



## LEAF RESOURCES LIMITED

Sustainable products from plant biomass

### Australian Securities Exchange Announcement

6 May 2015

### Third Party Report confirms economic advantages of Leaf Resources' Glycell™ process

#### Highlights

- Report confirms an almost 30% cost advantage of Glycell™ process over NREL dilute acid (full costing basis before co-products allowance)
- Advantage increases to almost 60% when co-products are included
- Full cost of production for Glycell™ \$151/t compared to dilute Acid \$363/t
- Report predicts Glycell™ process to have a 25% capital advantage over dilute acid
- At \$151 per tonne Leaf Resources' Glycell™ sugars could economically replace corn starch as a feedstock for ethanol production

Leaf Resources recently commissioned a report from ResourceInvest Pty Ltd to independently compare Leaf Resources' Glycell™ process with a dilute acid pretreatment process as described by National Renewable Energy Laboratory (NREL). The executive summary of that report stated:

*Leaf Resources' Glycell™ pretreatment process offers compelling cost advantages over current practice dilute acid pretreatment.*

*Our modelling takes dilute acid process economic data from the US Government's National Renewable Energy Laboratory (NREL) and compares it with the Glycell™ process to determine a minimum sugar selling price (MSSP). Sugars are an intermediate product in the formation of biofuels or biochemical products, and the MSSP represents one of the major costs in this production stream.*

*The NREL process uses a corn stover biomass feedstock. We have assumed a comparable bagasse biomass feedstock for the Glycell™ process.*

*The conversion efficiencies achieved by the Glycell™ process offer almost a 30% cost advantage in sugar production compared with our normalised NREL sugar production model.*



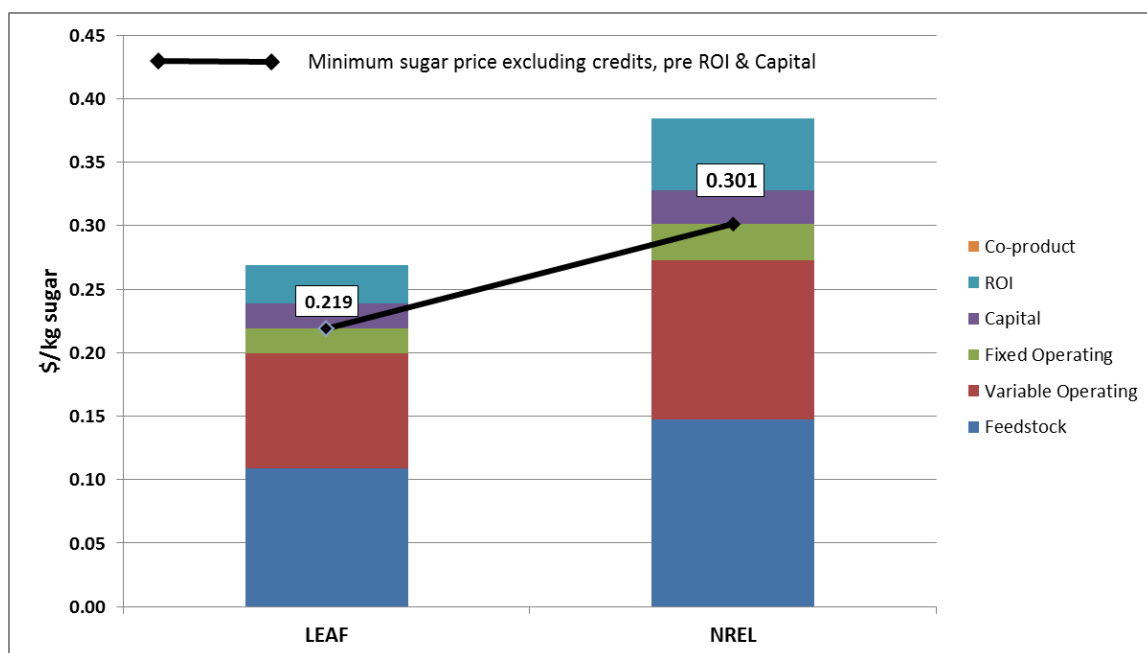
## LEAF RESOURCES LIMITED

Sustainable products from plant biomass

The Glycell™ sugar price is US\$219 per tonne compared with US\$301 per tonne for the normalised NREL model, or a 27.3% cost advantage, on a pre return on investment and capital allowance basis. On a post return on investment and capital allowance basis the cost advantage is \$269 to \$384 per tonne, or 29.9%. This cost differential is also before any allowance is made for co-product credits, which in the Glycell™ case may be substantial.

A viable lignin co-product stream from the Glycell™ process, where lignin is sold at US\$450 per tonne, reduces the overall cost of sugar production (including a 10% return on investment and capital allowance) to US\$151 per tonne compared with US\$363 per tonne for the NREL model where the waste product is burnt for steam and electricity generation. This is an almost 60% cost advantage.

### Minimum sugar price - excluding co-product credits

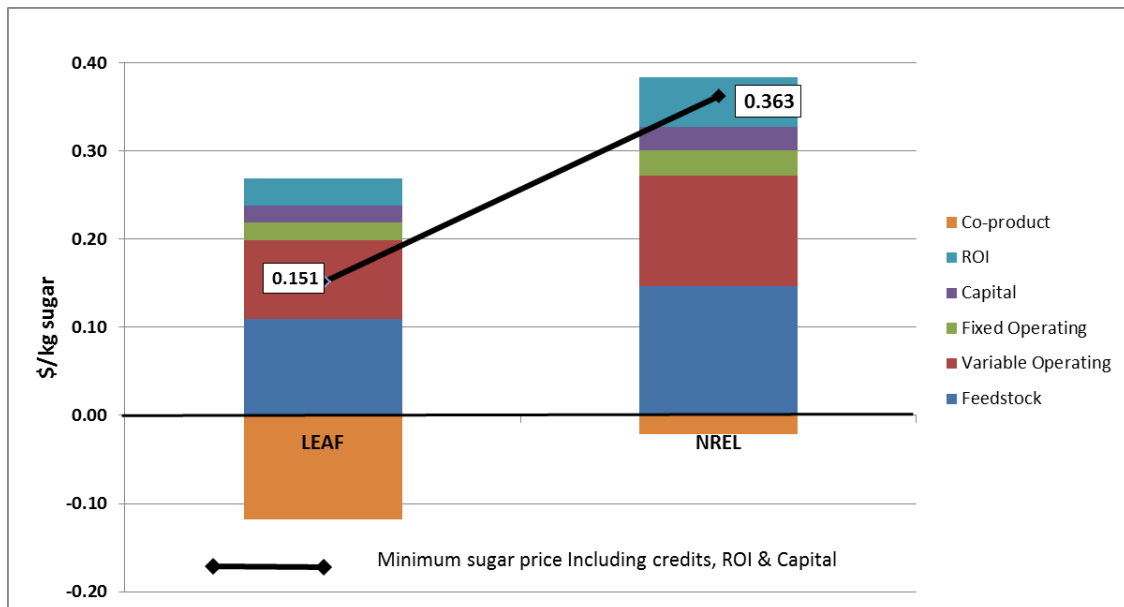




## LEAF RESOURCES LIMITED

Sustainable products from plant biomass

### Minimum sugar price - with co-product credits



### Coproduct credits

Leaf Resources modelling has assumed that the co-product Lignin will attract a price of \$450/tonne. ResourceInvest stated that this figure “*may be a conservative estimate in an emerging market for high quality lignin products*”.

The report goes on to say, “*The minimum sugar selling price by including this credit, and also including ROI and capital allowance, is reduced to \$0.151/kg for Leaf compared with \$0.363 for NREL. This is a saving of \$0.212/kg over the normalised NREL model.*” This results in a cost advantage of almost 60% for Leaf’s Glycell™ process over dilute acid.

### Capital costs

The ResourceInvest report assessed the capital cost for a 700,000 ton plant based on NREL dilute acid at \$272.3M. Utilising consistent protocols and the same Lang factor, ResourceInvest estimated the capital cost for a Glycell™ plant producing the same volume of sugar to be \$202.9m. These estimates included all utilities and the process taking the biomass through to cellulosic sugars.

These numbers represent a 25% advantage in capital cost for the Glycell™ process\*



## LEAF RESOURCES LIMITED

Sustainable products from plant biomass

### Commercial benefits

The minimum sugar selling price after allowing for the lignin co-product credit and also including ROI and capital allowance, is \$0.151 per kg. On a marginal cost basis this price is approximately \$0.100 per kg.

Jacobs Consultancy Inc, a specialized Petroleum, Chemicals and Energy Engineering Practice in their report of March 2013 commissioned by Alberta Innovates - Energy and Environmental Solutions, titled "Identification of Opportunities for the Production of Bio-Products from Waste bio-mass in Alberta made the following comment:

*"With 22 cents/kg (10 cents/lb. sugars feedstock ethanol production from biomass (cellulosic ethanol) is profitable."*

Leaf Resources' Glycell™ process, based on the data from ResourceInvest's report can produce sugars at 15.1 cents per kilo on a fully costed basis after allowing for co-products.

This is well below the 22cents/kg figure in the Jacobs Consultancy's report and opens up the potential for the Glycell™ process as a profitable supplement/replacement to corn starch ethanol (also known as 1<sup>st</sup> generation ethanol). There are over 200 corn-starch ethanol plants in production in the USA alone producing over 14.5 billion gallons per annum.

\* Based on NREL report on N<sup>th</sup> plant design numbers and Leaf Resources Class 5 techno-economic analysis.

### Contacts:

Ken Richards (Managing Director)  
Jay Hetzel (Chairman)

M: +61 403 385 051  
M: +61 413 045 478