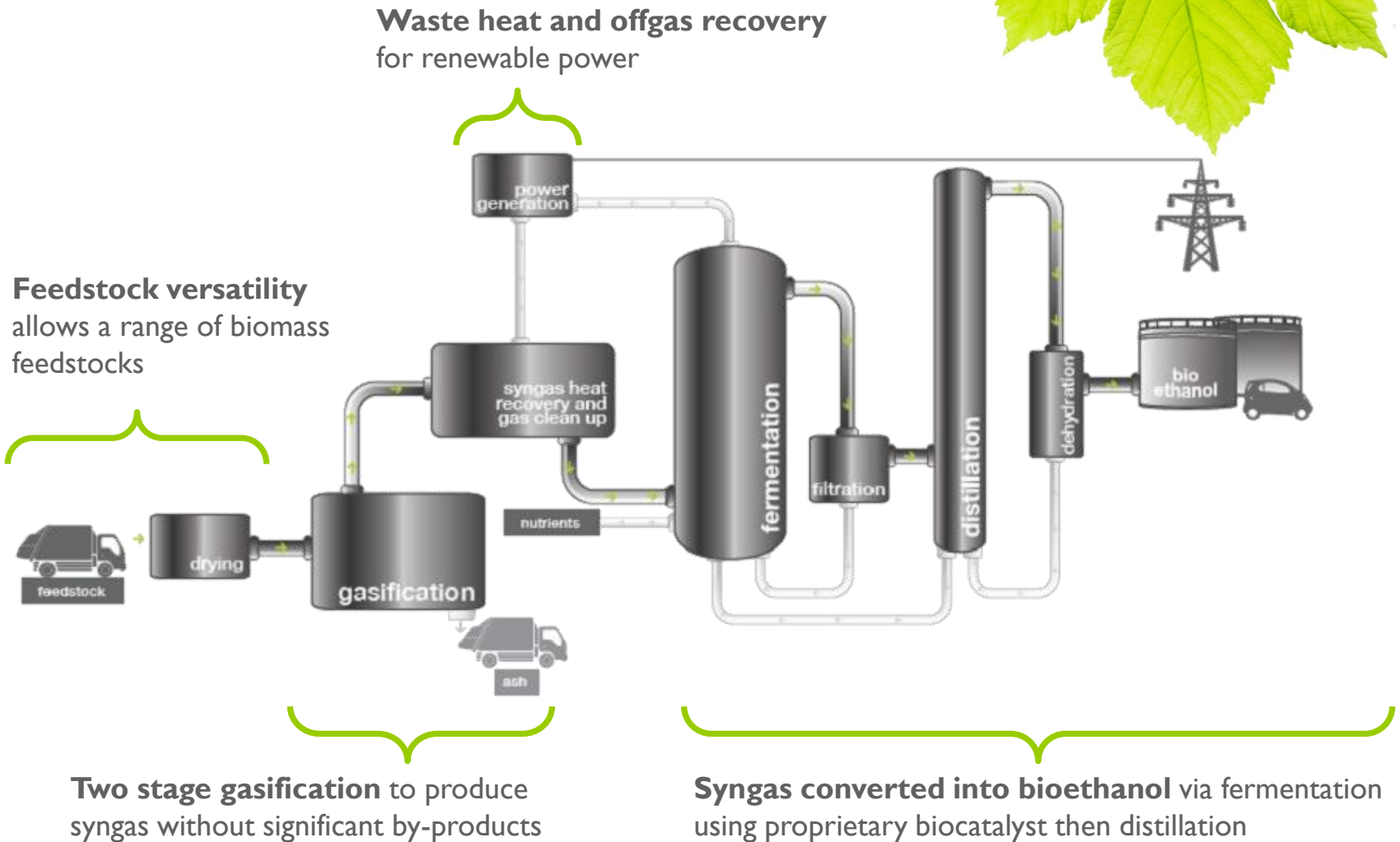
- Landfill diversion
- Recycling targets
- Energy demand
 - Cellulosic ethanol
 - Renewable power

Pathways to bioethanol

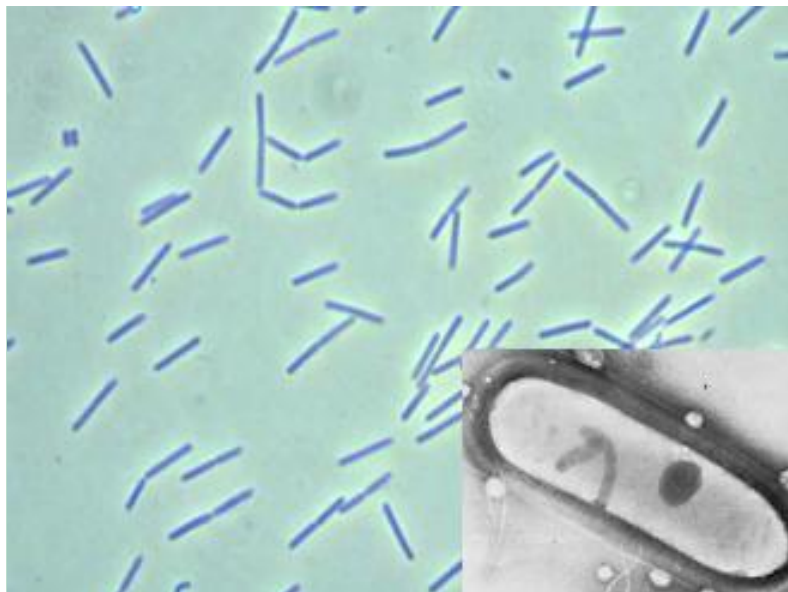
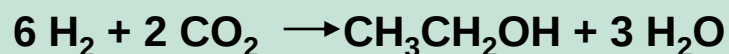
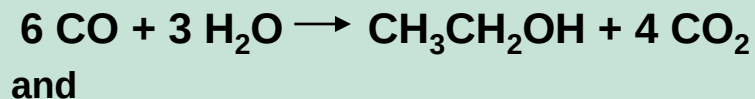
The INEOS Bio technology unlocks maximum value



Process Overview



Efficient synthesis of syngas to ethanol



- Fermentation using a naturally occurring anaerobic bacterium (*Clostridium ljungdahlii*)
- **High** yield, selectivity and efficiency
- **Low** temperature, pressure and cost
- **Tolerant** to syngas composition variations, common catalyst poisons and common invasive micro-organisms in fermentation processes
- **Fast** conversion to bioethanol

Tailored solutions through feed flexibility



* Prepared & unprepared household & commercial waste (e.g. food waste & solid recovered fuel)

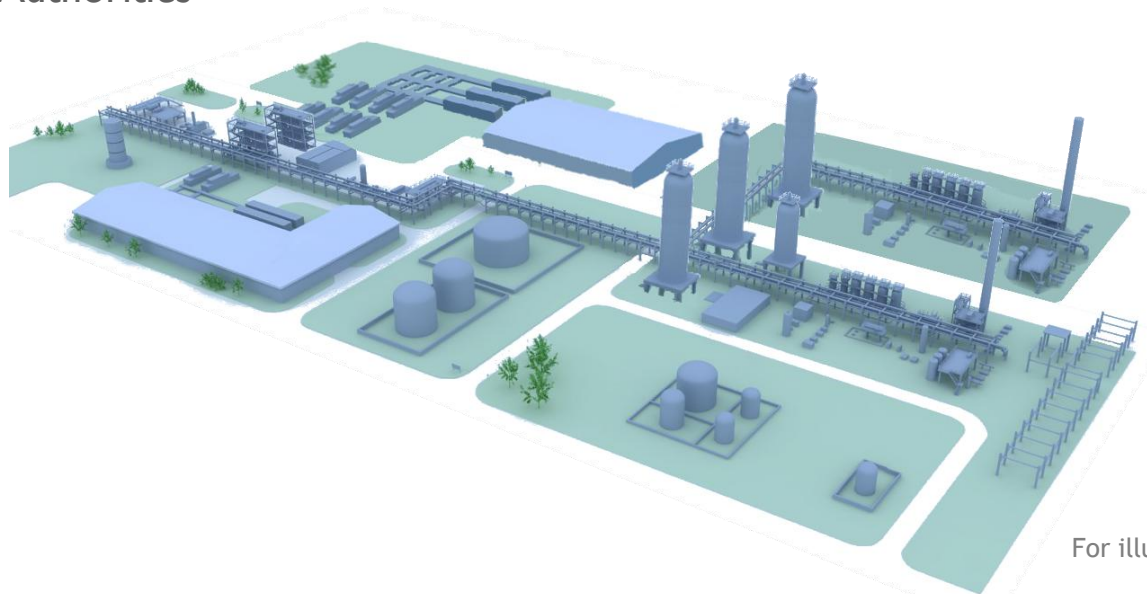
Distributed energy networks

- Small commercial scale (25 kt pa)
- Tailored to 200 kt pa MSW contract plus local commercial & industrial waste, waste wood
- Autonomy for Local Authorities



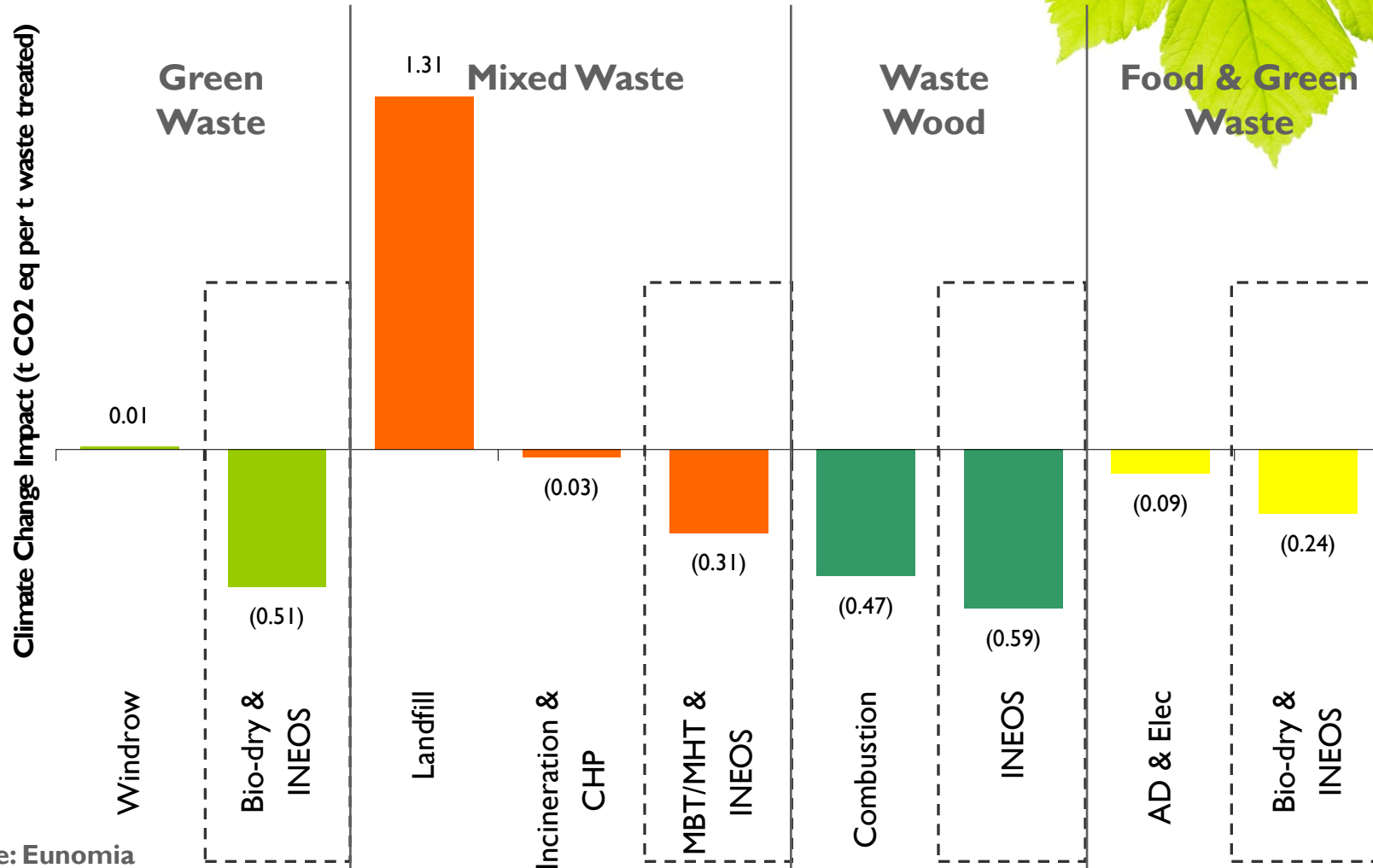
Biorefinery

- Large commercial scale (100+ kt pa)
- Multiple modules for economies of scale where favourable infra-structure exists
- Biomass resources to fuels and power



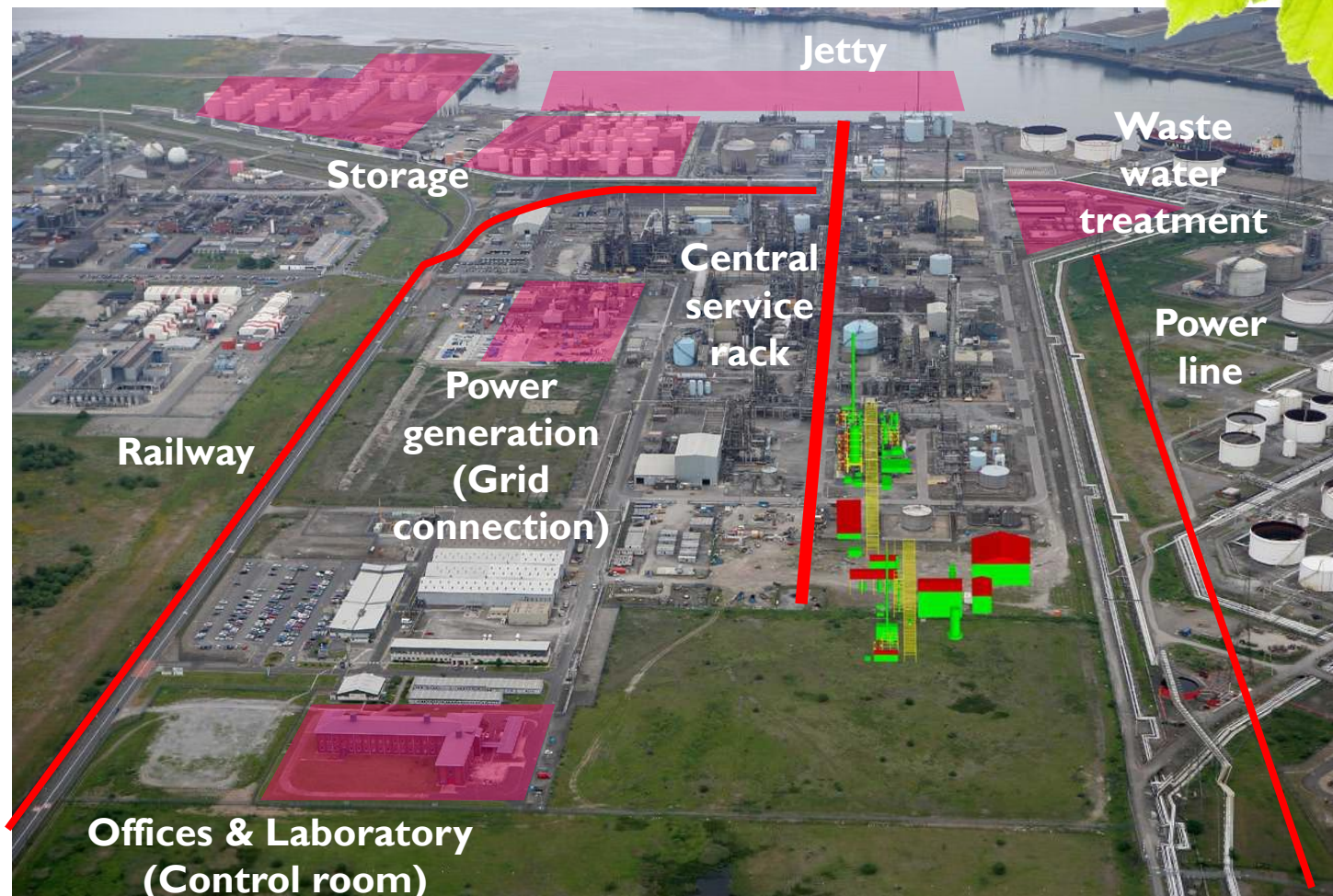
For illustrative purposes only

Life Cycle Assessment

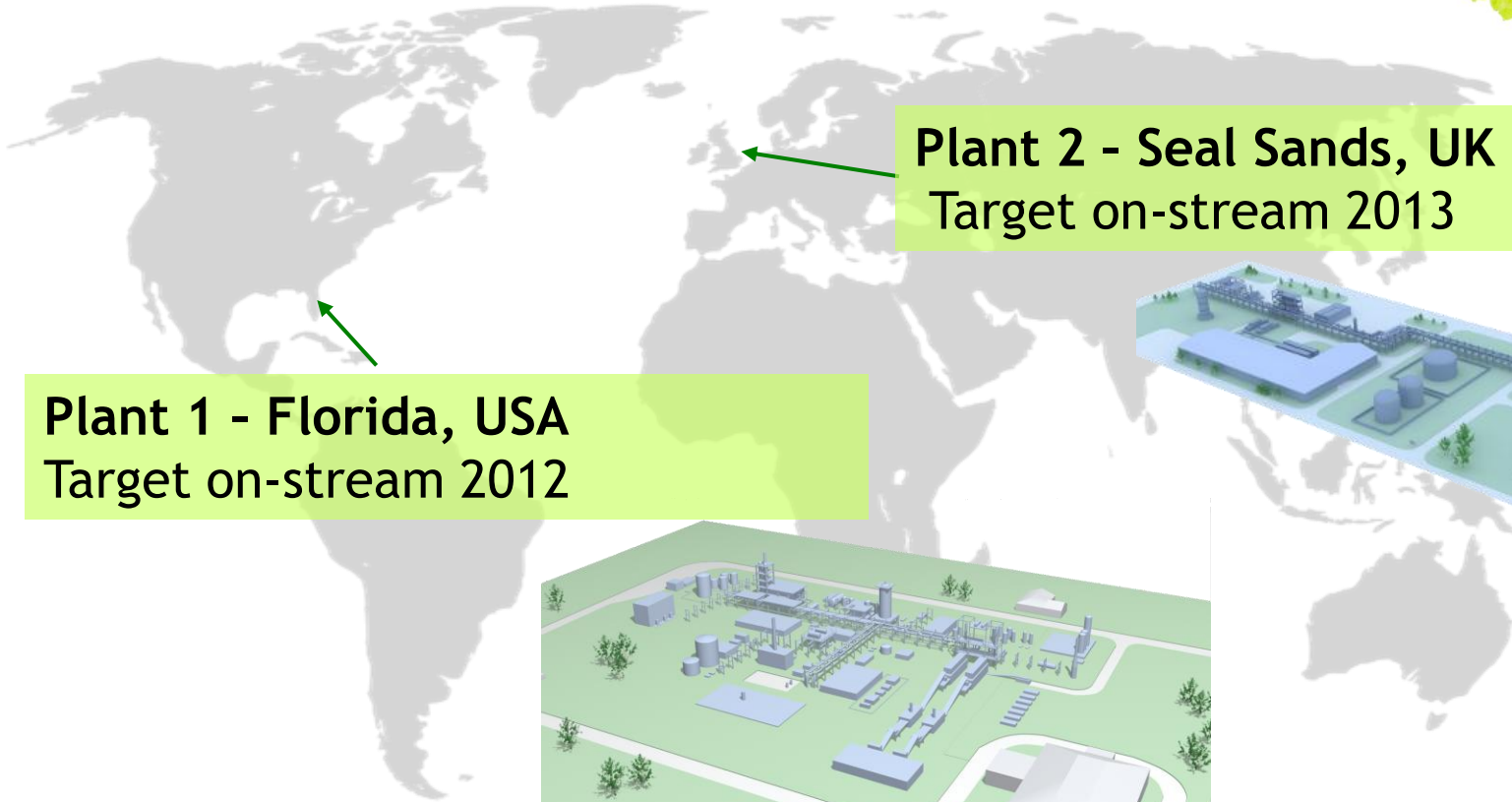


Source: Eunomia

Example of Integration into existing sites

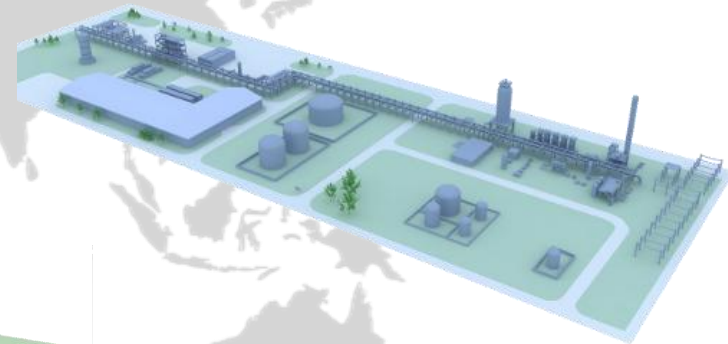


Commercialisation Progress



Plant 1 - Florida, USA
Target on-stream 2012

Plant 2 - Seal Sands, UK
Target on-stream 2013



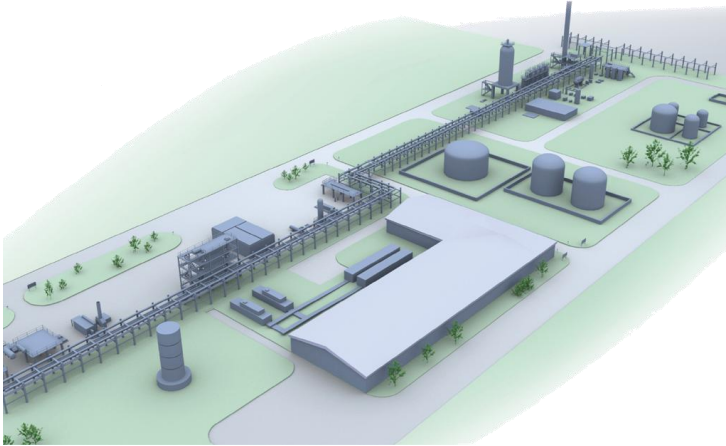
First INEOS Bio plant - Vero Beach, FL, USA



- Key parameters :
 - 24 ktpa of bioethanol (8M gall pa)
 - 6 MW gross power generated
- Strong US government financial support
 - \$50M DOE grant
 - \$75M USDA Loan Guarantee
- Independent validation by DOE & USDA
- EPC awarded to AMEC in Dec 2010
- Ground broken in February 2011



INEOS Bio plant - Seal Sands, Teesside, UK



- Key parameters :
 - 24 ktpa of bioethanol (8M gall pa)
 - 7 MW gross power generated
- UK government financial support
 - £7.3M Grant from ONE and DECC
- Initial planning consent granted
- Project 'ready to go' subject to financial close

Conclusion

INEOS Bio process technology:

- Combats climate change
- Uses waste as a resource
- Provides energy security
- Creates skilled jobs and wealth
- Supports emerging Bio-economy

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