



# TRASH TO CASH: TURNING WASTES INTO BIO-BASED PRODUCTS

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# International bioeconomy policy

- dedicated bioeconomy strategy
- partial bioeconomy strategy  
(e.g. bioenergy, bioindustry, regional strategies)
- bioeconomy strategy under development

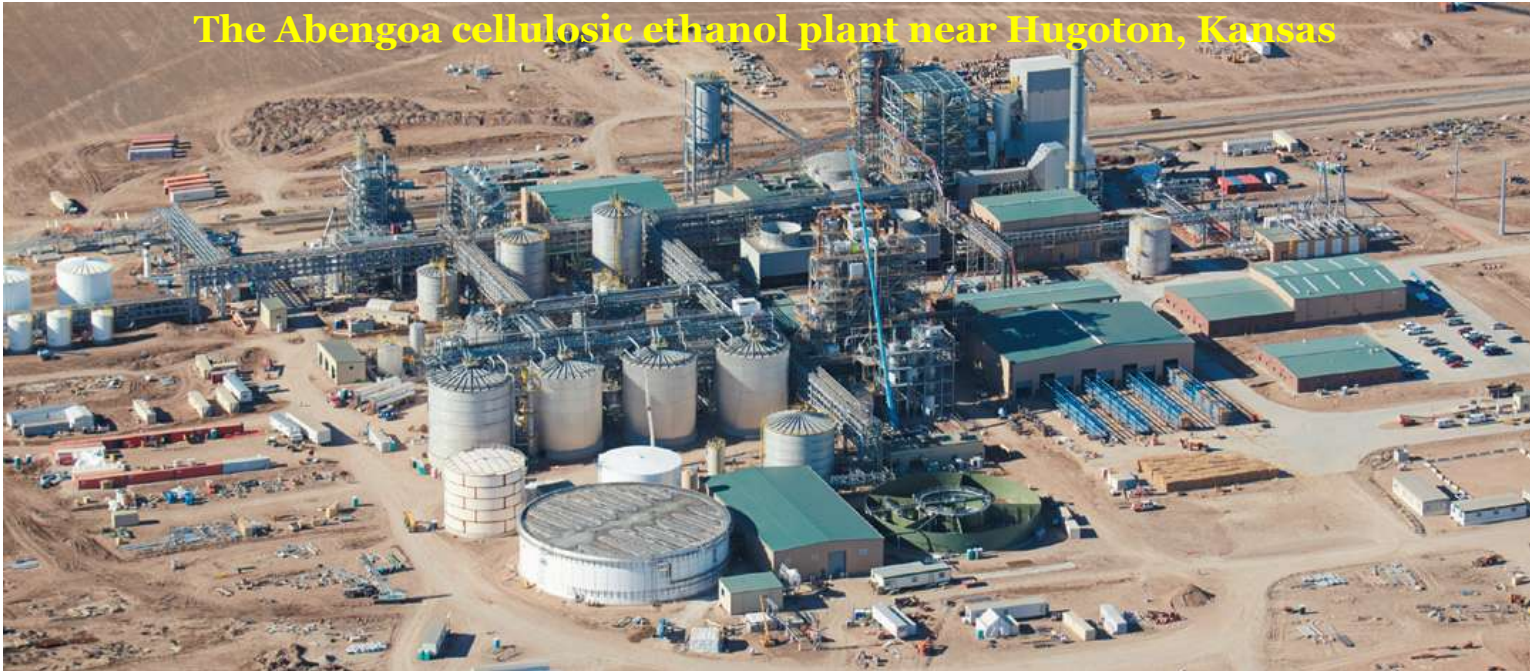


As of June 2015



# Biorefineries policy: why now ?

The Abengoa cellulosic ethanol plant near Hugoton, Kansas



- **Project LIBERTY:** US DoE grants to support engineering and construction, and biomass collection and infrastructure
- **The Abengoa plant** in Kansas: federal loan guarantee from the US DoE Loan Programs Office.
- **DuPont plant**, Nevada, Iowa: USDA and DuPont PPP to set voluntary standards for the sustainable harvesting of agricultural residues for cellulosic fuel



# GranBio waste to ethanol, Brazil

- 2G ethanol enables increased Brazilian capacity by 50% using agri-waste – straw and bagasse, without need of expanding the cane fields
- Processes 400,000 tonnes of straw per year
- Initial capacity of 82 million litres of ethanol per year
- \$190 million to build the plant and \$75 million on the steam and electricity co-generation





# Lessons from cellulosic flagships: unusual and complex projects, many stakeholders

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- High CapEx
  - Simultaneous commitment by many actors:
    - Technology providers, R&D partners
    - Customers (e.g. equity investors)
    - Banks/financial institutions
    - Funding bodies (EU/Regions)
    - Local authorities
- Sustained investment
  - Investors (many ongoing negotiations)
  - Grants (PPP, DG RTD, Regional funds)
  - **Debt (main difficulty)**
- Flagships are not easily bankable (**not for technical risk**)



Cellulosic biorefinery, Crescentino, Italy.



BETARENEWABLES



# Fermentation of waste gases

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LanzaTech, 2012



ArcelorMittal, 2017

“ArcelorMittal, LanzaTech and Primetals Technologies announce partnership to construct breakthrough €87m biofuel production facility”





# Calysta Feedkind: methane to salmon feed

- Methane is often a waste
- Sustainability: climate change *and* food security
- Methane much worse than CO<sub>2</sub> in warming potential
- High quality protein fish feed a barrier to future aquaculture



**CALYSTA**  
NUTRITION

 FeedKind

# Two PPP firsts for Canada

- **Sarnia:** BioAmber bio-succinic acid plant supported by a \$ 12 million investment from the Harper Government
- Due to open early in 2015
- First of its kind in the world
  
- **Edmonton:** Enerkem's first in the world commercial Waste-to-Biofuels plant
- Converts Edmonton's municipal garbage to methanol (ethanol later)
- Opened June 04, 2014
- "The mill that kills landfill"







# Malaysia and bio-based production






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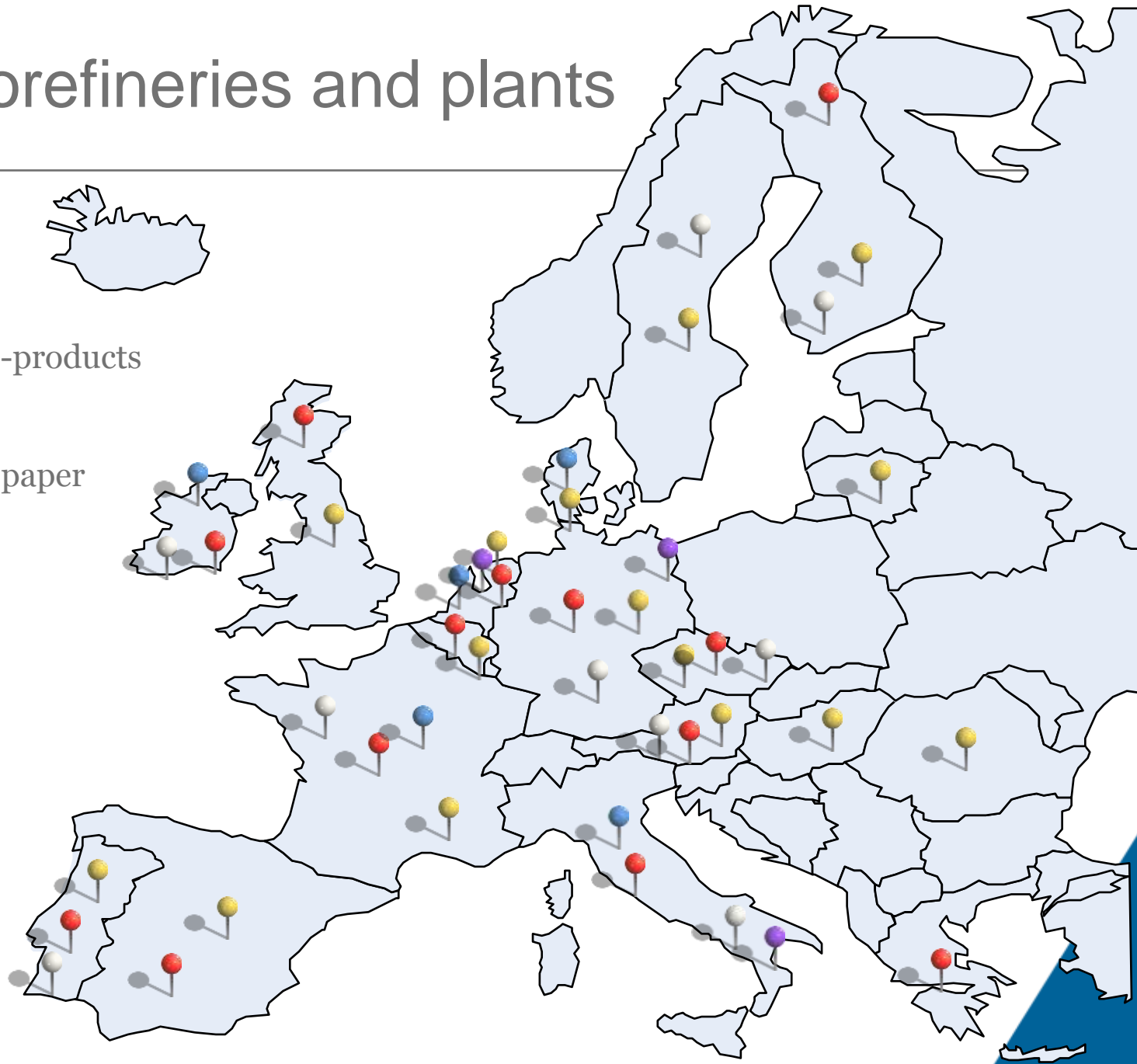
- Attracting inward investment through the bioeconomy strategy
- Verdezyne investing USD 48 million in Malaysia to produce renewable chemicals
- First commercial bio-isobutanol plant in Asia
- World's first bio-methionine plant and Asia's first thiochemical platform
- Integrated biorefinery project
- Biopharmaceutical manufacturing and development facility





# EU biorefineries and plants

-  Other bio-products
-  Biofuel
-  Pulp and paper
-  Starch
-  Algae





# Thank you for your time

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