Residues to Revenues 2009

Case Studies of Successful Waste to Energy Projects - Keys to Viability
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Residues to Revenues
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Profile for EFI

- Delivered energy and services to industrial or institutional counterparties
- Invest in projects with environmentally positive outcomes - with focus on process waste to energy and co-generation
- Normally long-term partnerships under Build, Own and Operate (BOO) arrangements
- Four EFI projects have been recognised with EECA Energy-Wise awards
- EFI is part of Meridian Energy Limited and operates with Meridian’s financial and operational support
- For further information see our website: [www.energyforindustry.co.nz](http://www.energyforindustry.co.nz)

Auckland Hospital Cogen plant

Our residues to revenue story

- Winstone Pulp International
  - 12MWh
  - Wood-waste fuelled heat plant
- DEC
  - 30MWh
  - Coal fuelled district heating scheme
- Blue Mountain Lumber
  - 16 MWh and 1.4MWe
  - Wood residue fuelled cogen plant
- Silver Fern Farms
  - 8.5MWh
  - Waste fuelled heat plant
Case study: WPI Karioi Pulpmill

- Karioi Pulp Mill, central North Island
- Chemi-mechanical pulp for niche export markets

- Energy requirements include:
  - 25 MW electricity, for pulp grinding
  - 12MW of heat for pulp drying.

- Process heat is supplied from:
  - EFI refinery heat recovery system (2008)
  - EFI heat plant (2005)
  - Balance from LPG.

WPI Karioi - EFI solution

- Pulp sludge dewatered and dried to create positive fuel value
- Log yard residue and imported wood residues

- Thermal fluid heater to deliver high temperature heat
- Vibrating water cooled grate with preheated primary combustion air
- Flue gas recirculation to limit radiant heat flux and control heater slagging
- Flue gas HRSG to increase thermal efficiency
WPI Karioi – fuel management

- Rocks
- Sawdust
- Post peelings
- And a truck diff!

WPI Karioi – operating challenges

- Fuel ash abrasion – extreme wear
- Para-screw fatigue failures resolved with attention to detail
- Sludge dewatering performance – practical considerations out weigh technical capability
- Heat supply and demand interaction – understand/control the effects on each
- Operator acceptance and support
WPI Karioi - outcomes

- Utilisation of wet fuels and including pulp sludge.
- Availability exceeds 95%
- Reduced energy supply costs – LPG use reduced by ~ 4m litres/y
- Reduced landfill – by ~ 6,000t/y
- Reduced GHG emissions – estimated by ~ 30,000t CO₂e/y.
- EECA award in 2006; winner in Renewable Energy category
- Recently completed an additional $3.5m heat recovery project to further reduce LPG usage

Case study: SFF Finegand meat works

- Finegand meat processing site at Balclutha
- 5 chains processing beef and sheep meat
- BAU situation was:
  - Steam from coal fired boilers
  - WWTP sludge dewatered and composted
- WWTP upgrade resulted in 15,000t/y sludge disposal problem
- Expanded composting requires space, wood residue, has odour issues – and produces a low value product
- EFI developed an alternative solution - a 8.5MW BFB boiler with full baghouse
- In 2007 SFF and EFI initiated a 15 year partnership covering a BFB boiler.
**Finegand - EFI solution**

**Fuel and combustion system:**
- Dewatered sludge and imported residues
- Bubbling fluidised bed with preheated combustion air
- Flue gas recirculation system for bed temperature control
- Full baghouse

**Innovations**
- Dewatering sludge to 50% dry solids by coagulation and centrifuging to create fuel value
- First NZ small scale BFB

**Bubbling fluidised bed boilers**

- Suitable for wet and/or high ash fuels – depending on ash properties
- Thermal mass of sand bed gives stable combustion
- Bed drainage to remove clinkers and ash contaminants
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Finegand - modular design

- Sand quality - critical to bed management and weekly restarts
- Sludge handling – keep it warm otherwise it can turn into solid lumps
- Operator learning curve – slowed commissioning and operating procedures changing as experience grows
- Fuel delivery house keeping – to avoid wind blown contamination

Finegand - experience to date
**Finegand - outcomes**

- High level of sludge dewatering achieved and proven to be an excellent fuel
- Generate 35,000t/y steam
- Displacing 6,000t/y Kai-point coal
- Reducing GHG emissions by 10,000t/y CO₂
- Reducing site's particulate and sulphur emissions
- First NZ reference site for small scale BFB technology
- EECA award this year; winner in Innovation and highly commended in Renewable Energy categories

**Key success factors for WtE projects**

- Window of opportunity typically due to step change in on-site energy requirement or costs
- Sound economic fundamentals
- Proven technology
- Technical and commercial capability to deliver the project and manage the associated risks
- Reasonable scale so that the economics can carry the appropriate levels of plant operating support, fuels management capability and contractor performance.
- Biomass fuel supplies can be sourced reliably, are consistent in quality and are affordable over the long term.
Outlook and emerging trends

In the last 10 years the base economics of WtE projects has been challenging. But fundamental changes are occurring:

- Base economic are improving – as other fuel costs rise
- Value from environmental and risk management is being recognised – GHG costs, air quality issues
- Attitudinal changes are happening – environmental responsibility and export market risk
- Biomass fuels recovery and markets are developing. NZ reportable has potential to use more than 5Mt per annum of process waste and residues.

Filling the gaps - residues ++

- Process wastes and sludges
- discharged in waste water or separated, dewatered and landfilled
- with appropriate pre-treatment can be used as a bio fuel.

- Forest residues
- Waste log butts, stem wood and thinnings
- Pulp wood

- Eucalypts and fast growing tree species
- Coppice and crops with relatively low moisture content (9 – 15%) and a good CV (17–18 GJ/tonne wet).
Value of long term partnering

*Successful partnering requires that the partnership creates value that would not otherwise be obtained.*

Every project is different, but partnering value can result from:

- **Lower cost** lower life cycle cost – rather than being determined by asset cost mentality.
- **Greater financial certainty** through the transfer of risks; asset development, performance, on-going operation, future asset obsolescence and external market costs.
- **Innovation and efficiency** through a focus on service delivery and outputs rather than asset procurement and inputs.
- **Sharing capacity** asset utilisation, expertise, experience and support services required to operate a portfolio.
- **Earlier delivery of benefits** discretionary projects funded where it would not otherwise be budgeted.

Why EFI?

- Sound and well resourced counter-party.
- Demonstrated track record.
- Know-how, and experience.
- Benefit sharing model.

EFI's Nelson LFG treatment plant
Where to from here?

- Not easy but becoming commercially viable
- Understand your fuels
- Use proven technology with reference sites
- Don’t try to do it on the cheap
- Get a specialist partner – preferably EFI

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EFI’s Dunedin Energy Centre – co-firing trials