



BETARENEWABLES

Keep It Simple! **The Future of Chemistry Is In Your Back Yard (Or Forest)**

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«Scaling Up Bio»
Ottawa, Canada



Why Cellulosic Ethanol



- It enables foresters and farmers to add value to their residues such as sawdust, stover or straw.
- Cellulosic Ethanol has a CARBON INTENSITY SCORE that is MUCH LOWER than corn ethanol.
- PROESA™ ethanol ranges from **20 to 25kgCO₂/MJ**
- It pays well ! D3 RINS in the US, and LCFS.
 - Lignin co-product of cellulosic ethanol, is a green fuel.
 - In the future, it will be a source of aromatics.



- **Why leave \$\$\$ on the soil ?!!**

KEEP IT SIMPLE

- **Today great progress has been made, both on the biotech side and on the mechanics of treating biomass.**
- **It is finally possible to make biomass into fuel.....if you respect the KISS rule !**

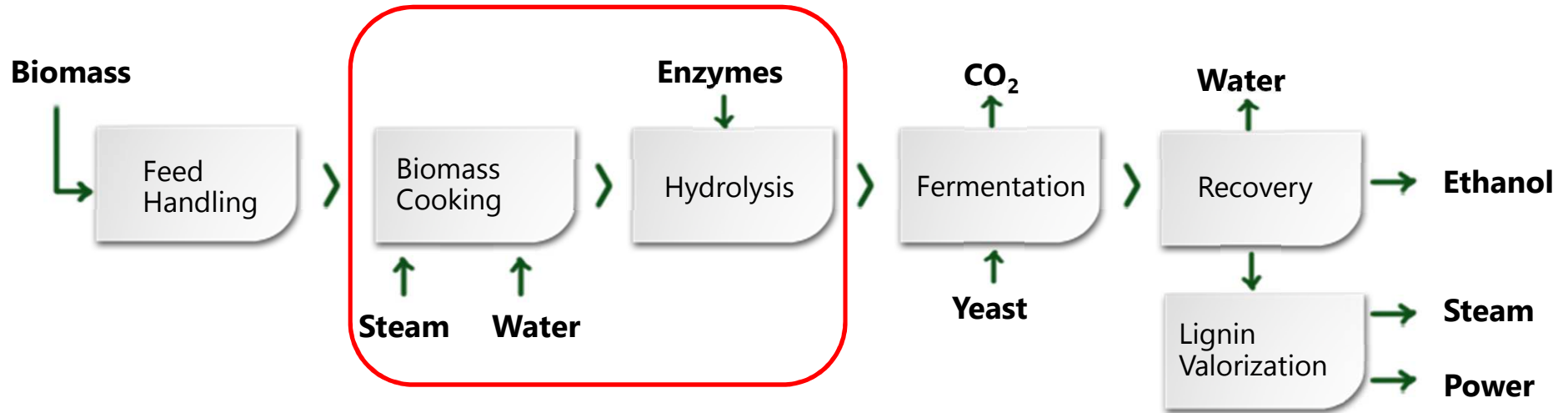


How?

- Make the plant SMALLER.
- Biomass radius should allow a **50-60 USD/BDMT price**.
- Find a site where CHP and ideally also WWT are already there.
 - Put in a process that is **not** hazardous, **not** fancy, **not** exciting for engineers 😊 !
 - Use carbon steel, minimize pressures and temperatures involved.
- BE CREATIVE, NOT COMPLICATED.



The PROESA™ Process



How PROESA™ is simple:

- ✓ Feedstock flexibility
- ✓ No milling or grinding
- ✓ No chemicals added
- ✓ Continuous process
- ✓ Small scale and small CAPEX
- ✓ Carbon steel almost everywhere



Our Roots ... in the PET Business



Beta Renewables belongs to the **MOSSI GHISOLFI**
GROUP

Mossi & Ghisolfi Group was founded in 1953 to produce packaging for detergents and toiletries, mainly from HDPE and PVC



- M&G Group today is the largest privately owned chemical company in Italy
- It is **one of world top 3 producers of PET** for packaging and polyester fibers
- >Our shareholders include **TPG (Texas Pacific Group)** and **Novozymes**.



Scaling Up Bio....



.....Our Scale-Up Story



PROESA™: pilot plant since 2009



Rivalta Plant, Italy



PROESA™: commercial since 2013



Operability index improved to >90% during two years of operation

Crescentino Plant, Italy

Total Footprint: 15ha



Ethanol Capacity: 25-40.000 MT/Y

100% water recycle

Biomass input: 150-200.000 BDMT

13MW green power from lignin

Crescentino today: an industrial reality



PRETREATMENT



WWT



Crescentino today: an industrial reality



**Ethanol shipped
by road**



**Ethanol shipped
by rail**



Woody biomass currently being processed in Crescentino



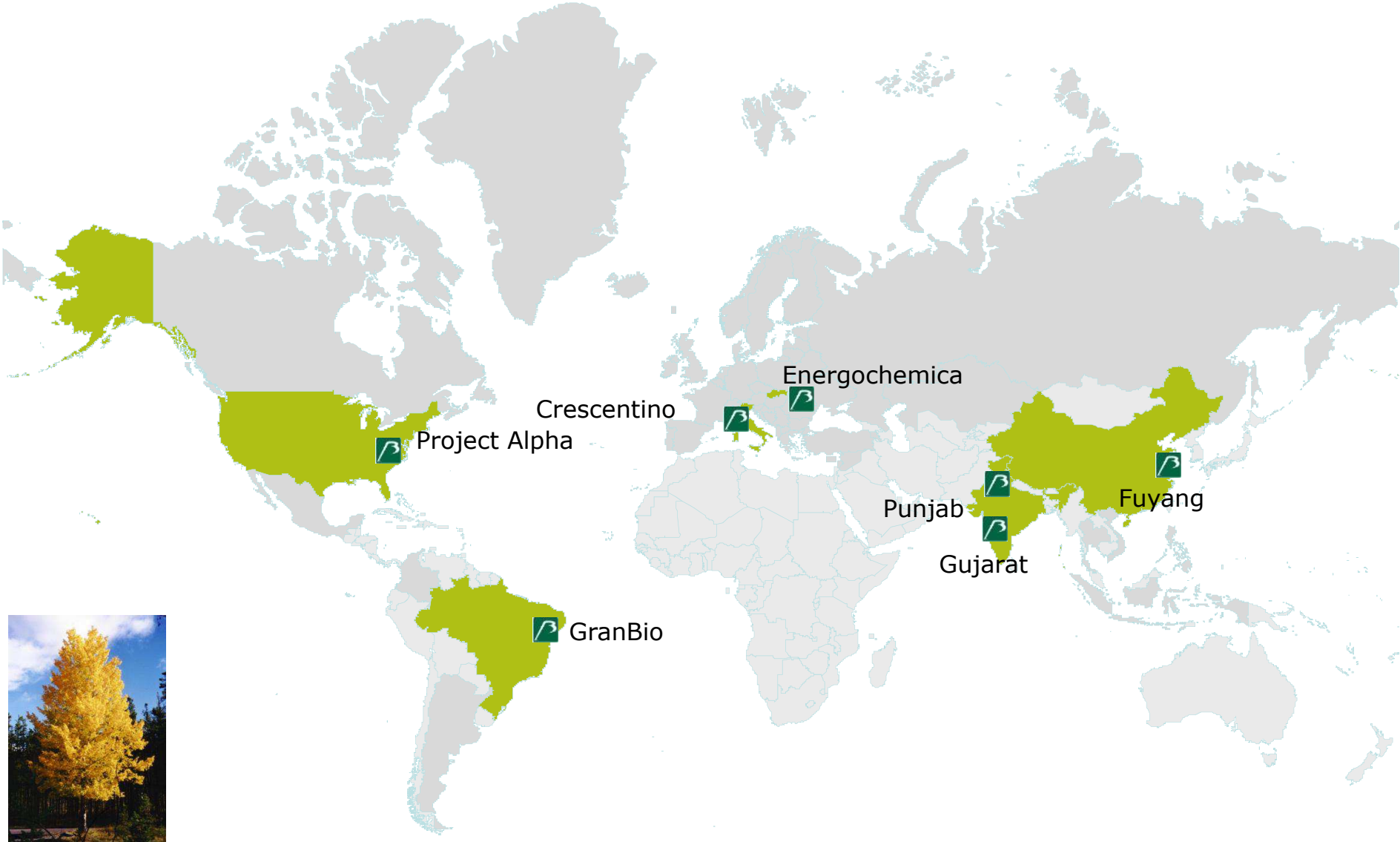
Since May 2016 we've been running on hardwood (Poplar + Chestnut).



About Poplar:

- Easily available and cost competitive
- **No need to wash the biomass prior to the pretreatment**
- Low in ash, rich in sugar

PROESA™ Projects worldwide



Our Vision for Canada



- Co-locate a **20ktpa** plant next to a sawmill and/or onsite a power plant in the center of an agricultural area.
- We will need ≈ 120 BDMT of biomass
- Make ethanol and export **to California at 3,7USD/gal, or to the USA at 3,45USD/gal, net of transport cost.**
 - Give lignin to CHP plant in exchange for utilities, thus reducing its carbon footprint
 - **Future:** biochemicals and aromatics.





BETARENEWABLES

**Thank you ...
Let's meet and discuss!**

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