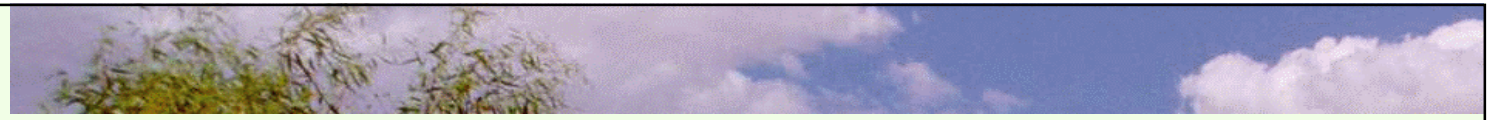
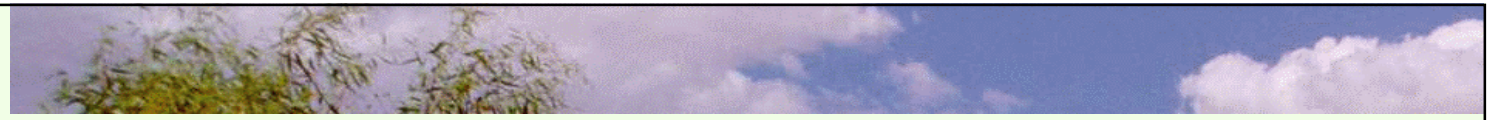


Bioenergy: Current and near term opportunities.

Presentation at OMA forum
Perth WA, 14th March 2008

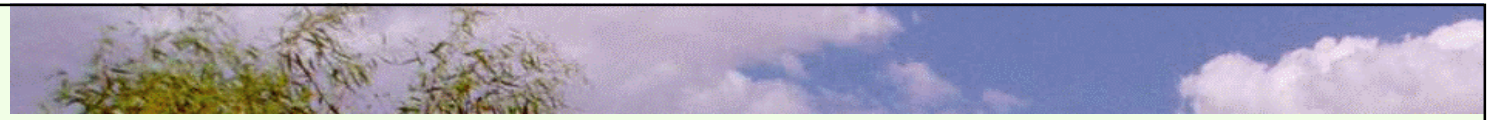
by

Colin Stucley, Enecon Pty Ltd



This presentation:

- **Who is Enecon?**
- **Current and near term bioenergy technologies**
- **Where to for mallees?**



Enecon is an Australian company, involved in engineering & project development.

Formed in Melbourne in 1998.

Specialise in bioenergy.

Enecon and IWP

- Identified technology at CSIRO
- Developed IWP concept
- Study with CALM and WPC
- Engineering for WPC (now Verve)
- Ongoing development for Verve

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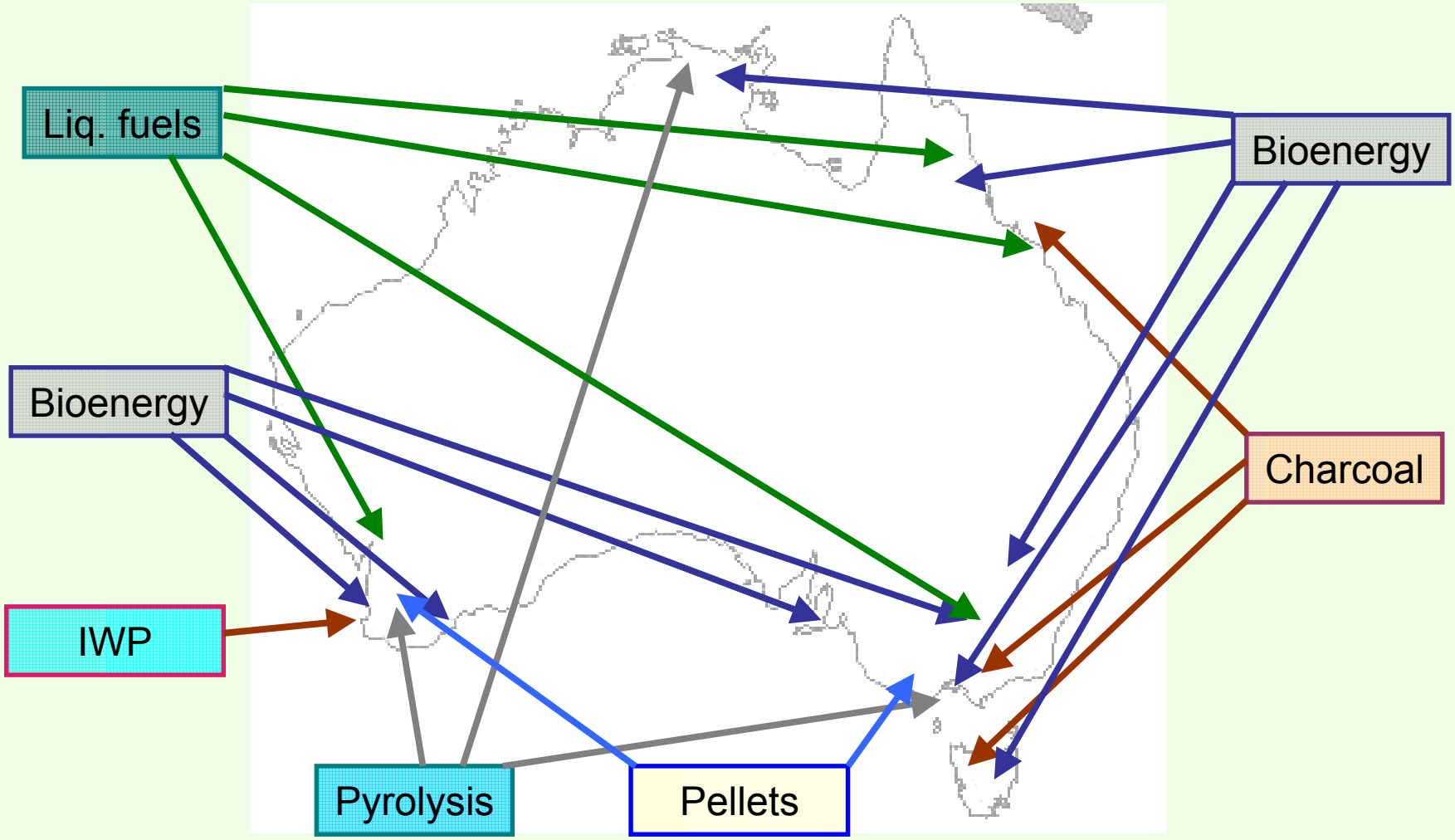
Enecon and bioenergy

- IWP is just one of the bioenergy processes that we consider

- We have ten years of bioenergy experience throughout Australia….

Enecon: Gov't and industry clients, around Australia



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Possible bioenergy technologies for large scale developments:

- **Electricity**
- **Pyrolysis**
- **Pellets**
- **Liquid transport fuels: syn-diesel and ethanol**

See 2007 Avongro report for further details. May be downloaded at Avongro or Enecon websites.

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Electricity…a difficult target

On main transmission lines:

- 40 MW costs just $2.5 million per MW
- but…380,000 green tonnes per year of feed!

On SW grid, off main transmission lines:

- 1or 2 MW costs more than $5 million per MW
- Steam is complex and gasification technology still hard to source
- If replacing line upgrades, must have similar reliability.

……What else can we consider?

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Fast pyrolysis:

Rapid heating of wood to approx. 500^0C, with no oxygen present.

Works with any biomass

Converts biomass into:
- Oil (about 60 – 70% by weight)
- Charcoal

Commercial plants already built in North America

Renewable Oil Corporation is commercialising in Australia. Plenty of feedstock available…the key to success is product market development

Wood pellets

How? Ground, dried wood, pressed through a die.

Technology?
Readily available now.

Why? Makes wood easier to transport and use.

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European pellet markets: from stoves……. to power stations

Typical pellet-fired heater for domestic use

The 570MW Avedøre-2 power plant in Denmark, during construction

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Wood pellets - summary

- Technology is available now.
- Suits small or large plants in WA.
- Large and growing product markets overseas.
- Product pricing is still volatile.
- Transport costs are critical.
- But: an opportunity that is worthy of further consideration.

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Wood to diesel: Technology is “nearly” commercial

Demonstration plant in Germany, almost completed

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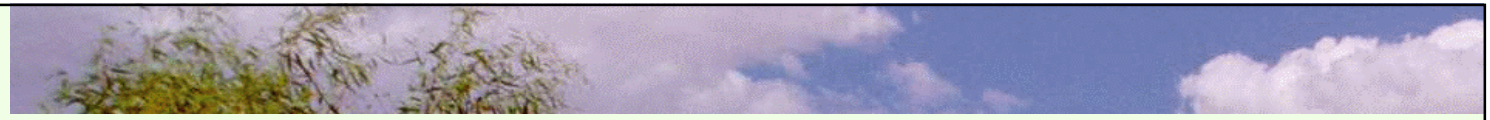
Wood to ethanol:

- Multiple pilot plants overseas many years ago.
- US Dept of Energy funded enzyme research over past few years – 30 fold improvement.
- Feb 2007: US DOE funding for six different commercial prototypes plants in USA.
- Total grant and private funds targeted for US bio-ethanol developments:

  ~ US $1.2 billion by 2011.



So, which bioenergy technologies should be of interest to mallee growers?

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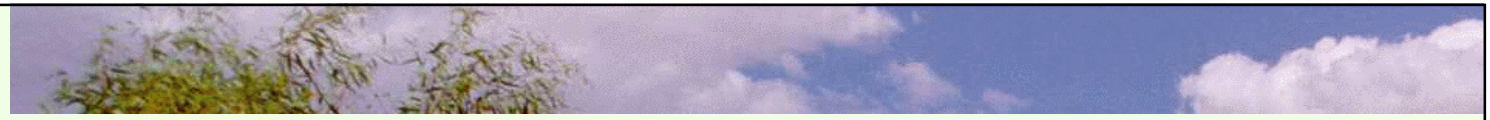

ALL OF THEM!

- ✓ There can be enough trees for multiple bioenergy technologies.
- ✓ Multiple technologies promotes growth and competitiveness and spreads risk.
- ✓ Technologies will take different times to commercialise and have different needs.

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Can growers build and operate bioenergy process plants?

- Electricity – yes, **if** you can make it profitable.
- Pellets – ready now and low capital cost.
- Pyrolysis – product market development needed.
- Ethanol and Syn-diesel – Huge opportunity in >5 years, but hundreds of thousands of tonnes feed, and hundreds of millions of dollars for plants.

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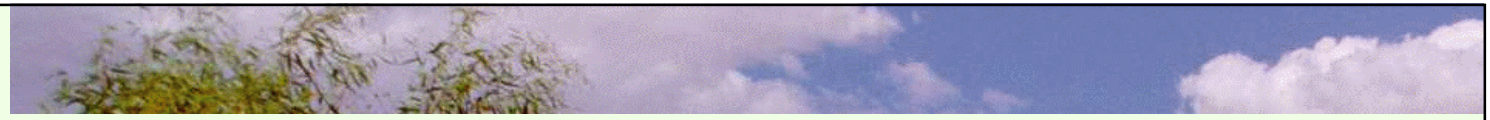

What should mallee growers be doing to attract bioenergy developments?

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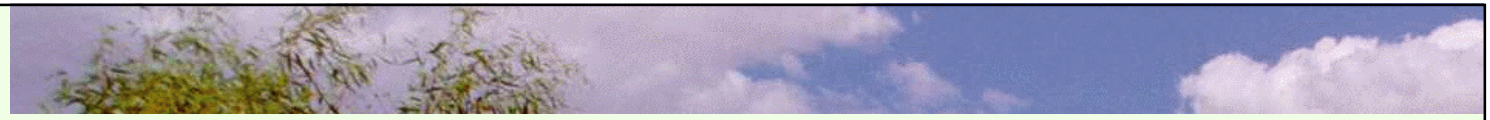


Guarantee feed supply:

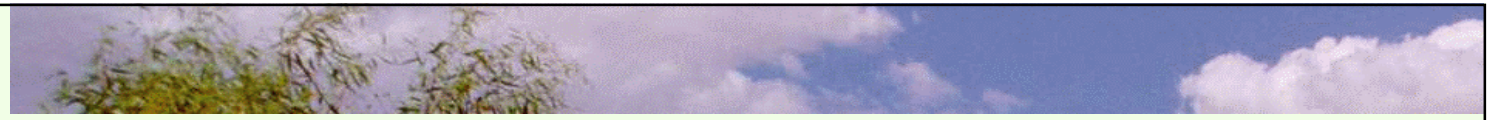
- reliable quantities of biomass,
- of consistent quality,
- at a competitive cost.

More work on harvest & delivery needed:

Cost-effective, large scale harvesting of whole tree mallees must have purpose-built equipment.

E.g. 20 tonne per hour, 40 h/week, 50 week/y.

Lack of harvester meant that mallees supplied to Narrogin IWP were not economic or to specification.



Longer term growth. Why mallees?

- Mallees can be a WA success story, but they will need to compete for bioenergy businesses.
- So, sell the environmental credentials and the professionalism of the WA mallee industry.
- Sell mallees as a truly sustainable feedstock
- Sell the proximity to Asian markets that cannot grow their own biomass.
- Plantation residues could be a short term supply of biomass while mallees grow – but they also influence the cost base.

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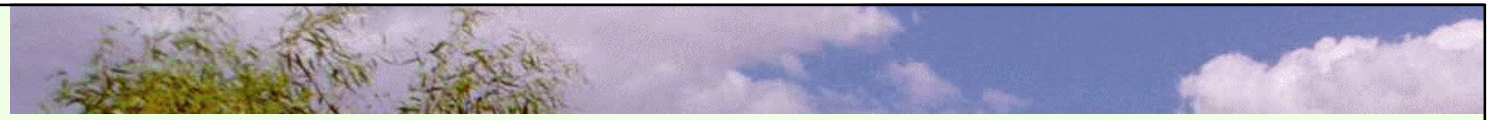
Longer term growth, cont'd.

The "chicken and egg" – trees must be planted before factories are built, but who will plant the quantities required without up front $$$ help?

Will carbon and other environmental trading mechanisms provide the momentum?
Or will they lock up trees?

Again: no large scale harvest & delivery = no long term business.

There is work to be done, but….



…a bioenergy future could be bright:

Several technologies exist now or are being commercialised overseas in next five years. Large markets exist for products.

By 2020 let's aim to have:

- Two million tonnes per year of commercial biomass sales, from 200,000 hectares or more planted to mallees.
- Multiple processing plants, based in WA's country towns. Jobs, cash flows, local value-adding.
- Major salinity protection on and off-farm.


Thank You
Colin Stucley, Enecon Pty Ltd
Suite 5, 651 Canterbury Rd,
Surrey Hills, Victoria 3127, Australia
Tel. (61 3) 9895 1250